This project has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement No. 101075515.

DE-RISK Project

D3.2: Regulatory Impact Analysis for Local Flexibility Markets and Services

Project Coordinator: Melike Güllüoğlu (WG)

Work Package Leader: Nadya Nikolova-Deme (SEA)

Deliverable Leader: Nadya Nikolova-Deme (SEA)

Document Information	
Project ID Number	HORIZON EUROPE - 101075515
Full Title	DE-RISK the adoption of Local Flexibility Markets to unlock the safe and reliable mass deployment of Renewable Energy Systems
Acronym	DE-RISK
Project URL	www.deriskproject.eu
EU Project Officer	Charles-Andre LEMARIE
Acknowledgement	The project has received funding from the European Union's Horizon Europe Framework programme under Grant Agreement No. 101075515.
Disclaimer	Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them

Deliverable	**Number**	D3.2	**Title**	Regulatory Impact Analysis for Local Flexibility Markets and Services
Work Package	**Number**	WP3	**Title**	Regulatory, Policy, Financial State of the Art analysis

Author(s)	Nadya Nikolova-Deme (SEA) Marc-Antoine Andrieux (SEA) Zoya Damianova (SEA) Juliette Grimaud (SEA)
Contributor(s)	Filip Gluszak (GP) Jean-Baptiste Bernard (GP) Jean-Christophe Mouton (GP) Guillaume Pilot (GP) Konstantinos Mamis (QUE) Yasser Alhelaly (UNL) Laura Pérez (R2M) Juan Manuel Espeche (R2M) Iván Aranda (R2M) Miguel Miñano (MIW) Ana García Garre (MIW) Jordi Solé (EC)

DE-RISK

	Eser Özdil (WG) Melike Güllüoğlu (WG) Kadir Ülger (WG) Marcus Keane (NUI) Mehmet Koç (UE) Çağatay Koçak (UE)
Reviewer(s)	Eser Özdil (WG) Melike Güllüoğlu (WG) Zdravko Georgiev (SEA) Laura Pérez (R2M) Miguel Miñano (MIW)

Date of Delivery	**Contractual**	30.09.2023	**Actual**	30.09.2023
Status	E01		Final version submitted to European Commission (EC)	
Nature	R – Document, report			
Dissemination level	PU - PUBLIC			

DE-RISK

Table of Contents

DE-RISK

Tables and Figures

DE-RISK

LIST OF ABBREVIATIONS

Term	Definition
aFRR	Automatic Frequency Restoration Reserve
BRP	Balance Responsible Party
BSP	Balancing Service Provider
CEC	Citizens Energy Community
CEER	Council of European Energy Regulators
CfD	Contracts for Differences
DER	Distributed Energy Resources
DLT	Distributed Ledger Technology
DR	Demand Response
DSO	Distribution System Operator
GDPR	General Data Protection Regulation
EC	Energy Community
EE	Energy Efficiency
EU	European Union
EV	Electric Vehicles
FCR	Frequency Restoration Reserve
FiT	Feed-in Tariff
FS	Flexibility Services
FSP	Flexibility Service Provider
HV	High Voltage

IEMD	Internal Electricity Market Directive
kWh	Kilowatt hour
LFM	Local Flexibility Market
LV	Low Voltage
mFFR	Manual Frequency Restoration Reserve
MV	Medium Voltage
MW	Megawatt
NECP	National Energy and Climate Plan
NRA	National Regulation Authority
P2P	Peer-to-Peer
PPA	Power Purchase agreement
PV	Photovoltaics
RAB	Regulatory Asset Base
REC	Renewable Energy Community
RED II	Renewable Energy Directive (2018)
RES	Renewable Energy Source
RIA	Regulation Impact Analysis
RR	Replacement Reserve
SMS	Smart Metering System
ToU	Time of Use
TSO	Transmission Service Operator
WP	Work Package

"Daily flexibility needs are expected to increase on average by 133% across Member States between 2021 and 2030. Comparing 2050 to 2030, a further increase on average by 250% is needed in the EU. The required system flexibility will have to come from non-fossil flexibility solutions such as demand response and storage."[1]

Kadri Simson, European Commissioner for Energy

[1] Opening Keynote Speech of Kadri Simson, European Commissioner for Energy on the European business conference of Smart Energy Europe in Brussels, 20 April 2023

A. EXECUTIVE SUMMARY

Problem Statement

With the current growth of renewable electricity, the electricity networks deal with more variable loads of energy. The development of flexibility services (FS) has become essential for network operators in order to maintain the balance of the grid. Although centralised electricity markets can provide such services, the developing Local Flexibility Markets (LFMs) allow for the active participation of customers in the electricity markets and leads to reduced investments in the grid.

LFMs and FS are deeply influenced by EU regulatory changes of both the Directive on common rules for the internal market for electricity (IEMD) and the Directive on the promotion of the use of energy from renewable sources (REDII), which establish market participants' roles and market participation rules. With the progressive implementation of EU regulations into national legislations, each EU country develops its own regulatory framework that impacts the development of LFMs and FS.

This report follows the principles of the OECD[2] Regulatory Impact Analysis (RIA), which is a global approach to highlight the positive and negative effects of new and current regulations (and non-regulatory alternatives).

This RIA report provides an overview of the regulatory framework in 10 European countries and as well at European level to achieve a better understanding of current regulatory environment of electricity markets, electricity network functioning and stakeholders, and electricity production and consumption (incl. flexibility services). The regulatory analysis also covers incentives that enhance LFMs deployment (incl. net metering) and technologies that are part of the electricity network such as energy storage, smart metering and blockchain (incl. smart contracts).

With the final objective to provide comprehensive information for a regulatory roadmap development for the 10 studied European countries, the RIA assesses the current regulatory framework that is enabling or acting as a barrier to the larger deployment of LFMs and FS.

[2] Organisation for Economic Co-operation and Development

DE-RISK

The RIA makes recommendations to enhance the development and operation of LFMs and help create new flexibility.

Proposed Solution and Value

The RIA Report is based on data gathered as a result of desk research with information about the regulation of the electricity sector in 10 countries (Bulgaria, France[3], Greece, Ireland, Italy, the Netherlands, Portugal, Romania, Spain and Türkiye). In addition, an in-depth survey has been conducted among the project partners to gather information about the pertinent regulations and their consequences on LFMs and FS development. Based on these two information sources and the subsequent analysis, conclusions have been drawn up and recommendations have been written for regulation and practices improvement to promote the adoption of LFMs in the studied countries.

The RIA report provides a valuable clarification of the existing electricity markets and flexibility services in the 10 studied countries based on the EU Regulation (EU Directives IEMD and REDII) and defines recommendations to apply these regulations or new regulations to encourage the adoption of LFMs and the further development of flexibility services. The deliverable covers a wide range of subjects related to the sustainable operation of LFMs such as theirs actors, the types of FS adapted to them, the needed technologies, their integration in the national electricity sectors, incentives, bureaucratic complexity and good practices among the analysed countries.

Assumptions are made about LFMs and flexibility services that need to be subject to legislative changes such as the DSO which must be allowed to purchase flexibility services as well as to be entitled to procure flexibility to the party responsible for resolving congestion in its own network. The network operator should allow producers (self consumers, prosumers, energy communities) to sell their self-generated electricity in real time.

The assumptions being made imply a change of model, moving from an entirely centralised system to a multitude of smaller local systems. Decentralisation of electricity markets needs to be one of the goals of energy policy in Europe. To ensure such policy, there is a need for

---

[3] Although the partner of DE-RISK from France, i.e. GRIDPOCKET has recently terminated their partnership from the project, required country data was already provided by them before this situation. Therefore, information regarding France is used as an input for the subject deliverable and we preferred not to leave the country out of this study.

specific legislation and objectives regarding LFMs and their relevant flexibility services (incl. standardisation). The RIA also focuses on the administrative and bureaucratic barriers and the ways to simplify procedures and reduce their costs for market actors.

To further promote and encourage citizens to take an active role in the electricity market, the RIA shows the benefits of better informing citizens on their potential role in the electricity sector and the schemes allowing them to take part in a project or activities at a household level. Incentives for flexibility providers also have an important role to play and should be advertised.

The curent report also examines the future use of technologies and their potential benefits for the electricity sector. Further development of technologies such as energy storage (incl. electric vehicles) needs to happen while European countries continue the deployement of smart meters to allow dynamic price of electricity as a major flexibility service in LFMs. Blockchain and smart contracts could be useful for exchanging data but they are still not well regulated and, therefore, their use in the energy sector is not widespread. Regulation and standardisation are needed for these innovative technologies to reach their full potential.

Conclusion

The RIA Report contributes to the creation of a complete regulatory package to facilitate the implementation of LFMs and to ensure fairness and competitiveness in the adoption and operation of the LFMs. It is an important element of an evidence-based approach to policy making to ensure that regulations are efficient and effective in the changing and complex modern world.

B. INTRODUCTION

DE-RISK project aims at (i) supporting the market deployment of renewable energy systems by fostering the development of Local Flexibility Markets (LFMs) in Bulgaria, France, Greece, Ireland, Italy, the Netherlands, Portugal, Romania, Spain and Türkiye, and (ii) unlocking 100 GW of flexibility in 2030, which will allow for a safe and reliable integration of Renewable Energy Sources (RES) in the electricity grid. DE-RISK aims to achieve this ambitious objective by minimising investment and implementation risks through an innovative journey focused on customer behaviour change that will increase the trust of end users and their willingness to participate in the local flexibility markets.

Despite the implementation of the EU legislation on the internal electricity market, the regulatory framework for LFMs and flexibility services is not yet fully developed. EU Member States are at a different stage of transposing the EU Directives and have as well differences in national-level regulation of electricity markets and the operation of their electricity networks. To develop a holistic approach to fostering the adoption of LFMs in Europe, there is an apparent need to review and assess the national regulation of European countries and further, to propose a set of recommendations to European policymakers as well as to policymakers in the EU Member States.

The implementation of DE-RISK goes through the following stages:

- The *first* stage deals with understanding customer behaviour through specific behavioural analysis followed by the design and implementation of a customer behaviour-change journey.
- **The *second* stage is focused on reviewing and analysing the legal, regulatory and financial conditions in order to determine the boundary conditions for four case studies in three European countries.**
- The *third* stage encompasses the design, implementation and analysis of the four case studies in Spain (two case studies), Türkiye (one case study) and Ireland (one case study).
- The *final* stage is dedicated to developing business models and replicability plans in order to ensure the sustainability of the achieved results.

The current analytical report is part of the work in the second stage of the project. The report makes an overview of current regulations at EU level and in 10 European countries, assessing their impact on the adoption of LFMs and flexibility services, and concluding with a number of recommendations for further regulatory developments.

Chapter A of the report is the Executive Summary, followed by Chapter B which is the introduction to the report and contains a brief presentation of the project, its ambition and objectives, before focusing on the scope of the regulatory impact analysis and its methodology.

The first part of Chapter C of the report introduces the concepts linked to flexibility services and energy markets and continues with presenting the state-of-the-art overview of the EU regulations impacting the adoption of LFMs and flexibility services. The main players, concepts and technologies are defined in relation to the relevant EU Directives. The second part of Chapter C briefly presents the regulatory framework of the 10 European countries under scrutiny. A history of the regulations and policy objectives relating to renewable energy and the energy market is given for each of the ten countries, followed by a presentation of the various players in the electricity sector, their interlinkages and the regulatory context in which they operate. This is followed by an overview of the organisation of the electricity market and the regulatory framework for the flexibility services available and the technologies operating on the electricity networks. Each analysis concludes with a summary of the main legislation in force.

Chapter D of the analysis focuses on the regulatory differences between the countries being analysed and their impact on the adoption of LFMs and flexibility services. It begins with assessing the compliance of national regulations with EU Directives, continues with looking at the impact of these regulations on market players, market characteristics and future developments in electricity networks. The analysis also looks at the regulatory barriers identified by experts, their impact on LFMs and the best practices to be studied and disseminated. The impact of regulations in the various countries on flexibility services, on flexibility-service providers and on the technologies deployed in electricity networks is also discussed and corresponding solutions are proposed. Finally, the analysis of regulations in the 10 countries focuses on data-related technologies, their management and protection.

Chapter E presents the recommendations made by the experts in each partner country and by desk research (for Italy, Romania and the Netherlands) for legislative changes to improve the adoption of LFMs. A summary of the general recommendations applicable in each country and at the European level is also provided. Annex 1 of the report includes the questionnaires received from the ten countries being analysed.

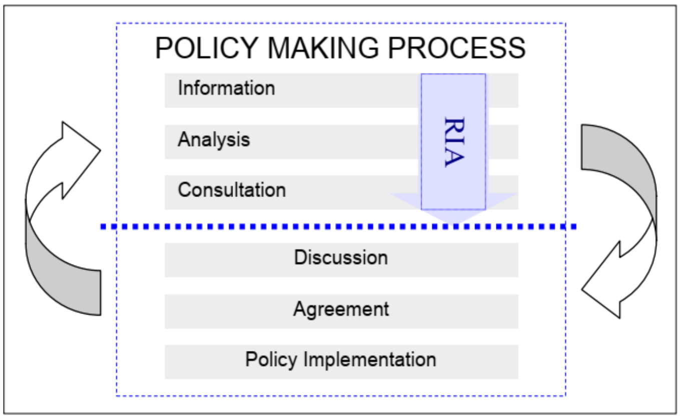
1. Regulatory Impact Analysis

The Regulatory Impact Analysis (RIA) is a systematic policy tool that is used to examine the effect of new or existing regulation through measuring its benefits, costs and impact on an analysed sector. The implementation of RIA contributes valuable empirical data to recommendations for policy decisions, and examines the implications of possible regulatory policy options. The review and updates of laws, rules, and other regulatory instruments, when being made, contributes to enhancing economic growth, decreasing regulatory risk and uncertainties.

Depending on policy objectives, impacts are measured in different ways and are focused on different policy fields and issues, setting priorities according to the policy objectives and capacities to measure different socio-economic regulatory impacts. RIA can help the decision-making process by assessing the efficiency of a policy and establish priorities across regulations and regulatory areas.

RIA can be used as an integrating framework which helps to determine the impacts of policies and as well to reveal interlinkages among them. In this sense, RIA is not only an analytical tool, but also a coordination tool that can bring different interests together.

Figure 1: Risk Impact Analysis in the Policy Making Process



Source: Building a framework for conducting RIA: Tools for Policy makers, OECD Regulatory Policy Division, November 2007

Most forms of RIA evaluate the consequences of existing or proposed regulation, as well as alternative scenarios, to select the most appropriate solution to achieve the desired results.

RIA can be applied *ex-ante* in the following cases: a new regulation, a revised regulation or even a de-regulation, where the impact is likely to occur in the future. It is forward-looking and estimates change in behaviour of stakeholders and resultant future consequences. *Ex-post* RIA looks at the past and evaluates the effects of the status-quo scenario, including existing regulations.

The primary and critical step of the RIA is to define the problem and objective on the basis of data, information and literature available in the public domain. Data quality is an essential element of the assessment because it is time and resource consuming and requires a systematic and functional approach. Further, the real value of a RIA report depends on the data which is used to evaluate the impact of the existing/proposed regulation.

The information that RIA requires can be collected through primary research (generating new data, for instance through specific surveys designed and implemented to attain a precise objective) or collecting data through secondary research (analysing existing data, i.e. data previously collected, and very likely re-processed). RIA further requires that data is tailored to the questions raised in regard to a specific regulation. For the proper implementation of the analysis and assessment of specific regulation, the collection of data from diverse sources is needed.

Current EU regulation aims to support the development and promotion of LFMs, so an in-depth study has been performed with the objective to provide an overview of how the regulatory environment in the 10 studied European countries and at the EU level evolved.

2. Methodology of the Regulatory Impact Analysis in DE-RISK Project

The overall objective of the RIA in DE-RISK project is to assess the current regulatory framework that is acting as an enabler for or as a barrier to the large deployment of LFMs and to flexibility services in ten countries and in the EU. By collecting data across Europe, the study aims to propose regulatory developments to boost the implementation of LFMs across Europe.

In DE-RISK project, the **methodology** of the Regulatory Impact Analysis goes through the following stages:

Stage I: Data collection

This stage includes the following research tasks:

- *State-of-the-art review of EU regulations* impacting the adoption of LFMs and flexibility services. The main players, concepts and technologies are defined in relation to the relevant EU Directives.
- *Documentary review of the national regulatory framework of the 10 European countries* under scrutiny in DE-RISK project: Bulgaria, France, Greece, Ireland, Italy, the Netherlands, Portugal, Romania, Spain and Türkiye. Each national review presents a history of regulatory developments and policy objectives relating to renewable energy and the energy market.
- *Mapping of the main players in the electricity sector of the 10 countries* in the focus of the report, their interlinkages and the regulatory context in which they operate.
- *Overview of the organisation/structure of the electricity market* and the regulatory framework for flexibility services in each of the ten countries.

The partners have used **two data-collection methods** for accomplishing the above research tasks: (i) data collection through desk research and (ii) data collection through in-depth structured questionnaire[4].

- **Desk research of EU and national-level legislation**. The desk research of the EU legislation has been performed by the Sofia Energy Agency – SOFENA, Bulgaria. The review of the national-level legislation has been accomplished in two steps: (i) for each country under scrutiny a first review has been performed by SOFENA, and (ii) upon receiving the filled-in in-depth structured questionnaires (in Annex I) by the DE-RISK partners, the country profiles have been further enriched. The scope of desk research encompassed the relevant EU directives and their transposition in the national legislation of the 10 countries being studied.

- **In-depth structured questionnaire**. The questionnaire was drafted by SOFENA, and then consulted with the DE-RISK partners. One such questionnaire has been filled in for each of the 10 study countries as follows: countries of the consortium partners - Türkiye, Spain, France, Portugal, Bulgaria, Greece, Ireland, as well as for *the*

[4] Data were collected until 30 June 2023, official data published after this date are not guaranteed to be covered in the current analysis.

Netherlands, Romania and Italy. The project partners were tasked with filling in the questionnaire for their own country, while SOFENA was responsible for filling in the questionnaire for the following studied countries: *the Netherlands, Romania and Italy*.

In few cases, the project partners had to invite external experts to support their work on filling in the questionnaire. In these cases, the partners followed the provisions of the GDPR.

Stage II: Regulatory Impact Analysis

This stage includes the following analytical tasks:

- **Regulatory differences between the countries** being analysed and their impact on the adoption of LFMs and flexibility services: assessment of compliance of national regulations with EU Directives, impact of these regulations on market players, market characteristics and future developments of electricity networks, regulatory barriers and their impact on LFMs, identified best practices to be studied and disseminated.
- **Impact of regulations on flexibility services** in the studied countries, on flexibility-service providers and on technologies deployed in electricity networks and possible solutions.
- **Recommendations for each country** for legislative changes to improve the adoption of LFMs.
- **General recommendations** stemming from the research and RIA.

C. POLICY AND REGULATORY ASPECTS OF LOCAL FLEXIBILITY MARKETS AND FLEXIBILITY SERVICES

1. State-of-the-Art of Local Flexibility Markets and Flexibility Services

Based on Article 194 of the Treaty on the Functioning of the European Union[5], EU Energy Policy has to preserve and improve the environment in the Member States and aims to:

- Ensure the functioning of the energy market.
- Ensure security of energy supply in the Union.
- Promote energy efficiency and energy saving and the development of new and renewable forms of energy.
- Promote the interconnection of energy networks.

To meet these objectives, the EU regularly legislates on the subject of energy. Since 1996 and the First Energy Package, EU energy policy is focused on liberalising the energy market by progressively unbundling energy sector activities and opening the energy markets to new stakeholders.

The First Energy Package (1996) includes two directives starting the liberalisation of the electricity and gas markets by encouraging competition, setting rules for third-party access to the networks and promoting the unbundling of the sector.

Adopted in 2003, the Second Energy Package pursues the objective of liberalising the market by organising competition among energy suppliers, thereby enabling consumers to choose their supplier freely.

<u>The Third Energy Package was adopted in 2009 and introduced the following reforms:</u>

- Unbundling of network transmission activities from those of electricity supplier and producer.
- Requirements for national regulatory authorities (NRA).
- Creation of a European Agency for Cooperation between NRAs (ACER).
- Creation of a European Network of Transmission System Operators for Electricity (ENTSO-E and ENTSO-G).

---

[5] Treaty on the Functioning of the European Union

- Strengthening consumer rights in the electricity market.

Following the Paris Agreement of 2015, the Forth Energy Package (also known as the Clean Energy for All Europeans Package) has been implemented in 2019 and includes one directive and three regulations:

- Directive (EU) 2019/944 on common rules for the internal market in electricity (recast).
- Regulation 2019/941 on risk-preparedness in the electricity sector.
- Regulation 2019/942 establishing a European Union Agency for the Cooperation of Energy Regulators (recast).
- Regulation 2019/943 on the internal market for electricity (recast).

The Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources is often associated to this package.

Through those directives and regulations, EU Energy Policy aims at:

- The promotion of renewable energy and energy efficiency.
- The promotion of energy communities and better integration of consumers in the electricity market.
- Better integration of RES in the electricity market.

The package also includes provisions for market design, grid access, and digitalisation of the energy sector, aiming to drive the transition to a clean and sustainable energy system.

In 2021, the "Fit for 55" process was launched to set EU's 2030 Climate Target on the way to climate neutrality.

In March 2023, the European Commission presented a proposal to reform the EU electricity market[6] to enhance renewable energy, to better protect and empower consumers and to promote industrial competitiveness. This proposal is currently being discussed at the European Council and at the European Parliament. Improving the flexibility of the power

[6] Proposal for a regulation of the European Parliament and of the Council amending Regulations (EU) 2019/943 and (EU) 2019/942 as well as Directives (EU) 2018/2001 and (EU) 2019/944 to improve the Union's electricity market design

system will be one of the main goals of this new EU legislation by introducing new support schemes (i.e., demand response and storage).[7]

Although the integration and the uptake of renewable energy within the electricity market has been encouraged by the EU, at the same time new challenges emerge such as the variability of electricity production depending on climate conditions. This variability calls for a more complex management of the electricity network between electricity production and consumption and the need to balance electricity in a new way. The growing demand for electricity in the decades to come (electrification of the car fleet, development of the hydrogen sector, etc.) will put more pressure on the operating networks. Interconnections between different European electricity networks are one solution at the European level but require high investments in these networks.

Large and centralised electricity generation plants (gas, coal, nuclear) remain the main electricity providers in Europe despite the development of renewable energy which has enabled the emergence of clean and decentralised means of electricity production. This decentralisation is both a challenge that requires the adaptation of the grid but also an opportunity to balance the grid at the local level. Local Flexibility Markets make it possible to moderate investments in the network but require the provision of specific flexibility services for this level.

The "Clean Energy for all Europeans" package[8] has made it possible to support and guide the evolution of national electricity markets by allowing local electricity producers/consumers to participate more actively. The EU Directive 2019/944[9] on common rules for the internal market for electricity (IEMD) and the EU Directive 2018/2001[10] on the promotion of the use of energy from renewable sources (RED II) aim to better integrate renewable energy into the electricity market by defining, for example, new market players. They also facilitate the use of flexibility services in order to guarantee network security.

[7] European Commission – Press release (March 2023)

[8] European Commission – Clean energy for all Europeans package

[9] Directive (EU) 2019/944 on common rules for the internal market for electricity (2019)

[10] Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources (2018)

1.1. Flexibility Services and Energy Markets

1.1.1. Demand-side Flexibility

Flexibility can be defined as the ability to shift the generation or the consumption of energy in time and location in order to maintain the balance of the electricity network (energy injections and withdraws have to be equal) and avoid outages.

Although some types of renewable energy, such as biomass or hydro, can adjust their production to the needs of the network and although energy storage (with physical storage, e.g. hydro pump, or with chemical storage, e.g. batteries) can also provide flexibility, the flexibility of the consumers (industry, residential), who can adapt their consumption or production to the needs of the network, is a key element for its stability.

Demand-side flexibility refers to the ability of electricity consumers to adjust their electricity consumption in response to changes in electricity prices or system needs. This can be achieved through various means, such as smart metering, automated demand response systems, and energy management systems. By providing demand-side flexibility, consumers can help to balance electricity supply and demand, reduce grid congestion, and lower costs. Additionally, demand-side flexibility can enable the integration of more renewable energy sources into the electricity system, as it can help to balance the intermittency of renewable generation.

Demand-side flexibility can be managed by various actors, depending on the specific market and regulatory framework. In some cases, distribution system operators (DSOs) or transmission system operators (TSOs) might manage demand-side flexibility as part of their overall system management responsibilities. In other cases, third-party aggregators or service providers might manage demand-side flexibility on behalf of consumers or groups of consumers. The specific management structure can vary widely depending on market design and regulatory context of the country.

A combination of education, incentives, and technology (smart metering) can help to increase awareness of demand-side flexibility and encourage more consumers (industries, households) to provide demand-side flexibility.

1.1.2. Explicit Demand-side Flexibility[11]

Explicit Demand-side Flexibility refers to the active participation of energy consumers in demand-response programmes or other market-based mechanisms that provide financial incentives for reducing or shifting electricity consumption during times of peak demand or other grid stress events. This type of demand-side flexibility involves explicit contracts between energy consumers and utilities or other market participants, in which consumers agree to curtail or shift their electricity consumption in exchange for compensation. Flexibility can be traded on several energy markets depending on the flexibility services needed and their delivery time:

- *Wholesale Market:* Wholesale Markets are the place where electricity is traded before being bought by and delivered to end consumers.
- *The Day-Ahead and Intra-Day Markets* are two markets that allow participants to buy or sell electricity for the following hours/day based on their anticipated needs.
- *Balancing Market:* Balancing markets are used to manage the real-time imbalances between electricity supply and demand on the grid. They provide a mechanism for network operators to procure additional capacity or reduce demand to maintain system balance.
- *Capacity Market:* Capacity markets allow grid operators to procure additional capacity from generators, demand response providers, and other resources to ensure grid reliability and meet future demand. This market usually involves long-term contracts that provide a guaranteed payment for capacity availability.

Explicit Demand-side Flexibility Services[12]

Constraint Management Services:

When there are difficulties on the network for the transmission of electricity from the production site to the location of the demand, network operators can resort to the following flexibility services:

---

[11] Klaassen, E., & Van Der Laan, M. (2019). USEF White Paper "Energy and Flexibility Services for Citizens Energy Communities"

[12] Project Local Energy Oxfordshire (LEO) – Flexibility services

- *Voltage Control*: Also known as reactive power management, this flexibility service consists of increasing the load or decreasing electricity generation to maintain voltage stability on the local grid.
- *Grid Capacity Management*: Grid operators may require this service to reduce grid losses at a long-term scale without an impact on the market.
- *Congestion Management*: Network operators use this service to manage peak loads by requiring a decrease of demand or an increase in generation to their flexibility service providers (FSP).
- *Controlled Islanding*: This service enables a portion of the electricity distribution system to operate independently in the event of a power outage by being supplied by local energy sources.
- *Optional Downwards Flexibility Management*: This service is used to respond to low levels of demand on the network by RES in order to reduce the use of conventional power plants.
- *DSO Constraint Management (pre/post fault)*: Network operators use this service to mitigate generation or demand in case of an emergency issue to avoid an outage or to restore the system following a fault.

Adequacy services:

Adequacy services ensure that the power system is always able to meet the needs of consumers at a long-term scale thanks to the consumption forecasting (including peaks loads in winter time):

- *Capacity markets*: These markets provide payments to electricity producers for committing to provide capacity in the future, at specific periods of time to meet the expected demand.
- *Strategic reserve*: These are capacity reserves that are kept on standby and are only dispatched during periods of high demand or low supply on the TSO's demand.
- *Hedging*: Suppliers buy electricity in advance to match the expected electricity consumption of their clients to avoid price spikes.

Balancing services[13]:

Balancing services are used by the TSO to maintain the stability of the grid's frequency (50 Hz, nominal frequency) and react to sudden instability:

- *Dynamic Containment*: After an unexpected imbalance of the grid's frequency, the TSO may require this service to restore rapidly the 50 Hz frequency on the network.
- *Frequency Containment Reserve (FCR):* This service is the first to be used by the TSO to restore instantaneously any deviation of frequency on the grid by balancing supply and demand automatically.
- *Automatic Frequency Restoration Reserve (aFRR)*: This service, also known as secondary reserve, is activated to restore the grid balance when the FCR does not succeed to do so within seconds after the imbalance.
- *Manual Frequency Restoration Reserve (mFRR)*: This third reserve intervenes to restore balance on the network when the aFFR does not succeed to do so within minutes after the imbalance.
- *Replacement Reserve (RR)*: Activated by the TSO within minutes or hours after an imbalance of the network, the RR comes in addition to the previous mechanisms.

Wholesale services:

Flexibility Service Providers sell their flexibility by trading electricity on the wholesale market and so they allow flexibility buyers to meet their needs at different time's scales.

- *Day-ahead optimisation*: Networks operators and other flexibility buyers can adjust their electricity needs for the following day by participating in the Day-ahead market through a daily auction.
- *Intraday optimisation*: Electricity is traded between flexibility providers and buyers in a continuous way to adjust to the electricity real consumption compared to the electricity consumption forecast.
- *Self/passive balancing*: Balance Responsible Party (BRP) reduces the imbalance within its portfolio and for a precise period of time to avoid imbalance charges.
- *Generation optimisation*: Optimise the behaviour of central production with some over- or undershoot in output to avoid imbalance and an increase in fuel consumption.

[13] Next Kraftwerke GmbH – Energy Markets

- *Exceeding Maximum Export/Import Capacity*: Electricity generators trade electricity among themselves to match the contractual amount of electricity they have to inject on the grid.
- *Offsetting*: Matching a local increase in demand with local increase in generation on a local flexibility market in order to have no impact on the transmission network.

1.1.3. Implicit Demand-side Flexibility[14]

Implicit demand-side flexibility refers to the flexible nature of electricity demand that is not explicitly contracted or compensated in a demand response programme or other market mechanism. It refers to the inherent flexibility of electricity demand, which can be used to help balance the electricity grid without the need for explicit financial incentives or contracts. Realising the full potential of implicit demand-side flexibility requires new technologies (such as smart metering) and regulatory frameworks (data access and protection) that enable grid operators to better monitor and control electricity demand in real time.

Implicit Demand-side Flexibility Services: Local Optimisation

Those services aim to improve the efficiency and the stability of the local energy system by providing and consuming electricity at a local level. They lead to greater independence from the larger grid system and reduce the consumer's exposition to an outage.

- *Time of use optimisation*: Through contracts, energy suppliers can provide electricity with different tariffs for consumers depending on the time of the day or on the season. This system provides financial incentives for the prosumer who will be encouraged to shift their electricity consumption from peak to off-peak periods.
- *kWmax control*: Reduce the max load that the prosumer consumes within a defined period through load or generation shifting or shedding in exchange for a financial incentive.
- *Self-balancing*: Prosumers can generate a financial value when managing electricity through the difference between the buying price and the selling price of electricity.
- *Emergency power supply*: Have a local response to global grid outages and have prosumers or emergency power supply being able to provide electricity for essential infrastructures.

[14] R. van Gerwen & H. de Heer – USEF Position paper – Flexibility Value Chain (2015)

- *Smart contracts*: Automation of buying and selling flexibility services between parties.
- *Collective self-consumption*: By producing and consuming energy, the participants of the collective self-consumption system have access to electricity at a lower cost and are able to stock and sell their excess electricity into the grid especially during peak loads.
- *Transmission charge management*: Exposing large customers connected on the transmission grid to additional charges based on their electricity consumption during annual peak loads to encourage them to reduce their demand during those periods.
- *Distribution charge management*: Exposing small and medium customers (industry, tertiary sectors) connected on the distribution grid to additional charges based on their electricity consumption during annual peak loads to encourage them to reduce their demand during those periods.

1.2. European Regulation on Flexibility Services and Energy Markets

1.2.1. Energy markets

The Clean Energy for all Europeans Package sets out a wider legal framework for energy markets by introducing new market players and their interactions. Those actors are defined in both EU Directives 2019/944[15] and 2019/943[16] on common rules for the internal market for electricity and Directive 2018/2001[17] on the promotion of the use of energy from renewable sources.

- *Aggregation* (Art. 2 (18) of IEMD 2019/944): 'aggregation' means a function performed by a natural or legal person who combines multiple customer loads or generated electricity for sale, purchase or auction in any electricity market.
- *Distribution System Operator – DSO* (Art. 2 (29) of IEMD 2019/944): 'DSO' means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity.

[15] Directive (EU) 2019/944 on common rules for the internal market for electricity (2019)
[16] Directive (EU) 2019/943 on the internal market for electricity (2019)
[17] Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources (2018)

- _Transmission System Operator – TSO (Art. 2 (35) of IEMD 2019/944):_ 'TSO' means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity.
- _Balance Responsible Party – BRP (Art. 2 (14) of IEMD 2019/943):_ 'BRP' means a market participant or its chosen representative responsible for its imbalances in the electricity market.
- _Self-consumer (Art. 21 of REDII 2018/2001):_ 'Renewables self-consumer' means a final customer who generates renewable energy for its own consumption within their premises, and who stores or sells their excess production of renewable electricity (including through PPA, electricity suppliers and peer-to-peer trading arrangements).
- _Active customer (Art. 2 (8) and Art.15 of IEMD 2019/944):_ 'Active customer' means a final customer, or a group of jointly acting final customers, who consumes or stores electricity generated within its premises located within confined boundaries or, where permitted by a Member State, within other premises, or who sells self-generated electricity or participates in flexibility or energy efficiency schemes, provided that those activities do not constitute its primary commercial or professional activity.
- _Renewable Energy Community – REC (Art. 2 (16) and Art. 22 of REDII 2018/2001):_ 'Renewable energy community' means a legal entity:
    - which produces, consumes, stores and sells renewable energy, including through renewables power purchase agreements;
    - which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity;
    - in which the shareholders or members of which are natural persons, SMEs or local authorities, incl. municipalities;
    - of which the primary purpose is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits.
- _Citizens Energy Community – CEC (Art. 2 (11) and Art. 16 of IEMD 2019/944):_ 'CEC' means a legal entity that:

- is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises;
- has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits;
- may engage in generation, including from renewable energy sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholders.

1.2.2. Flexibility services

The European Directives do not provide a specific definition of flexibility services. However, they encourage the development of demand response and demand-side management, which are key concepts for flexibility services.

Demand response (Art. 2 (20) of IEMD 2019/944): *'demand response' means the change of electricity load by final customers from their normal or current consumption patterns in response to market signals, including in response to time-variable electricity prices or incentive payments, or in response to the acceptance of the final customer's bid to sell demand reduction or increase at a price in an organised market as defined in point (4) of Article 2 of Commission Implementing Regulation (EU) No 1348/2014 (17), whether alone or through aggregation.*

The directives establish common rules and guidelines for the organisation and operation of electricity markets, which can enable the development of flexibility services. They also require the Member States to remove regulatory barriers to demand response and demand-side management, and to promote the development of technologies that can facilitate the provision of flexibility services. In general, the directives seek to promote a more flexible, efficient, and competitive electricity market in Europe by defining parts of the electricity market or its services.

- *Ancillary service* (Art. 2 (48) of IEMD 2019/944): 'Ancillary service' means a service necessary for the operation of a transmission or distribution system, including balancing and non-frequency ancillary services, but not including congestion management.

- *Non-frequency ancillary service* (Art. 2 (49) of IEMD 2019/944): 'non-frequency ancillary service' means a service used by a transmission system operator or distribution system operator for steady state voltage control, fast reactive current injections, inertia for local grid stability, short-circuit current, black start capability and island operation capability.
- *Balancing* (Art. 2 (10) of IEMD 2019/943): 'balancing' means all actions and processes, in all timelines, through which transmission system operators ensure, in an ongoing manner, maintenance of the system frequency within a predefined stability range and compliance with the amount of reserves needed with respect to the required quality.
- *Congestion* (Art. 2 (4) of IEMD 2019/943): 'congestion' means a situation in which all requests from market participants to trade between network areas cannot be accommodated because they would significantly affect the physical flows on network elements which cannot accommodate those flows.
- *Energy storage* (Art. 2 (59) of IEMD 2019/944: 'Energy storage' means, in the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical energy or use as another energy carrier.

1.2.3. Technologies integrated in local flexibility markets

Energy Storage

IEMD 2019/944 considers energy storage as a flexibility service to improve the security of supply and the management of electricity networks. As per Art. 3, national laws should encourage the development of energy storage facilities especially as an alternative to the construction of new generating capacity (Art. 8). Art. 36 states that DSO cannot own, develop, manage or operate energy storage facilities unless those facilities are fully integrated into the network and are validated by the NRA or unless the NRA does not award a third party during a tendering procedure and there is a need for storage facilities for the network to work efficiently.

Electric Vehicles

Art. 33 of IEMD 2019/944 ensures that Member States shall facilitate the connection of publicly accessible and private recharging points to the distribution networks. DSOs shall work in cooperation with the owners of those facilities and shall not own, develop, manage or operate recharging points for electric vehicles (except for their own use) unless the following conditions are fulfilled:

- No parties have been awarded a right to own, develop, manage or operate recharging points following a tendering procedure.
- The regulatory authority has carried out a prior examination of the conditions of the tendering procedure under the previous point and has granted its approval.
- The DSO operates the recharging points on the basis of third-party access (Art. 6) and does not discriminate between network's users.

Smart Metering

Art. 19 of IEMD 2019/944 defines Smart Metering Systems (SMS) as the best way to promote energy efficiency and active participation of customers in the electricity market energy. Suppliers should give management services by providing SMS. Each member state should ensure that smart meters are deployed and meet the following functional and technical requirements (Art. 20):

- Accurately measures actual electricity consumption and actual time of use.
- Customers must be able to access that information in a secure manner without additional cost and with respect for their privacy (compliance with GDPR Directive). Customers can extract data from meter readings and transmit them to a third party.
- SMS security uses the best available techniques to ensure the highest level of cybersecurity protection.
- Prosumers must be able to access the data of the electricity they inject into the network.
- Information and advice are given before or at the time of SMS installation in order to raise awareness about energy management and data protection.

Art. 21 of IEMD 2019/944 asserts the right for customers to have access to a SMS and Art. 11 - the right for them to have access to dynamic electricity price contracts.

Some of the technologies used for the modernisation of the electricity market require access to and processing of personal data, which are regulated by the GDPR 2016/679[18], which protects data by securing and limiting access to them. To complete this regulation, the Data Governance Act entered into force in June 2022 and will be applicable as of September 2023. Technologies such as blockchain and smart contracts have yet to be regulated at the European level.

Main EU Legislation

- **Directive 2019/944 (IEMD)** on the common rules for the internal market for electricity
- **Regulation 2019/943** on the internal market for electricity
- **Directive 2018/2001 (RED II)** on the promotion of the use of energy from renewable sources
- **General Data Protection Regulation 2016/679** on the protection of natural persons with regard to the processing of personal data and on free movement of such data
- **Directive 2012/27/EU** on energy efficiency

[18] EU Regulation 2016/679 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data

2. Overview of the Regulatory Environment for Local Flexibility Markets and Flexibility Services in European Countries

The RIA report presents an overview of the regulatory environment for Local Flexibility Markets and Flexibility Services in the different countries studied in the DE-RISK project, based on desk research. This analysis covers the regulation in 10 countries (Bulgaria, France, Greece, Ireland, Italy, the Netherlands, Portugal, Romania, Spain and Türkiye) in order to cover a wide range of backgrounds about regulations in the electricity sector. During the desk research the following documents have been reviewed:

- Legislation of each of the ten countries mentioned above.
- Annual reports from the National Regulatory Authorities to the European Commission.
- Relevant reports from EU-supported projects.
- Information gathered from TSOs and DSOs websites.
- Scientific articles and publications on LFM and FS.

By collecting and studying information, data and national-level regulation about the electricity market and services in the ten European countries under scrutiny, country profiles were developed and some good practices fostering LFMs were identified.

2.1. Bulgaria

Introduction

The liberalisation of the Bulgarian electricity market commenced in 2004 and is still in progress today. With joining the European Union in 2007, the regulatory thresholds for market liberalisation were removed, which allowed all users (domestic and non-domestic) to formally enter into transactions on the free electricity market, apart from industrial users. In 2007, in line with the requirements of the Second Energy Package, the energy suppliers were legally separated from the network operators. The next step was the transposition of the requirements of the Third Energy Package, with the amendments of the Energy Act (promulgated on 9 Dec 2003 and going through numerous amendments since then) introducing exceptional requirements for separation of production and supply from electricity transmission activities.

At present the market consists of two segments – a segment with regulated prices and a segment with freely negotiated prices or the so-called “open market”. Prices on the regulated segment are established by the state regulator – the Energy and Water Regulatory Commission (EWRC).[19] Household consumers are only on the regulated market. All business consumers, including those which have not yet selected an electricity supplier (and thus are supplied by the “supplier of last resort” (SLR)) have been obliged to enter the liberalised market since 1 Jul 2021. It is expected that from 2026 onwards household consumers will also enter the free energy market.

On the free market the regulatory control and monitoring is performed by the EWRC which has adopted Electricity Trading Rules [20], which form the regulatory framework for trading of electricity in the country. The electricity market structure includes several types of markets, among which an exchange market, a balancing energy market, a reserve market and additional services, etc. The electricity on the free market is purchased by the network operators, traders and consumers on freely negotiated prices from the electricity generators or from the Independent Bulgarian Energy Exchange (IBEX).[21]

Although nowadays there are established and well-functioning market platforms for wholesale trade and a high degree of connectivity with the neighbouring electricity markets, the process of liberalising the electricity market in Bulgaria is not yet fully finalised.

Market participants

The main participants in the energy market are EWRC, the independent system operator, the DSOs, electricity traders, balancing groups, energy asset owners and consumers (households and businesses).

On the free market main participants are the state-owned power plants such as the Nuclear Power Plant “Kozloduy”, the thermal power plant ”Maritza East 2”, the Hydro Power Plants of the National Electricity Company (NEC), as well as big energy consumers and traders.

[19] Energy and Water Regulatory Commission (EWRC)

[20] Energy and Water Regulatory Commission – Electricity Trading Rules (2020)

[21] Independent Bulgarian Energy Exchange (IBEX)

In January 2014, the Independent Bulgarian Energy Exchange (IBEX) was established as a 100% subsidiary of the Bulgarian Energy Holding.[22] IBEX started its operation in January 2016 with the launch of the Day-ahead market. Significant shift of the market took place in 2018 and 2019 as a result of legislative changes. With amendments dated 8 May 2018, mandatory sales through IBEX were enforced for the combined heat and power plants (CHP) and renewable energy generators with installed capacity equal to or higher than 4 MW. With the amendments to the Energy Act in force since July 2021, all RES and co-generation power plants with installed capacity of 500 kW or higher are obliged to sell their electricity only via the IBEX. All these changes, alongside with the obligation of the business consumers to enter the free market, significantly influenced the Bulgarian market model. Nowadays IBEX operates 3 trading platforms – a Day-ahead Market, an Intraday Market and Bilateral Contracts.

In compliance with the liberalisation process, the internal electricity market has been established as a market for bilateral contracts and balancing market. On a daily basis, generators, traders and coordinators of balancing groups notify the Electricity System Operator (ESO)[23] of their hourly schedules for generation and consumption for the next day. As an operator of the balancing market, the ESO compensates the difference between declared and consumed/generated electricity. The resulting costs are charged to the market participants in the form of prices for balancing energy.

At present, in Bulgaria, there are many active electricity trading companies. Usually, their portfolio includes a mix of generation plants and clients, ensuring resilience regarding the supply and demand. Traders offer forecasting and balancing services and bear partially the financial risk for the imbalances (mismatch between the forecasted and the real consumption). The client pays for the electricity and covers the costs for imbalances while all other expenses related to trading, balancing, scheduling, and additional services and managing of the service portfolio are covered by the traders.

Selling electricity to end consumers is organised through individually negotiated contracts for every customer. The administration and management of the load schedules, balancing, depositing network fees, excise duty and electricity fee "Obligation to Society", as well as all administrative procedures related to electricity trading, are covered by the traders. Traders

[22] Bulgarian Energy Holding (BEH)
[23] Electricity system operator (ESO)

offer diverse electricity consumption profiles, which are individual solutions for the client specific energy needs.

European regulations pave the way for new technologies (smart grids, energy storage; more renewable energy sources, hydrogen, heat pumps, geothermal energy, and more electromobility) and hence for new models of market relations. The regulations laid down in REDII have not been fully transposed in Bulgarian legislation, but the corresponding draft provisions are currently under discussion in the Bulgarian Parliament.

Flexibility services

The facilitation of active consumer engagement in the energy market is one of the key elements of the Bulgarian Implementation Plan[24] (for adoption of measures to eliminate identified regulatory distortions or market failures), and it is considered one of the key components of having an efficient energy market. Currently, the Bulgarian legislation lacks many of the details facilitating the users' activity. An appropriate and reliable policy framework is required in order to create a local flexibility energy market. At present, LFMs are demonstrated mainly by pilot programmes and research endeavours. In Bulgaria, the process of implementing the European regulations and directives has been delayed, though some of the functions of the LFM are already defined in the Electricity Trading Rules.

The balancing of the energy system (demand and supply, production and consumption) can be achieved by flexibility services including a range of solutions and capabilities. Bulgaria has implemented the necessary regulations for the functioning of the balancing energy market. The balancing model in Bulgaria is transparent; it provides equal conditions for balancing, regardless of the production technology, the size of the sites, and whether they are supplied at regulated or freely negotiated prices. In the market framework, a coordinated balancing group is actually composed of both a Balancing Responsible Party (BRP) and a Balancing Service Provider (BSP). This makes it a market player, which on the one side provides balancing services and on the other side is in a way responsible for any imbalances that happen.

Final users and small businesses should be able to access the electrical market, especially with the help of aggregation. Discussions about the proper regulation of aggregators in Bulgaria

[24] European Commission – Bulgarian Implementation Plan (2021)

are actively ongoing; at the moment this business model is only being presented as another responsible party for balancing. There is no single uniform definition for aggregators, which is why they are currently being defined as another balancing responsible party. There is also a lack of an aggregator licensing system. There is a need to develop better detailed market rules on the aggregators' activity and business models that are to be utilised in the electricity market.

Resources, such as efficient energy use, support for behavioural changes, heating systems, as well as energy storage capacities are underutilised in terms of supplying flexibility to the electric grid. Throughout the whole energy value chain, from production to customer relationship management, the digitalisation of electrical distribution can enhance operations and boost flexibility. Establishing trading regulations, fostering competition, and preventing the misuse of market dominance or other unfair trading practices are the main objectives in the creation of the local flexibility market.

Currently in Bulgaria, there are no provisions in the legislation on the creation and functioning of energy communities. At present (June 2023) legislative proposals are ready and are under discussion for adoption in the newly formed Parliament.

In Bulgaria, a number of changes are expected in the structure and legislative framework of the energy sector and especially in the regulatory framework of the energy markets, mainly driven by the major European directives – REDII and IEMD. In relation to these two directives, Bulgaria prepared an Implementation Plan, as well as an Integrated Energy and Climate Plan of the Republic of Bulgaria 2021-2030, which outline the direction in which the energy markets in Bulgaria will develop in the coming years.

Main legislation

- **The Law on Energy**[25] regulates public relations on the implementation of the activities of production, import and export, transmission, distribution of electric and thermal energy and natural gas, as well as the powers of state authorities to determine energy policy, regulation and control.
- **The Energy from Renewable Sources Act (ERSA)**[26] provides a regulatory framework for the promotion of renewable energy sources, including wind, solar, biomass, geothermal, and hydro power.
- **The Energy Efficiency Act (EEA)**[27] promotes energy efficiency across all sectors of the Bulgarian economy, including the renewable energy sector. The EEA requires large enterprises to undergo energy audits and provides incentives for energy efficiency investments, such as grants and low-interest loans.
- **The Electricity Trading Rules**[28] forms the regulatory framework for trading of electricity in the country.
- **The Integrated Energy and Climate Plan of the Republic of Bulgaria 2021–2030** defines the energy and climate targets until 2030 regarding renewables, energy efficiency, GHG emissions reductions, interconnections, research and innovation**.**

[25] Ministry of Energy – Energy Act
[26] Energy from Renewable Sources Act
[27] Energy Efficiency Act
[28] State Commission for Energy Supply Regulation in Bulgaria – Electricity Trading Rules (2020)

2.2. France

Introduction

In France, since the global opening of energy markets in 2007, new regulations have transformed the electricity market. As early as 2007, during the “Grenelle de l’environnement”, the first objectives concerning the development of renewable energy sources were introduced into French legislation (Law Grenelle 1). But it was necessary to wait until 2015 for the adoption of the Energy Transition Law for Green Growth 2015-992 (LTECV) for France’s energy future and for actions to be implemented to achieve it. The LTECV sets the target of 32% renewable energy in the French energy mix by 2030. In 2019, the Energy and Climate Law 2019/1147 complemented the previous regulation with the objective of carbon neutrality by 2050 in response to the Paris Agreement (2016). To help achieve these objectives, the Law 2023-175 on accelerating the production of renewable energy has been implemented in 2023 and aims at removing certain administrative barriers in order to facilitate the emergence of RES projects and their speed of execution.

The development of RES introduced an increasing need for flexibility services in the French electricity market. In 2010, the new organisation of the electricity market (Law NOME 2010/1488) recognised the benefits of load shedding for balancing the transmission network and ensuring its security.[29] After the adoption, in 2019, of the Clean Energy for all Europeans package, signals for better investment and more flexibility have been put in place. The transposition of both European Directives IEMD 2019/944 and RED II 2018/2001 through the Ordinance 2021-236[30] has put consumers at the centre of the electricity market by allowing them to have a more active role in the production of energy as well as have a better control of their consumption and their expenses. The French multi-annual energy plan (2019, review in 2023) sets a target for the development of demand response capacity of 4.5 GW in 2023 and 6.5 GW in 2028. In the «Energy pathways to 2050» report[31], RTE (French TSO) estimates flexibility needs at 15 GW regardless of the energy mix scenario.

[29] Smartgrids – CRE – Regulatory framework for Demand-side management
[30] Ordinance 2021-236 on Directives (EU) IEMD 2019/944 & RED II 2018/2001 Transposition
[31] RTE – Energy Pathways to 2050 (2021)

DE-RISK

Market participants

Electricité de France (EDF) is the main French company for generation and distribution of electricity. EDF was founded in 1946 by nationalising a number of electricity producers, transporters and distributors. After the EU directive 96/92/EC in 1996 on the common rules for the internal electricity market, the electricity market was opened to new participants and EDF was split into several entities (nowadays EDF, Enedis, RTE). EDF remains the main electricity supplier for residential and industrial consumers and is also the main electricity producer (historical nuclear electricity producer). RTE is the only TSO operating in France. Enedis is the main Distribution System Operator (95% of electricity) while 6 other DSOs have more than 100 000 consumers. Despite the presence of independent participants on the market, it is common for the largest electricity suppliers to also perform other roles such as aggregator or balance responsible party. To ensure the proper functioning of the market, the energy regulation commission (CRE – French NRA) sets a revenue cap (Tariff for the use of public electricity networks – TURPE) each year.

Article L321-7 of the Energy Code provides for the development of Regional Network Connection Plans for Renewable Energies (S3REnR) by RTE in agreement with the DSOs in order to set RES electricity production targets. The plans define, for the existing structures and those to be created, the production capacities to achieve the objectives. Defined in article L322-11 of the Energy Code, the network development plan is published bi-annually by the major DSOs (serving at least 100 000 customers). This plan provides transparency to the medium and long-term flexibility services that are needed, and sets out the planned investments for the next 5 to 10 years, placing a particular emphasis on the main distribution infrastructure needed to connect new generation capacities and new loads (including electric vehicle charging points). It also includes the use of Demand Response, energy efficiency, energy storage facilities or other resources that the DSO must use as alternatives to expansion of the network.

To achieve the objectives for the production of renewable electricity and better integrate RES into the electricity market, France has mainly two types of support mechanisms: (1) The “Open Counters” which offers the right to benefit from support for any eligible installation (Obligation to purchase or Additional remuneration) and (2) Competition procedures where the support is only awarded to the winners of these procedures.

Structure of the electricity market[32]

The wholesale electricity market in France consists of several markets, which serve different purposes. Demand-side management operators, traders, electricity generators and electricity suppliers are the main market participants. The main markets are:

- **Day-ahead market**: Operated by EPEX SPOT (partially owned by RTE), this market operates on a day-ahead basis, where market participants submit their bids for the next day's electricity supply.
- **Intraday market**: This market allows market participants to trade electricity on an hourly basis, up to a few hours before delivery. This market is also managed by EPEX SPOT.
- **Balancing market**: Managed by RTE, this market is used to maintain the balance between electricity supply and demand in real-time, by allowing market participants to adjust their bids based on the real-time network conditions.
- **Capacity market**: This market provides incentives for power generators to invest in new capacity or maintain existing capacity to ensure the security of supply in the long term. The capacity market is managed by the French government.
- **Renewable energy certificate market**: This market allows generators of renewable energy to sell their certificates to energy suppliers or consumers who are required by law to purchase a certain amount of renewable energy. This market is managed by the CRE.

Flexibility services

Demand response for electricity consumption is defined in the Energy Code (Art L271-1 to 4) as an action aimed at temporarily lowering (on a one-off request sent to one or more end consumers by a system operator or a supplier) the level of electricity withdrawal from the network of one or more consumption sites, in relation to a forecast consumption programme or an estimated consumption. But, according to the French law, load increase or generation reduction are not part of the demand response. Demand-side flexibility has been continuously developed since 2014 and is part of TSO and DSO congestion management services, as well as the day-ahead and intraday market, balancing market and capacity market.

[32] CRE – Wholesale electricity market (2021)

According to the Energy Code, Art. L321-15, any person intervening on the electricity market is responsible for their deviations. It can either define the terms according to which these differences are charged to it financially by contract with a TSO or contract for this purpose with a BRP which is responsible for the differences.

To ensure the security of the grid[33], the TSO has power reserves that can be mobilised with the balancing market (FCR, aFRR, mFFR and RR). Between 2021 and 2022, CRE approved changes so as to have a daily tender process for contracting secondary reserve and to revise the French balancing process to bring it closer to the European target balancing model defined in the EU regulation 2017/2195.[34] Among the missions of the DSOs (Energy Code, Art. L344-5) is the obligation to ensure the electricity balance, the efficiency, security and safety of the networks that they operate. In accordance with Art. L344-9 of the Energy Code, the DSO freely negotiates with producers, suppliers and/or other market participants the contracts necessary to meet its obligations, which include flexibility and ancillary services (through competitive, transparent and non-discriminatory procedures). To this end, DSO ensures the call of production facilities connected to the distribution network in conjunction with the TSO (Energy Code, Art. L321-9). A capacity obligation system also exists in the French Energy Code (Art. L335-1/2/3) which requires from each supplier to obtain capacity guarantees to cover the consumption of all of its customers during national peak consumption periods. This mechanism encourages the development, at medium term, of demand response capacity.

In order to increase the flexibility available at the residential level, Enedis launched, in 2015, the installation of smart meters for all its customers. At the end of 2021, 90% of the Enedis meter park has been equipped with Linky smart meters, which allow electricity suppliers to adapt contracts as accurately as possible to the needs of their customers and provides wider flexibility to the grid. Smart metering gives access to personal consumer data. In accordance with the EU regulation on data protection (GDPR), the customer has the possibility to consult those data. Hourly consumption data can be saved in the meter's memory (Energy Code, Art. R341-21). The subscriber can keep them (with or without transmission to the DSO and to the supplier) or deactivate the storage of their consumption data.

---

[33] CRE – Annual Report to the European Commission on the main developments on the French electricity and natural gas markets in 2021 and the first semester of 2022 (2022)

[34] Commission Regulation (EU) 2017/2195 establishing a guideline on electricity balancing (2017)

For LFM development, France has pilot projects such as the "Reflex"[35] project carried by Enedis and operating with a regulatory sandbox (operational until 2025). After deciding about the geographical areas where market players can offer local flexibility services, Enedis launched a tender aimed at identifying local flexibility opportunities. They also plan to develop a platform for local market participants where they will trade flexibility such as production excess, participation in DR, Energy storage services. The platform will allow for real-time monitoring of the local energy system and will provide as well the necessary information for the optimisation of electricity production and consumption. Feedback and a regulation evolution are expected from this project in order to accelerate the development of further LFMs. At term, those flexibilities should be included in the network planning (S3REnR).

Main legislation

- **The Energy Code** is the official French legal code bringing together various provisions relating to energy law.
- **The Energy Transition Law for Green Growth (LTECV - 2015)** introduces the multi-annual energy plan (PPE) and sets a 32% renewable energies goal in the French energy mix.
- **The Energy and Climate law (2019)** sets the goal of carbon neutrality by 2050.
- **Ordonnance 2021-236 (2021)** transposes various provisions of both EU Directives 2018/2001 and 2019/944.

[35] Enedis – Roadmap for the transformation of network sizing methods and the integration of flexibilities (2020)

2.3. Greece

Introduction

Greece aims to achieve carbon neutrality by 2050. The national climate and energy policy is focused on improving competitiveness, energy security and protecting vulnerable consumers. The major policy document is the National Energy and Climate Plan, adopted in 2019, which defines the country's policy until 2030, specifying targets and supporting measures towards achieving net-zero emissions. The National Climate Law of May 2022 establishes the following benchmarks for reducing total greenhouse gas (GHG) emissions: 55% by 2030, 80% by 2040 and as well net-zero emissions by 2050. Phasing out lignite-fired power generation is planned by 2028.[36]

Although Greece has decreased the use of fossil fuels in its energy supply, they continue to be an important energy source in the country. Between 2010 and 2021 the share of fossil fuels decreased from 90% to 82% of total energy supply. But when it comes to lignite-fired generation of electricity, within the period 2005 to 2021 Greece has managed to achieve a remarkable progress in decreasing the share of lignite-fired generation from 60% to 10%. This decline was offset mainly by increasing gas-fired generation, along with increasing the generation of electricity from wind and solar photovoltaics (PV).[37]

According to the report *Snapshot of Global PV Markets 2023*[38], published by the International Energy Agency on 27 May 2023, Greece is among the global leaders in the production of energy from renewable energy sources (ranking in 7th place among the countries with the highest penetration of renewable energy in electricity production in 2022). As per the same report, Greece ranks second in the world in the use of photovoltaic technologies in the production of electricity. In the list of countries with the highest penetration of photovoltaic technologies, Spain is the leader with 19.1%, followed by Greece with 17.5%, Chile with 17% and the Netherlands and Australia with over 15%.

[36] IEA – Energy Policy Review (Executive Summary) – Greece
[37] Ibid.
[38] IEA-PVPS - Snapshot of Global PV Markets (2023)

Near-future reforms in Greece will be focused on cost reduction and electrification which will be driven by modern technologies: e-mobility, energy-efficient buildings as well as smart grids.

Market participants

The Ministry of the Environment and Energy (MEE) and the Regulatory Authority for Energy (RAE) regulate the Greek energy market. MEE is responsible for developing the national energy policy and as well issues secondary legislation. RAE has been established by Law 2773/1999[39] as an independent regulatory authority. Directive 96/92/EC on the liberalisation of the electricity market has been transposed in the Greek legislation by Law 2773/1999.

After the adoption of the Third Energy Package with Law 4001/2011 and Law 4425/2016, RAE became the competent authority responsible for the security of energy supply, as well as for issuing all certificates and licenses of energy producers. In 2020, this responsibility was transferred to another administrative body under Law 4685/2020. Other responsibilities of RAE encompass the certification of transmission system operators (electricity and gas) and as well the certification of distribution system operators (gas).[40] Further, RAE publishes an annual report, which is submitted to the Hellenic Parliament, the Minister for Environment and Energy, the Agency for the Cooperation of Energy and the European Commission.

The Independent Power Transmission Operator S.A. (IPTO) has been established with Law 4001/2011. IPTO is organised and operates in line with the provisions of EU Directive 2009/72/EC, performing the duties of Owner and Operator of the Hellenic Electricity Transmission System (HETS). IPTO has been certified by RAE in December 2012. Since 20 Jun 2017, IPTO has been following the Ownership Unbundling model. IPTO's mission is to secure the electricity supply, to promote free market competition, and as well to ensure the equal treatment of HETS users.[41]

The Public Power Corporation S.A. (PPC) has been established in 1950 by the Greek Government, with the main objective to design and implement a national energy policy focused on supplying the Greek citizens with cheap electricity. Nowadays, PPC Group is composed of 3 subsidiary companies: PPC S.A, HEDNO S.A. (the Greek DSO), as well as PPC

---

[39] Law No. 2773 on the liberalization of the electricity market – Arrangement of energy policy issues and other provisions.

[40] The Energy Regulation and Markets Review: Greece

[41] IPTO – About us

Renewables S.A. HEDNO S.A. owns and operates the electricity distribution network of Greece. PPC Renewables S.A. is a 100% subsidiary company of PPC, and is the pioneer in wind and solar energy since the 80s, both in Greece and in Europe.

HEDNO S.A. has been established under Law 4001/2011, which transposed into Greek legislation the provisions of Directive 2009/72/EC. This Directive imposes the legal and operational separation between Transmission and Distribution from Vertically Integrated Electricity Companies, such as PPC. Directive 2009/72/EC has been replaced by Directive (EU) 2019/944 of the European Parliament and of the Council of 5 Jun 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (recast), which was incorporated into Greek legislation with laws 4986/2022 and 5037/2023.[42]

HEDNO S.A. has two major responsibilities as per the provisions of Law 4001/2011:

- To operate the Hellenic Electricity Distribution Network (HEDN).
- To manage the Markets of the Non-Interconnected Islands (NII).

Pursuant to Law 4508/2017, HEDNO S.A. has been appointed as the single operator of the Utility Services Special Account for the entire country. As of 30 Nov 2021, HEDNO S.A. has absorbed the Distribution Branch of PPC S.A. HEDNO S.A. further became an Owner of the Hellenic Electricity Distribution Network (Article 129 Law 4819/2021), and an Operator of the Hellenic Electricity Distribution Network (Articles 123 and 127 Law 4001/2011). The capital of HEDNO S.A. is owned at 51% by PPC SA and 49% by Macquarie Asset Management.

Structure of the electricity market

The structure of the electricity market of Greece is compliant to the single European energy market model, also known as the Target Model, which is a wholesale electricity market model, aiming at gradual harmonisation of the different electricity markets (through coupling) in order to establish a unified electricity market at the EU level. The legal basis for the Target Model stems from the Third Energy Package.

At the national level in Greece, Law 4512/2018 amended Law 4425/2016, through which the following four markets were established: the wholesale market of forward electricity products (renamed energy financial market), the Day-ahead market, the Intraday market and the Balancing Market. The Law provides for the establishment of the Hellenic Energy

[42] HEDNO - Company Profile

Exchange (HEnEx). The operation of the forward market, the day-ahead market and the intraday market has been entrusted to HEnEx. The Independent Power Transmission Operator (IPTO) is responsible for managing the aforementioned markets and balancing the system in real time.[43]

Interconnection of the Greek islands

The electricity system of Greece is unique because of its numerous inhabited islands. Although Greece has progressed in interconnecting the grids of the inhabited islands to the mainland grid, still a high number of them remain not interconnected. HEDNO S.A. is responsible for the development, operation and maintenance of the distribution network of the non-interconnected islands of Greece. PPC is the main supplier of electricity on the non-interconnected islands. The goal of the Greek government is to interconnect all inhabited islands to the mainland grid by 2030.

Flexibility services[44]

Greece is introducing key measures to improve the flexibility of the electricity grid so that the grid integrates higher shares of variable PV and wind, and at the same time increases grid efficiency. These measures include a plan to roll-out smart meters for most consumers by 2030, increase energy storage capacities and include demand-side response (DSR) in balancing markets.

Yet, the deployment of smart meters in Greece is still limited. As of 2021, a total of 83000 smart meters have been deployed. In July 2022, the DSO has announced a forthcoming tender to select companies to install up to 7.7 million smart meters, with plans for additional tenders as needed to complete the rollout of smart meters in the country. The full deployment of smart meters is expected to be achieved by 2030 and will cost around EUR 1 billion.

Greece has the ambition for a much greater contribution of DSR to increasing grid efficiency and integrating variable RES generation. A new platform to support DSR participation in the electricity balancing market has been started in July 2022.

Electricity storage is already a significant contributor to the Greek electricity system and market. As of June 2022, Greece has two large pumped hydro-storage facilities in operation: Thissavros (0.38 GW) and Sfikia (0.33 GW). At the end of 2021, the RAE has issued 181 licenses

[43] Karageorgiou & Associates – Target Model in Greece: Legal Framework and Challenges
[44] International Energy Agency – Energy Policy Review: Greece 2023 (April 2023)

for electricity storage projects with a total capacity of 14.3 GW, including 14 pumped-storage projects with a total capacity of 3 GW. Greece has developed a special support scheme for energy storage projects, approved by the European Commission in September 2022. With a budget of EUR 341 million the scheme will deliver support to the construction and operation of about 0.9 GW of electricity storage, connected to the high-voltage grid. The measure will be co-funded by the European Union's Recovery and Sustainability Mechanism.

Main legislation

- **Law 2773/1999** transposing Directive 96/92/EC on the liberalisation of the electricity market and establishing the Regulatory Authority for Energy.
- **Law 4001/2011 and Law 4425/2016** adopting the Third energy package and establishing HEDNO S.A.
- **National Energy and Climate Plan (2019)** defines the Greek policy until 2030 towards achieving net-zero emissions.
- **National Climate Law**, May 2022 benchmarks for reducing total greenhouse gas (GHG) emissions.
- **Law 4508/2017** pursuant to which HEDNO S.A. has been appointed as the single operator of the Utility Services Special Account for the entire country.
- **Law 4819/2021** pursuant to which HEDNO S.A. became an Owner of the Hellenic Electricity Distribution Network (Article 129 Law 4819/2021), and an Operator of the Hellenic Electricity Distribution Network (Articles 123 and 127 Law 4001/2011).
- **Law 4425/2016** establishing the wholesale market of forward electricity products (renamed energy financial market), the Day-ahead market, the Intraday market and the Balancing Market.

2.4. Ireland

Introduction

The electricity sector of Ireland has undergone significant developments over the past century. Ireland's experience in developing the national electricity sector vis-à-vis other European countries is unique, given its island power system and the lack of significant fossil fuel resources. The first electricity market in Ireland was established in 1927. A paradigm change came with the development of plans for generating electricity from hydroelectric power stations, with the first project focusing on harnessing the energy of the River Shannon. Ardnacrusha, the hydroelectric power station on the River Shannon, was designed to meet the national demand for electricity, thus making Ireland's electricity sector 100% renewable in the early 20th century.[45]

The energy policy of Ireland reflects the EU energy policy, largely driven by the relevant EU legislation. The Government of Ireland is responsible for designing and implementing the national policy about the electricity markets. This is the Minister for Environment, Climate and Communications who is responsible for exercising executive authority in relation to the Irish electricity sector. The Irish electricity sector is regulated by the Electricity Regulation Act 1999 (which has been frequently amended since then), which established the Commission for Regulation and Utilities (CRU) as Ireland's independent energy regulator, whose purpose is to protect the interests of energy consumers and to maintain the security of supply. CRU promotes competition in the generation and supply of electricity, as well as in the supply of natural gas. The 1999 Act gave effect to EU Directive 96/92/EC[46] (part of the First EU energy package).[47,48] Thanks to the liberalisation of the Irish Electricity Market with the adoption of the 1999 Act, since February 2005 any person in Ireland can generate electricity provided that

---

[45] Wonders of World Engineering – The Shannon Power Scheme

[46] Directive 96/92/EC of the European Parliament and of the Council of 19 December 1996 concerning common rules for the internal market in electricity (1996)

[47] E. Cassidy, P. McLay & W. Carmody – Electricity Regulation 2022 - Ireland

[48] Fact Sheets on the European Union – Internal energy market "The first liberalisation directives (First Energy Package) were adopted in 1996 (electricity) and 1998 (gas), to be transposed into Member States' legal systems by 1998 (electricity) and 2000 (gas)."

a license from the CRU is obtained for electricity generation, as well as an authorisation for constructing the required generating station. Since 2005 electricity customers in Ireland may select an alternative electricity supplier.

Market participants

EirGrid, a public limited company, is the electric-power Transmission System Operator (TSO) of Ireland, and as such is responsible for the operation, planning and developing the electricity transmission system, including as well interconnections to neighbouring grids and running the wholesale electricity market. EirGrid is regulated by the Commission for Regulation and Utilities.[49]

ESB Networks (Irish DSO) finances, builds and maintains the transmission system of Ireland under a license granted by the CRU and under the direction of EirGrid. They distribute electricity to the end users.[50]

Electricity interconnection is very important in the energy policy of Ireland, and is strongly emphasised in the National Policy Statement on Electricity Interconnection.[51] Electricity interconnection is also the means to further improve the security of supply and the market competition.

The East West Interconnector (between Ireland and Great Britain) is very important for the Irish electricity grid as it provides for enhanced "security of supply, voltage and frequency support, lower wholesale prices and reduced curtailment of renewable generation".[52] The Celtic Interconnector is anticipated in 2026 and will connect the electricity grids of Ireland and France.

Structure of the electricity market[53]

Launched in Ireland on 1 Nov 2007, the Single Electricity Market (SEM) united the electricity markets of the Republic of Ireland and Northern Ireland into one wholesale electricity market, operating on an all-island basis. The Utility Regulator and the Commission for Regulation of

---

[49] EirGrid

[50] ESB Networks

[51] Government of Ireland, Department of the Environment, Climate and Communications – National Policy Statement on Electricity Interconnection (2021)

[52] Commission for Regulation of Utilities – Publications

[53] SEM Committee – Market Overview

Utilities jointly regulate the market. The SEM Committee is the decision-making body which governs the market.

In the fall of 2018, the SEM went through a major development, the reasons behind being the significant increase in the share of renewable generation and the interconnections with other markets which provide significant advantages. Thus, new market arrangements were enforced on 1 October 2018, namely, the Integrated Single Electricity Market (I-SEM).

The SEM encompasses three pillars, which provide revenue streams:

- **The Energy Trading Arrangements (ETA)**: these comprise the wholesale energy trading, which form the larger share of revenues. SEM Energy Markets are broken down between forward market, day ahead and intraday markets, and the balancing markets.
- **Capacity Remuneration Mechanism (CRM)** ensures that there is enough capacity to meet demand and allows generators to recover their fixed costs.
- **Delivering a Secure Sustainable Electricity System (DS3)** programme aims to ensure that the interests of all customers are protected. The DS3 multi-year programme started in 2011 with the main objective to "to identify the challenges associated with integrating unprecedented levels of variable renewable generation and to implement solutions"[54], i.e. to operate the Irish electricity system securely and sustainably. DS3 is about changes in the market and regulations which benefit the end consumer.[55] DS3 has three pillars: System Performance, System Policies and System Tools.

  DS3 programme is focused now on the implementation of the System Services Future Arrangements (SSFA) project, which has the objective to establish a stable DS3 regulatory framework through to (at least) 2030.

Flexibility services

System Services Future Arrangements (SSFA) project

Following a public consultation, the SEM Committee published Decision Paper 1[56] on the Future Arrangements for System Services on 30 Mar 2021, presenting the decisions on the Objective and the Assessment Criteria for the project and a framework for procuring System

[54] European Commission – DS3 Delivering Secure Sustainable Electricity System

[55] Ibid.

[56] SEM Committee – SEM-21-021 System Services Future Arrangements – Decision Paper 1 (2021)

Services through Fixed Contract Arrangements. Decision Paper 1 also established the SEM Committee's approach to the project, with three phases: Phase I (Scoping Phase; Decision Paper 1 (SEM-21-021), Mar 2021), Phase II (High Level Design Phase, High Level Design Consultation paper (SEM-21-069), Aug 2021 and high-Level Design Decision SEM-22-012) and Phase III Implementation.[57]

National Smart Metering Programme (NSMP)

Launched in September 2017 by CRU, following the provisions of the Energy Efficiency Directive 2012/27/EU for customer behaviour and technology trials and a positive cost-benefit analysis, NSMP is focused on Irish homes, farms and businesses. ESB Networks have been tasked by CRU with the roll-out of the programme, the objective of which is the replacement of all existing electricity meters in Ireland with smart meters. NSMP is part of the national Climate Action Plan. By the end of 2024 ESB Networks is replacing 2.4 million electricity meters in Ireland.

Electricity storage[58]

Electricity storage is of high importance for the security of electricity in Ireland and supporting the energy transition. In 2022, the combined storage capacity which is connected to the grid is ~792 MW. The Department of the Environment, Climate and Communications is working towards developing a policy on electricity storage. In parallel, the Commission for Regulation of Utilities is reviewing "the regulatory treatment of storage" including licensing, charging and market incentives.

The National Network, Local Connections Programme[59]

The programme aims to transform the way electricity is consumed by customers and stored at the local level (homes, farms and small businesses) throughout the country. The ambition is to have a local distribution system, which will monitor, forecast and manage power supplies. Thanks to this new system local communities will be able to become active market

---

[57] Ibid.

[58] Government of Ireland – Consultation on Developing an Electricity Storage Policy Framework for Ireland (Nov. 2022)

[59] Newstalk – ESB Networks launches the National Network, Local Connections Programme to help decarbonise Ireland's power (2021)

players, i.e. actively managing and controlling their electricity consumption, on the new localised electricity markets created by ESB Networks.

Phased flexibility market development plan

ESB Networks are responsible as DSO to develop the distribution system in a safe, secure, reliable, economical and efficient manner by developing the distribution system infrastructure. In line with the responsibilities of DSOs established in the Electricity Market Directive (EU 2019/944), ESB Networks is also responsible for the development of market-based flexibility services.

The National Network, Local Connections Programme is the ESB Networks' initiative which is focused on developing and introducing flexibility services which are "operationally compatible with transmission system services and energy market operations".[60]

Main legislation

- **Electricity Regulation Act 1999** (which has since then been amended frequently) is the central piece of legislation for the Irish electricity sector. Act 1999 established the Commission for Regulation and Utilities (CRU) as Ireland's independent energy regulator.
- **Climate action plan (CAP, June 2019)** establishes Ireland's policy objective to achieve carbon neutrality by 2050 and sets out the course of action towards attainment of this objective. Under the CAP, the Government of Ireland has committed to increase the share of electricity generated from renewables from 30% to 80% by 2030.
- **Statutory Instrument (S.I.) 20/2022** European Union (Internal Market in Electricity) Regulations 2022.
- **S.I. 365/2020** European Union (Renewable Energy) Regulations 2020.

[60] ESB Networks – Phased Flexibility Market Development Plan, National Network Local Connections Programme, DOC-230921-GYU

2.5. Italy

Introduction

Italy nationalised its electricity sector by Act 1643 of 6 December 1962. Ente Nazionale per l'Energia Elettrica (ENEL), the electricity generation board of Italy, was established through merging more than 1,200 private electricity companies. ENEL has had a monopoly on the production and transmission, and was partially in charge of the distribution of electricity. During the following 30 years the electricity system of Italy was organised as follows: (i) ENEL – a country-wide company, (ii) municipal utilities in the larger cities (Rome, Milan, Turin), and (iii) a large number of industrial electricity producers. In 1992, ENEL became a joint-stock company, but continued to be owned by the Italian Ministry of Economy.[61]

The process of liberalisation of the electricity sector commenced in the late 1990s, in line with the European Union directives. The liberalisation of the electricity market was implemented through Legislative Decree 79/1999[62] ("Decreto Bersani") transposing the EU Directive 96/92/EC, which suggested a progressive liberalisation of the electricity markets and separation of monopolistic activities from the free-market activities. By implementing this decree, a new entity has been established within the ENEL Group, Terna. Terna S.p.A. is the Italian transmission system operator (TSO). *Terna Rete Italia* manages the Italian transmission grid while *Terna Plus* is in charge of the business development. Globally, Terna is ranked the sixth largest electricity transmission grid operator based on the size of its electrical grid.[63]

In Italy, the development of renewable energy has been regulated since 2003 (Decree 387/2003[64]), and further regulated by the Romani Decree of 2011 (Decree 28/2011[65]). A number of mechanisms have been put in place to accelerate the development of RES (feed-

---

[61] IAEA – Country Nuclear Power Profiles – Italy

[62] Legislative Decree 79/1999 – Implementation of Directive 96/92/EC

[63] Terna

[64] Legislative Decree 387/2003 on the promotion of electricity produced from RES in the internal electricity market (2003

[65] Legislative Decree 28/2011 on the promotion of the use of energy from renewable sources (2011)

in-tariff programme, Green Certificates, Conto Energia support scheme for PV plants[66]). RES electricity generation has induced a wider development of the electricity market and currently accounts for nearly 42% of electricity production.

In 2021, the Law-Decree 77/2021[67], aiming at simplifying procedures for RES, was introduced to speed up the achievement of renewable energy objectives. The European RED II and IEMD Directives were transposed into the Italian legislation in 2021, respectively, through Legislative Decrees 199[68] and 210[69] on 8 Nov 2021. They facilitated the development of the electricity market by defining the participants and their interactions.

Market participants

ENEL retains a dominant position on the distribution network (32 million consumers) and remains the leading Italian producer (17.5% in 2021[70]) and as well the leading supplier of electricity.

The development plan for the national electricity transmission network was introduced into Italian regulation with the Legislative Decree 93/2011.[71] Article 35 of the Legislative Decree 199/2021 defines the methods for electricity network planning. Complete planning is required to anticipate renewable energy development areas as well as the infrastructure needed for electric vehicle charging. The TSO has the additional task of specifically planning urgent work on the network.

ARERA is the Italian Regulatory Authority for Energy, Networks and Environment, established in 1995 by Law 481. ARERA supervises the sectors of electricity, natural gas, water services, waste cycle and district heating. ARERA is an independent administrative authority and is tasked with the promotion of competition and efficiency in public utility services, the protection of interests of users and consumers and the supervision of the market. ARERA

[66] GSE – Renewable energy

[67] Law-Decree 77/2021 – Governance of the National Recovery and Resilience Plan (2021)

[68] Legislative Decree 199/2021 – Implementation of (EU) Directive 2018/2001 (2021)

[69] Legislative Decree 210/2021 – Implementation of (EU) Directive 2019/944 (2021)

[70] Statista – Market share of the leading electricity providers in Italy in 2021

[71] Ministry of the Environment and Energy Security – Development Plan of the National Electricity Transmission Grid and VAS

further advises the Italian Government and Parliament, incl. for the matters related to transposing and implementing the relevant EU legislation.[72]

As per Resolution 568/2019/R/eel[73], ARERA establishes a tariff system to remunerate the Italian TSO for the transmission services and the dispatching. ARERA also sets the tariff regulation for distribution. Those tariffs depend on the cost and the quality of service and on the innovation and are defined for a 4-year period (currently 2020-2023).

State-owned energy service system operator GSE is managing support schemes for electricity generation including the main financial mechanism (FER Decree – 4 July 2019) for joining the electricity network.

Structure of the electricity market

The electricity market is divided into a Day-Ahead Market (MGP), an Intra-Day Market (MI) and a Dispatching Services Market. The first two markets are managed by Gestore dei Mercati Energetici (GME also known as Italian Power Exchange IPEX which is responsible for managing electricity capacity and for granting energy reserves)[74] and the Dispatching Services Market encompassing the following sub-markets:

- Ex-ante MSD where Terna trades energy and balancing services in order to release congestion and to create reserve margins.
- Balancing Market where Terna trades real-time balancing services to restore secondary/tertiary reserves and maintain the grid's balance.
- Daily Products Market where all participants in the electricity market are admitted and where they sell/buy daily products with the obligation of energy delivery.

Flexibility services

In Italy, the TSO (Terna SpA) monitors the network balance by ensuring that the injections of electricity are equal to the withdrawals. Through offers and bids, the TSO buys flexibility from operators generating electricity or consuming it on demand. According to article 23-3a of the Legislative Decree 210/2021, the DSOs cooperate with the TSO to ensure the network

[72] ARERA

[73] ARERA – Resolution 568/2019/R/eel on the update of the tariff regulation for 2020-2023

[74] GME - Gestore dei Mercati Energetici SpA

security, in particular through the management of ancillary services and balancing services (through the participation of electricity production, consumption and storage).

In order to ensure network security at a local level, article 23-3b of Legislative Decree 210/2021 provides for the experimentation of a self-dispatching system to encourage producers and final customers to balance their positions by offsetting local electricity consumption by local production (mechanism of rewards and penalties).

As early as 2006, ARERA recognised the potential of smart metering in adapting tariffs to end-customers in the residential sector as well as providing flexibility on the network. The main DSO, ENEL, had the ambition to install 30 million smart meters. With a significant advance on the EU objectives (80% of households equipped by 2020), almost the entire Italian residential sector is equipped with smart meters. ENEL, with the support of the regulatory authority, commenced the deployment of the second generation of smart meters.[75] Regulated by Article 8 of the Legislative Decree 210/2021, end-customers with smart meters have the right to conclude a contract with a dynamic electricity price with a supplier (which has more than 200 000 end customers). The pricing must be based on customer's actual consumption data.

For Smart Meters installed after July 2019, end-consumers must have access to the data generated by the device or to an online interface in a secure way. Article 9-1 of Legislative Decree 210/2021 specifies that the data security measurement and communication systems must comply with EU legislation.

Italy has not yet regulated blockchain and its applications but Distributed Ledger Technologies (DLTs) have been defined by the Law Decree 135/2018[76] (Article 8-ter) and Law Decree 12/2019. This decree also defines smart contracts as a software that operates on DLTs and whose execution automatically binds two or more parties based on predetermined arrangements.

[75] Enel – The Circular Smart Meter: sustainable innovation (2022)

[76] Law-Decree 135/2018 on support and simplification for businesses and the public administration (2018)

Main legislation

- **Bernasi Decree (Legislative Decree 79 March 16, 1999)** transposes EU Directive 96/92/EC on the creation of an internal energy market.
- **Legislative Decree 387/2003** authorisation framework for renewable energy pants
- **Environmental Code** defines the environmental procedures.
- **Romani Decree 28/2011**
- **FER Decree** sets incentive procedures for RES integration on the electricity network.
- **Legislative decrees 199 and 210 on 8 Nov 2021** transposes various provisions of EU Directive 2018/2001(energy production from RES) and EU Directive 2019/944 (common rules for the internal electricity market).

2.6. The Netherlands

Introduction

The policy of the Netherlands is focused on encouraging the production of renewable energy, especially solar energy and wind power, which tend to grow rapidly. Approximately 40% of the electricity produced in 2023 comes from RES.[77] According to the 2019 Climate Act[78], the Netherlands has to reduce its greenhouse gas emissions by 49% in 2030 (compared to 1990) and the ambition is to achieve carbon neutrality, i.e. the production of 100% renewable energy by 2050.

The 1998 Electricity Act[79] is the main law concerning the supervision and regulation of the electricity network. The transposition of European Directive 2019/944 has been partly implemented through amendments to the 1998 Electricity Act. A project to merge this Act and the Gas Act is planned, in order to create a new Energy Act, in which the EU Directive 2019/944 will be transposed. This new legislative project has been submitted to the House of Representatives for parliamentary consideration at the end of 2022.[80] The European RED II directive has been transposed in June 2021, amending the Environmental Management Act.

[77] NL#Times – Netherlands produced 20 percent more renewable energy last year

[78] Climate Change Laws – Climate Act (Netherlands, 2019)

[79] Electricity Act 1998

[80] Government Gazette 2022, 6101 – Communication on the implementation of Directive (EU) 2019/944 on common rules for the internal market in electricity

The Dutch market has been fully liberalised since 2004, and since 1 Jul 2001 a green energy market has been open to all consumers. Therefore, every private individual has a free choice for their electricity supplier. At the moment, foreign players have privatised and acquired a considerable share of the electricity supply and generation industry.

According to Art. 95l of the Electricity Act, producers, traders and suppliers have to disclose to their customers the proportion of each energy source used and the environmental consequences of the production of electricity from these energy sources. Promotion of the use of more environmentally friendly energy by producers and suppliers is specified in the Art. 68 of the same Act.

To accelerate the development of renewable energy, financial incentives have been implemented, both for companies and for individuals. As a result, significant subsidies have been included in the government policy, as well as programmes for companies to boost energy efficiency and renewable energy, such as:

- SDE+ is a programme launched in 2020 to stimulate the sustainable energy production, with a total amount of 30 billion euros, for large-scale energy projects, such as wind farms.
- SDE++ is a 13-billion-euro subsidy for companies and organisations which use (or plan to do so) new energy production technologies to reduce CO_2 emissions.[81]
- ISDE: subsidies for solar-water heaters, small-scale wind turbines, or connections to a heat network for example. The amount of the subsidy is 350 million euros for 2023, with a new budget available every year. The continuation of the ISDE grant is planned until 2030.

Other measures are also put in place to create a framework for renewable energy in electricity production, such as an eco-label for green electricity (Milieukeur elektriciteit) which certifies the renewable origin of electricity production.

Market participants

The Netherlands Consumer and Market Authority (ACM, for Autoriteit Consument & Markt) is the reference regulatory authority designated by the 1998 Electricity Act. The ACM is responsible for competition oversight, enforcement of consumer protection laws and sector-

[81] Netherlands Enterprise Agency – Stimulation of sustainable energy production and climate transition (SDE++)

specific regulation of several industries. It is an independent regulator that defends the rights of businesses and consumers by making sure that the market is in compliance with the Electricity Act (Electricity Act, Art. 5). The ACM publishes some monitors to provide insight into the energy market developments. Art. 11b stipulates that the ACM shall receive an annual report from the system operator on how the regulation has been implemented and on the measures being taken in this context.

The company TenneT (Dutch TSO) is in charge of managing the transmission network. It is a 100% state-owned company certified under the ownership unbundling model.[82] TenneT is supervised by state authorities, in order to protect consumers from potentially abusive behaviour of the monopolist. Distribution networks are managed by 8 main DSOs, which ensure the distribution of electricity to final consumers.

Most of the electricity production is carried out by five large companies. The Netherlands has a large proportion of decentralised capacity, unlike other European countries. Most of it comes from cogeneration plants (in horticulture or industry), but also from renewable sources (solar, biomass and wind) or from waste treatment plants. About 40 companies are licensed to supply electricity to small customers. However, the largest share of the retail market is held by 4 companies: Nuon, Essent, Eneco and DELTA.

Energy suppliers are chosen by the customers, and they pay them the full electricity bills. The supplier will then pass on the network fees to the medium and low-voltage operator (the networks maintenance and development. Tariffs are set by the ACM each year (Electricity Act, Art. 41c) and tariff structures are communicated by network operators to customers (Electricity Act, Art. 38).

<u>**Structure of the electricity market**</u>

Dutch Electricity market is meant to ensure a freedom to dispatch, a freedom of transaction and a freedom of connection and is divided in the following markets:[83]

- *The Forward and Futures market* allows participants to trade electricity between 4 years and one-month delivery. Futures financial products are standardised contracts on power exchanges while forward financial products are traded over the counter.

---

[82] TenneT – Regulation
[83] TenneT – Market types

- *The Day-ahead market* allows market players to participate in an auction of electricity blocks for next day's electricity supply.
- *The Intraday market* allows buyers and sellers to adjust their electricity needs on a quarter-hourly or hourly basis.
- *The Balancing market*[84] is operated by TenneT where balancing service providers (BSP) (who have been pre-qualified) can offer their capacity as flexibility services in order to ensure the balance of the network on a real-time basis.

Networks interconnection with neighbouring countries and markets coupling ensure the integration of the Dutch electricity market in the European market.

Flexibility services

As per Article 16 of the Electricity Act, the TSO needs to ensure the security and reliability of the network. Therefore, the development of flexibility is crucial and TenneT is an active player in improving the flexibility of the grid, since it acts by taking part in pilot storage projects or by carrying out studies and developing tools. It is the case of the ValueFlex Tool which is an industrial tool, available free of charge to industrial wholesale electricity consumers. The aim of this tool is to highlight the possible savings on the energy markets, by using electricity in a more flexible way.[85]

Projects have been developed in order to improve smart solutions to reduce grid congestion and improve its flexibility. For example, the GOPACS Project has been launched in 2019. The actors of this project were the main Dutch network operators like TenneT end Enexis Groep. The main goal of the project is to create a smart solution to reduce the congestion of the electricity network and thus improve its flexibility.

Electric cars are also used to improve the flexibility of the grid. Indeed, there are many "Vehicle-to-grid" (V2G) projects, whose purpose is to use electric cars as temporary batteries and thus to discharge the grid, and to supply local electricity networks. The energy can be transferred to the grid, stored in a battery or consumed immediately by charging the car to drive it. This type of project has been introduced in Utrecht's municipality, in partnership with the French group Renault. Electric vehicles (Renault Zoé) in car-sharing have been integrated

[84] TenneT – Balancing markets
[85] TenneT – TenneT and be.storaged to use flexibility of battery storage to support stable network operation

into the electric system of the district, where photovoltaic panels ensure the energy generation.

At the end of 2021, the electricity network was made up of 7.3 million smart meters, representing 87.4% of households[86] which is above the requirements of EU Directive IEMD and offers a vast potential source of flexibility through dynamic pricing. Art. 95ca of the Electricity Act also specifies that a metering company must provide metering data to the customer or supplier only if it is authorised to process the data on the basis of the Art. 6 of the GDPR.

To experiment with blockchain technology in the energy sector, the Equigy Crowd Balancing Platform has been developed by TenneT in collaboration with a number of European TSOs. It is a blockchain-based cross-border data platform. This platform will help to stabilise the electricity grid by offering the flexibility of households' systems, free of charge, via electricity suppliers and manufacturers in the ancillary services markets.

Main legislation

- **National Plan for Energy and Climate 2021-2030 (PNEC)** sets new objectives for renewable energies and electricity production decarbonisation.
- **Climate Act 2019** sets targets regarding the reduction of greenhouse gas and renewable energies.
- **Environmental Management Act 2004** covers fields such as CO2 emissions trading, waste prevention, environmental permits and renewable energies. Amended several times, it also contains the transposition on EU Directive 2018/2001.
- **Electricity Act 1998** implemented the First Energy Package, has been amended to implement the Second Energy Package (2004) and the Third Energy package (2012 E-Act).

[86] Energievergelijk – Energy figures in the Netherlands

2.7. Portugal

Introduction

In Portugal, the energy sector policy is set by the National Plan for Energy and Climate (2020-2030)[87] which allows the country to respect its EU commitments regarding the decarbonisation of the sector and the development of renewable energy. Electricity production is mainly based on RES (58% in 2020) and gas. The last coal plants have been closed in 2021. The electricity market includes many production units that have variable production depending on climate conditions. Thus, there is an apparent need for uptake of flexibility services in order to be able to ensure the balance of the network and its security.

Legislation on renewable energy in Portugal dates back to 1988 when the Decree-Law 189/88[88] (modified by Decree-Law 313/95) established a Feed-in Tariff system to encourage the development of RES. The Decree-Laws 186/95 and 182/95, in 1995, complemented the previous legislation by adding regulation on co-generation plants and by setting a regulation base for the organisation of the electricity market in order to have a better integration and development of RES.

During the same period the liberalisation of the energy sector started. Even though the electricity legislation from 1995 divided the market in several segments, they were still non-competitive. The market has gradually opened up, primarily to industries with high electricity consumption. It was in 2006 that the electricity market started to be open to new stakeholders according to the European Directive 96/92/EC and that residential consumers were able to choose their supplier.

[87] Official Gazette – National Integrated Energy and Climate Plan for 2030 horizon (PNEC 2030)

[88] Official Gazette – Decree-Law 189/88 on establishing rules relating to the activity of generating electricity by natural persons or by public or private legal persons

The gradual integration of RES in the electricity production has led to structural changes in the electricity market, in particular through Decree-Law 215-A[89] and 215-B[90] of 8 Oct 2012 which have enabled RES electricity producers to sell directly their electricity on the open market. Decree-Law 76/2019 supplemented the previous regulations by requiring future producers to obtain a network capacity reserve title prior to any authorisation to produce. The EU Directives IEMD and RED II were transposed into Portuguese legislation in 2022 through the Decree-Law No 15/2022[91], which has made it possible to better define market players and their actions in order to develop the electricity market as close as possible to the European model and as well to optimise flexibility services. New market players are now able to have a role in production, distribution or energy supply. Scheduled for 2025, the abolition of the regulation of energy supply tariffs for end customers will conclude the market liberalisation.[92]

Market participants

To supervise the changes in the electricity sector, the ERSE (national regulatory authority) was created by the Decree-Law 187/95[93] and adjusted by Decree-Law 76/2019. The authority ensures the proper functioning of the electricity market, by setting a revenue cap for distribution and transmission tariffs and by having a regulated price for public electricity (until 2025). Decree-Law 215-B/2012 provides that revenue caps for the transmission and distribution of electricity are set by the regulatory authority ERSE. The method for calculating these prices is fixed for a 3-year period and reflects the network's cost, the regulatory asset base (RAB) but also investments.

Missions related to the transmission and distribution systems are now carried out by private companies under a concession system. The Portuguese TSO is Redes Energéticas Nacionais (REN) and the main DSO is the historical operator of the electricity network E-REDES but several concessions also exist for low voltage lines at a municipal level. These concessionaires

---

[89] Decree-Law 215-A/2012 on establishing the general principles relating to the organisation and functioning of the National Electric System (SEN)

[90] Decree-Law 215-B/2012 on the domestic electricity market

[91] Decree-Law 15/2022 on the transposition of Directives (EU)IEMD and RED II

[92] ERSE - Electricity sector

[93] Decree-Law 187/95 on the creation of the National Regulatory Authority ERSE

are in charge of managing the National Electricity System (SEN) and ensuring its security under the ERSE.

Network planning is among the network operators' missions. The 10-year development and investment plan for the transmission network (PDIRT – Decree-Law 15/2022, Art. 124, initially defined with Decree-Law 80/2015, Art. 39) encompasses modernisation and construction of infrastructure, strategic investment objectives and an implementation schedule. This planning takes into consideration the development of RES-based production and, therefore, the new needs in terms of network capacity. This plan is subject to approval by the Directorate-General for Energy and Geology (DGEG) and the ERSE. The DGEG monitors compliance with energy policy objectives and investment needs to ensure the security of energy supply. ERSE verifies that the coverage of investment needs is adequate and that the PDIRT is in line with the development plan for the European network. Article 128 of Decree-Law 15/2022 also defines the PDIRD as a 5-year plan for the development and investment of the distribution network including investments related to the maintenance, modernisation and renewal of infrastructures. This plan must be compatible with the PDIRT and is subject to the same notices.[94]

The production, supply and trade of electricity are subject to licensing procedures which are granted by the DGEG. Access and connection to the electricity network are carried out by network operators in a non-discriminatory and transparent procedure (Decree-Law 15/2022, Art. 52). Depending on their configuration and their power, the connected installations are subject to procedures (Decree-Law 15/2022, Art. 11). The production licence is defined by articles 24 to 29 of Decree-Law 15/2022 and the operating licence is defined by articles 33 to 39 of Decree-Law 15/2022.

With the liberalisation of the electricity sector, all these stakeholders now have the possibility to participate in the electricity market with a market agent qualification.

Structure of the electricity market

The ancillary services market (Decree-Law 15/2022, Art. 164 to 168) corresponds to a process of contracting the needed services to maintain the balance and therefore the security of the network. Under the control of the ERSE, the SEN is responsible for managing this market

[94] ERSE - Transport of electricity

within a framework of transparency, non-discrimination, competition and economic efficiency. Article 166 specifies the possibility of creating services markets at a regional level if there is a need and with the agreement of the ERSE. Flexibility services can be provided by all qualified market agents (including RES, self-consumption surplus, energy communities, storage and demand response services, with or without aggregation).

Defined by the MIBEL agreement, the Portuguese electricity market is fully integrated into the Iberian electricity market (MIBEL[95] – created in 2007) and complies with Portuguese legislation. An electricity producer, or supplier recognised by one of the two countries (Portugal or Spain) is automatically recognised in the second. Based on an auction system, transactions on the daily and intraday markets are carried out on the MIBEL; offers and requests for flexibility made by Portuguese players can therefore find a response in their country or on the Spanish market.

Flexibility services

The Portuguese part of the Iberian electricity market is the OMIP and manages the ancillary markets by offering standardised agreements. Services system markets have been created in accordance with the EU regulation. They allow the TSO to have direct access to flexibility services but also to enter into bilateral contracts with certain market players for specific flexibility needs.[96]

End customers are also a possible source of flexibility with the implementation, through the tariff regulation, of plans to promote efficiency in electricity consumption, including demand response measures. For this and in application of Ordinance 231/2013 which considers the installation of smart meters to be viable, the government has, by decree, set up a schedule for the installation of smart meters for all end customers by 2024. At the end of 2021, 64% of low-voltage customers had installed a smart meter and less than half of them were integrated into a smart grid.[97]

To ensure the protection of generated data in the electricity sector, Portugal is mainly regulated by the General Data Protection Regulation (GDPR) of the European Union, which is

[95] Mibel – Iberian Electricity Market

[96] I. Rocha, A. Pires da Silva, V. Matos Mendes & L. Vilas Boas – The Energy Regulation and Markets Review: Portugal (2023)

[97] ERSE – Review of the implementation of smart electricity distribution networks in 2021 (2022)

directly applicable in all EU member states, including Portugal. The GDPR sets out the rules for the collection, use, storage, and transfer of personal data, including in the context of the electricity market. In addition to the GDPR, the Portuguese data protection framework includes specific legislation, such as the Personal Data Protection Law[98] (Law 67/98) and the Electronic Communications Law[99] (Law 41/2004). These laws include the implementation of appropriate technical and organisational measures to ensure the security of personal data, such as access controls, encryption, and data minimisation. Smart metering system operators are also required to obtain consent from customers for the use of their data, provide them with transparent information on the processing of their data, and enable them to exercise their rights under the GDPR, such as the right to access, correct, and delete their personal data.

Portugal has not yet regulated blockchain and smart contracts. Smart contracts are considered as electronic contracts which are recognised in the e-Commerce Law (Law 7/2004).

Main legislation

- **Parliamentary Resolution 23/2006** approves the Agreement between the Portuguese Republic and the Kingdom of Spain for the constitution of an Iberian Electricity Market (MIBEL).
- **Decree-Law 141/2010** defined the National Energy Strategy until 2020 by setting RES targets and partially transposed EU Directive 2009/28/EC.
- **Decree-Law 74/2013** promotes effective competition in the wholesale market, protects the interests of consumers.
- **National Plan for Energy and Climate 2021-2030 (PNEC)** sets new objectives for renewable energies and electricity production decarbonisation.
- **Decree-Law 15/2022** transposes the EU Directives 2018/2001 (on energy production from RES) and the EU Directive 2019/944 (common rules for the internal electricity market).

[98] Law 67/98 on Personal Data Protection

[99] Law 41/2004 on the processing of personal data and the protection of privacy in the electronic communications sector

2.8. Romania

Introduction

The electricity sector of Romania has been liberalised in 2007. In Europe, Romania is the second largest producer of natural gas, following the Netherlands. Further, Romania ranks 49th in the world for gas reserves. In Romanian legislation, Law 220/2008 promotes renewable energy for electricity production since 2008. In 2020, 24% of total energy consumption was from renewable sources in Romania.[100] To reach the policy goal of 30.7% by 2030, Romania needs to add 7 GW from renewable sources on the electricity network. To ensure a better development of renewable energy, power purchase agreements (PPAs) have been authorised on energy markets in 2020 through amendments of Law 123/2012. To promote renewable energy, the certification of electricity produced from RES is attested by guarantees of origin and issued by the regulation authority. Financial incentives are foreseen in 2023 to increase renewable electricity generation with contracts for differences (CfDs).

EU Directive 2019/944 has been partially transposed through the Government Emergency Ordinance 143/2021 (GEO 143)[101] modifying the Law on Electricity and Natural Gas 123/2012.[102]

Market participants

After being state-owned during the communist time (following World War II), the Romanian electricity market made place to new actors in 1998 by establishing a national regulation authority – ANRE (Autoritatea Naţională de Reglementare în domeniul Energiei) and by separating generation and distribution activities. In 2000, the electricity transmission was also separated with the creation of Transelectrica for electricity transmission, power system operation and dispatching, and OPCOM (Transelectrica subsidiary) as the electricity market

---

[100] V. Radu, R. Dulamea, R. Diaconeasa & M. Constantinescu – The Renewable Energy Law Review: Romania (2022)

[101] Government Emergency Ordinance 143/2021 for the amendment and completion of the Electricity and Natural Gas Law 123/2012

[102] Law on Electricity and Natural Gas n°123/2012

administrator. In 2001, the distribution company was divided into 8 new entities. In the following years, these different market players have been open to private investors to meet the EU requirements upon EU membership (2007).[103] To complete the liberalisation of the electricity market, since 1 January 2021, regulated tariffs for households have been suppressed (Electricity Law 123/2012, Art. 22(11)).[104]

According to Art.21 (2) of the Electricity Law 123/2012, players in the electricity market are either a natural or a legal person who buys, sells or produces electricity, who deals with aggregation or who is an operator of dispatchable energy consumption or storage services, including by placing trade orders on one or more markets, including energy balancing markets. The Romanian Energy Regulatory Authority (ANRE) supervises the electricity market (Art. 7 of Law 123/2012). The transposition of EU Directives also helped define new market actors such as aggregators, active customers, and prosumers or energy communities. The definition of an active consumer (Law 123/2012, Art. 3 (18)) states that end-consumers or a group of end-consumers can participate in the flexibility market as long as it does not constitute their principal commercial or professional activity.

Rights and obligations of the DSOs are defined in Articles 44 and 45 of the amended Electricity Law 123/2012. DSOs provide services to all users of the electricity distribution networks, under non-discriminatory conditions, guaranteeing access to networks for any applicant meeting the legal requirements. Among their missions, DSOs should operate, modernise, improve and develop the distribution network in compliance with the regulation and with efficiency and respect for the environment.

The Romanian TSO is Transelectrica (Compania Nationala de Transport al Energei Electrice) which has a concession contract to operate the transmission network. The company was once public but has been privatised in 2000 and was introduced on the stock market in 2006.[105] Its only possibility to participate on the electricity market is by covering its electricity grid needs, to maintain the balance on the network (through the balancing market or by buying/selling electricity with foreign TSOs) as mentioned in the Electricity Law, Art. 36. The transactions have to be transparent and non-discriminatory and should follow the ANRE regulation.

103 M. Bădileanu – Crossroads in the past 23 years history of the Romanian energy system (2013)
104 ANRE – Electricity market monitoring report December 2021 & March 2022
105 Transelectrica

In accordance with EU Directives, *Government Emergency Ordinance* 143 (GEO 143) (transposed in Electricity Law 123/2012, Art. 35) also defines the obligation for the TSOs to prepare and submit every two years a 10-year network plan based on the current state and future development of electricity consumption and sources (including electricity imports and exports). On the basis of urban development plans and under the execution of the concession contract, DSOs are obliged to ensure the development and the financing of the distribution network (electrification of localities or extension of the grid within the area covered by the concession contract). GEO 143 (66) also mentions that the electricity distribution network development should provide transparency on the required flexibility services in the medium and long term and presents the investments planned for the next 5 to 10 years.

Art. 70 of the Electricity Law 123/2012 guarantees access to electricity networks and priority transmission of electricity produced from renewable energy sources and high-efficiency cogeneration. RES electricity producers (less than 1 MW) also have priority access to the electricity grid. Articles 25 and 75 of the same law define the access to the electricity network and the obligations of both network operators and their clients. The network costs of using the electricity network are regulated and fixed by the national regulator authority ANRE for a period of 5 years (currently 2019-2023) and are based on OPEX, variable costs, RAB depreciation and profitability of the RAB.[106]

Structure of the Electricity Market

OPCOM, the Romanian Gas and Electricity Market Operator, manages the organised markets for electricity trade under the supervision of ANRE:

- Centralised market of bilateral electricity contracts
- Electricity market for large final customers
- Centralised market for universal service
- Centralised market for electricity from RES supported by green certificates
- Centralised market for long-delivery-periods electricity contracts
- Day-ahead market
- Intraday market

[106] CEER – CEER Report on Regulatory Frameworks for European Energy Networks 2021

A singularity of the Romanian Day-ahead Market (DAM) is that it is coupled with markets from Hungary, the Czech Republic and Slovakia in the 4M Market Coupling project[107] which aims at providing the benefits of market integration to market participants.

Flexibility services

Flexibility services are formally defined in Art. 3 (105) of the Law 123/2012 as services provided by a market player and purchased by distribution operators to support the efficient and safe operation of the distribution system and to maximise the quality of the provided services. New regulation for operation of the energy market (Law 123/2012, Art. 23 amended in 2021) include the possibility for market players to contract electricity transactions outside the centralised power exchange, by authorising, for example, bilateral power purchase agreements or bilateral capacity reservation agreements. Long-term supply contracts between electricity market actors are also allowed (ANRE President Order No 65/2020, Art. 7). Article 23 of the electricity law also mentions the possibility for network operators to purchase flexibility services. In the competitive wholesale market, ANRE has the right to approve the introduction and use of specific products within the framework of certain trading methods, in order to ensure flexibility in the conclusion of future electricity transactions; including flexible delivery profiles suitable for RES producers. The use of flexibility services and their impact are monitored by ANRE.

To ensure the security of the network, the national TSO Transelectrica SA has access to flexibility services, especially balancing services (defined as ancillary services in the amendment introduced by Law 155/2020). Flexibility service providers are involved in the balancing market and can provide services (FCR, aFRR, mFRR, RR) through auctions to ensure the stability of the network's frequency.[108]

According to Law 123/2012, ANRE creates a regulatory framework by which distribution operators are incentivised to purchase flexibility services (congestion management included). DSOs may purchase flexibility services (in a transparent, non-discriminatory, market-based environment) from entities that offer distributed generation, dispatchable consumption or energy storage services if these services reduce the financial needs for modernisation or

[107] 4M Market Coupling overview

[108] Bondoc & asociatii – Long Awaited Amendments to the Romanian Electricity (and Gas) Law (2022)

replacement of electrical capacities and support the efficient and safe operation of the distribution network.

As another source of flexibility, dynamic electricity price is also regulated in the new amendments and should reflect market price variation.[109] Only main suppliers (more than 200 000 customers) providing smart metering can offer such services.

According to Art. 66 of Law 123/2012, DSOs are obliged to present to ANRE projects to implement smart metering within their concession areas. Only final consumers who have an annual consumption above a threshold (expressed in kWh and set by ANRE) and prosumers (with installed capacity less than 10 kW) need to have smart metering by the end of 2023. A wider implementation for other consumers is also planned by the end of 2028. Data collected by smart meters are treated according to the European General Data Protection Regulation (GDPR).

Main Legislation

- **Electricity and Gas Law 123/2012**
- **Law 155/2020** for the modification and completion of the Electricity and Natural Gas Law 123/2012 and regarding the modification and completion of other normative acts.
- **Government Emergency Ordinance 143/2021** for the modification and completion of the Electricity and Natural Gas, as well as for the modification of certain normative acts (Transposition of EU Directive 2019/944).

[109] Ibid.

2.9. Spain

Introduction

In line with EU policy objectives, Spain aims at carbon neutrality by 2050. Currently, almost half of the electricity production comes from RES. With growing electricity demand, Spain has started to adapt its electricity market. Electricity production is less dependent on fossil fuels and investments in renewable energy are increasing.[110] For example, to accelerate the development of RES, auctions (pay-as-bid model) are organised to provide financial support (stable and fixed FiTs for a period of up to 20 years) to selected projects with the objective of 8.5 GW capacity for wind power and 10 GW for solar power.[111]

Set by the National Energy and Climate Plan 2021-2030[112] (Article 3), the goal of 74% of renewable electricity generation in 2030[113] is now half achieved and will require further efforts to respect EU commitments in terms of de-carbonisation, renewable energy development and electricity market evolution (development of flexibility services, storage facilities, grid adaptation). The reform of the electricity market started in 2013 with the enactment of the Law 24/2013 in December 2013 (Electricity Act) to ensure its financial sustainability. Further legislative acts, such as the Specific Remuneration Regime, were adopted during the last decade focused on reforming the electricity market and following the EU Directives. The establishment of a common electricity market with Portugal in 2006 (MIBEL) was a precursor of the EU policy towards the goal of a more integrated European market. Spain's electricity network has also interconnections with France, Andorra and Morocco.

[110] IEA – Spain Electricity Security Policy
[111] The Brattle Group – Renewable Energy Law Review
[112] European Commission – Spanish Integrated National Energy and Climate Plan 2021-2030
[113] J.A. García, P.L. Marín & J. Stirzaker – The Renewable Energy Law Review: Spain

Market participants

Since the liberalisation of the market in 1997, the electricity market has been open to new players and historical operators have seen their operations separated (transmission, distribution, supply, generation).[114] Since 2010, there is only one Transmission System Operator: Red Eléctrica de España, S.A. (REE), controlled at 20% by the state and at 80% by private investors. REE is responsible for the development, maintenance and security of the transmission network especially by forecasting electricity generation and demand on a long-term basis (network planning) and a short-term basis (with the use of flexibility services) according to Law 24/2013, Art. 30 and 36. The liberalisation of the distribution activity in 2010 (Royal Decree-Laws 6/2010 & 13/2012) led to the emergence of 5 main DSOs that control 90% of the consumers (with more than 26.3 million consumers connected to their grids) and 333 smaller companies. Their missions are coherent with the TSO missions but at the local level, on the distribution network (Law 24/2013, Art. 38, 40 and 41). The TSO and DSOs are managing the access to the network according to Art. 33 of Law 24/2013 and under the monitoring of the national regulatory authority, the CNMC.

With the help of network operators, the General State Administration (under the supervision of the Ministry for the Ecological Transition and the Demographic Challenge – MITECO) is responsible for the transmission network development plan as defined in Law 24/2013, Art. 4. This is a 6-year plan, currently for 2021-2026, which aims to identify the network needs based on future electricity production and demand.[115]

Structure of the electricity market

In Spain, the electricity market is organised as a wholesale market and a retail market. The wholesale market is managed by OMIE and is divided into the day-ahead, the intraday and the balancing markets (Art. 23, Law 24/2013). The latter one is used by the TSO to manage real-time imbalances between supply and demand. Participation in the balancing market is allowed for different market participants such as electricity producers (generation), big consumers (above 1MW of flexibility), aggregators and storage facilities. The procurement of balance services (aFRR, mFRR, RR) by the TSO is remunerated by recovering balancing costs.

[114] CMS Expert Guides – Electricity law and regulation in Spain

[115] Ministry of Ecological Transition & REE – Transmission network development plan – 2021-2026 period

To participate in the electricity markets, market players must be registered with the Spanish regulatory authority, the National Commission on Markets and Competition (CNMC). CNMC is responsible for ensuring the electricity market competitiveness and its efficiency by monitoring and regulating market entry and exit, and price setting.[116]

Flexibility services

To face the fluctuation of RES production and the need of flexibility, the Spanish government leans towards the development of energy storage with an objective of 6 GW additional storage capacity (of which 3.5 GW from pumped storage and 2.5 GW from batteries) according to the PNIEC.[117] As per Article 49 (Law 24/2013) consumers and owners of storage facilities (either directly or through aggregation) may participate in the services included in the generation or demand-side flexibility market. REE and the DSOs are allowed to operate storage facilities since 2021 and as long as they are integrated as a network component.

As a developing flexibility provider, charging stations (for electrical vehicles) are regulated by Art. 48 of Law 24/2013 and are submitted to a declaration system. DSOs are only able to own such installation if no private investor answers to an open tender process.[118]

The Order TED/1359/2022 of December 28th, 2022 explicitly mentions in its introduction that the development of flexibility services is necessary for the proper integration of a growing share of RES in the Spanish electricity production. Demand management and electricity storage are cited as the two major components of the national policy in this area, in accordance with the PNIEC 2021-2030. This legislation opens up the possibility of incentives for the provision of flexibility services (Art. 1 (1)) and particularly within local markets.

Smart metering is dealt with by Law 24/2013 which establishes the legal framework for the electricity sector. With a significant advancement on EU objectives, smart meters have been fully deployed in the residential sector since 2018 (27 million customers) allowing the customers and the market participants to have a better view and control over demand response, load management and personalised consumer profiles.[119] Security of the power system is ensured through the Royal Decree 43/2021 which also transposes the EU Directive

---

[116] CNMC – National Commission on Markets and Competition

[117] CMS – Energy storage trends Spotlight on Spain (2022)

[118] smartEn – The Implementation of the Electricity Market Design to drive Demand-Side Flexibility (2022)

[119] DNV – Smart meter roll-out in Spain

on the network security and information systems. Concerning data protection, Spain follows the rules stated in the Organic Law 3/2018[120] (transposition of EU Legislation GDPR).

Several initiatives have been launched in Spain to test the use of blockchain technology in the energy sector. For example, Endesa has developed a pilot project that uses blockchain to enable customers to track the origin of the renewable electricity they consume.

Main legislation

- **Law 54/1997 is** about the liberalisation of Spain's electricity market.
- **Parliamentary Resolution 23/2006** which approves the constitution of the Iberian Electricity Market (MIBEL).
- **Integrate National Energy and Climate Plan (2021-2030 (INECP)** which sets objectives for de-carbonisation and RES development.
- **Climate Change and Energy Transition Act[121] (CCET Act)**
- **Spain's Recovery, Transformation and Resilience Plan (RTRP)** provides financing for the development of RES and the electricity network evolution.
- **Law 24/2013[122] – Electricity Act** which organises and regulates the electricity market and its participants.
- **Royal Decree 244/2019[123]** which regulates auto-consumption.
- **Royal Decree-Law 23/2020[124]** which regulates access to the electricity network and promotes energy efficiency.
- **Order TED/1359/2022** approving regulatory bases for granting incentives to projects for new economic models in the energy transition within the framework of the Recovery and Resilience Plan.

[120] Organic Law 3/2018 on the Protection of Personal Data and the guarantee of digital rights (2018)
[121] Law 7/2021 on climate change and energy transition (2021)
[122] Law 24/2013 of the Electricity Sector (2013)
[123] Royal Decree 244/2019 which regulates the administrative, technical and economic conditions of self-consumption of electrical energy (2019)
[124] Royal Decree-Law 23/2020 which approves measures in the field of energy and in other areas for economic reactivation (2020)

2.10. Türkiye

Introduction

The reform of the Turkish electricity market commenced in March 2001 when the Electricity Market Law (EML) 4628 has been enacted. The purpose of this law is to provide continuous electricity to consumers at affordable price. The law also established EMRA, the Energy Market Regulatory Authority, which operates as an autonomous body.[125]

In 2022, renewable energy represented 42.45%[126] of the total installed capacity for electricity production in Türkiye, which is about 104 GW. These 42.45% (or 54 GW) of renewable installations, are distributed as follows: 30.4 GW of hydroelectricity, 11.0 GW of wind power, 9.0 GW of solar energy, 1.6 GW of geothermal and 1.85 GW of biomass. Türkiye plans to build 3 nuclear power plants, with a total of 12 reactors. The first reactor of the Akkuyu site is expected to be commissioned at the end of 2023. This site will include 4 reactors, with a cumulative power of 4.8 GW.[127] At the same time, Türkiye is heavily dependent on energy imports such as natural gas and coal, with 73% of its energy sources needs coming from abroad.[128] To achieve decarbonisation and energy independence, renewable energy and flexibility services have a key role to play in the electricity market.

Law 5346 of 2005 on Utilisation of Renewable Energy Sources for the purpose of electricity production aims at encouraging the use of renewable energy for electricity generation and covers the certification of energy from renewable sources but also the procedures and principles for the conservation of energy resource areas.[129]

To foster the wider deployment of RES in the electricity sector, the government provides a range of incentives for market players such as the YEKDEM scheme[130] (Decree No 3453, dated 30 Jan 2021). Under this support mechanism, the Energy Market Regulatory Authority (EMRA)

[125] PwC – Overview of the Turkish electricity market (2021)
[126] EMRA – Electricity market sector report 2022
[127] Connaissances des énergies – Türkiye's energy situation in 2 infographics
[128] Ministry of Energy – National Energy Balance Table
[129]Climate Change Laws of the World – Act No. 5346 on Utilisation of Renewable Energy Sources for the Purposes of Generating Electrical Energy (Renewable Energy Law)
[130] YEKDEM Scheme: Renewable Energy Resources Support Mechanism

announced 5-year domestic production incentives for RES projects commissioned between 2021 and 2025. Feed-in tariffs are in place to support the development of RES and their integration in the electricity market for a period of 10 years and are issued in Turkish Lira (TRY) instead of US Dollar (USD).[131] Another mechanism, the YEKA scheme, consists of a tender for renewable energy production to award RES electricity generation with fixed tariffs for a period of 15 years. It aims to contribute to research and development through technology transfer in Türkiye. This tender model was developed for high-capacity solar and wind projects, with manufacturing obligations for certain components or equipment, and on identified territories. Other incentives can be provided depending on the location of the project and its specificities such as VAT Exemption, Customs Duty Exemption, Tax reduction.[132]

Market participants

Since the Electricity Market Law 4628 in 2001, the Turkish electricity market has progressively opened up to private investors. The law provided the basis for the unbundling of the market activities which was followed by the privatisation of the distribution activity and of the retail (in 2013). There are now 21 private DSOs which are operating the distribution networks. The transmission network is operated by TEİAŞ (Turkish Electricity Transmission Corporation). The State holds the controlling share of the company.[133]

The national regulation authority is EMRA (Enerji Piyasasi Düzenleme Kurumu – EPDK in Turkish)[134] which, since the liberalisation of the market, is responsible for ensuring the proper functioning of the electricity market and aims at the elimination of market entry barriers. Its functions, attribution and obligations are determined and established by different laws such as the Law 4628 on the Organisation and Duties of the Energy Market Regulatory Authority, the Natural Gas Market Law 4646, the Petroleum Market Law 5015, the Amendment to the Liquefied Petroleum Gas (LPG) Market Law 5307 and the Electricity Market Law 6446. The EMRA and the laws governing it enable the establishment of a transparent, stable, financially strong energy market that respects the competition rules.

[131] Enerdata – Turkey announces new renewable FIT under YEKDEM scheme
[132] PwC – Overview of the Turkish Electricity Market
[133] Nasdaq – Türkiye to privatise national electricity transmission system operator
[134] EPDK – Republic of Türkiye Energy Market Regulatory Authority

The EMRA is the organisation responsible as well for issuing licences, inspecting certificate holders about their licence, monitoring market performance, setting performance standards, reviewing regulated tariffs and amending them, ensuring that the market is treated in accordance with the Electricity Market Law. Indeed, a licence is required for a renewable facility higher than 5 MW. It is possible to install renewable energy systems without a licence, under the following conditions: the capacity must be less than 5 MW and the installation must be located on a façade's roof. The EMRA issues a certificate of renewable energy resources, in order to identify and control the renewable nature of the resource being used when selling or buying energy.

Grid operators are obliged to provide grid access to renewable energy producers, as long as the grid is technically available. Independent power producers are eligible for the feed-in tariff. Retail energy licensees are required to purchase a percentage of their consumption from RES-certified generation companies.

Structure of the electricity market

Electricity markets are operated by the EPİAŞ (Electricity Markets Operating Corporation) and are regulated by Law No 6446, 2013.[135] The electricity market is organised as a wholesale market and a retail market. The wholesale market is structured into the following markets:

- Day-Ahead market
- Intraday market
- Balancing Power market
- Ancillary Services market [136]

Energy Exchange Istanbul (EXIST) is an energy exchange company, legally incorporated under the Turkish Electricity Market law. The wholesale electricity markets have been operating on it since 2015. It is enforced by the Energy Markets Operation License granted by the Energy Markets Regulatory Authority of Turkey.[137]

Flexibility services such as Primary Frequency Control (PFC) or Secondary Frequency Control (SFC) are part of this electricity market and are not compulsory; PFC and SFC reserves are procured on a voluntary basis.

---

[135] CEE Legal Matters – Türkiye: Liberalisation of the Electricity Market and the Role of Antitrust Interventions
[136] Electricity Market – Sector Report 2021 – Republic of Turkey Energy Market Regulatory Authority (EMRA)
[137] Europex – EPİAŞ – Energy Exchange Istanbul

Flexibility services

In the Turkish National Energy Efficiency Action Plan (NEEAP)[138], the development of the market infrastructure for demand-side response has the objective to better manage peak demand through flexibility services. The foreseen improvements aim at creating a "flexible consumption portfolio" of large industrial consumers able to provide flexibility, and as well at better integrating the residential consumers in the flexibility market (through demo areas, micro grids, smart city).

Since 2018, Türkiye's regulation of Ancillary Services (Electricity Market Ancillary Services Regulation[139] – EMASR – Official Gazette No 30252, 26 Nov 2017) added a registry system for flexibility services. Flexibility services providers (FSP) need to identify and register the flexibility services that they will sell. Generation (over 50 MW installed capacity) and energy-storage facilities (and even consumption facilities) can now register as FSP.[140] Flexibility services are defined by Art. 4 of the EMASR (incl. balancing services, energy storage, voltage control). Ancillary services are defined as "Services that are provided in accordance with this regulation by relevant legal entities that are connected to the transmission or distribution systems to ensure reliable operation of the transmission or distribution system, and supply of electricity that comply with the necessary quality requirements, as set out in detail under this Regulation and the Electricity Network Regulation".

Türkiye is also exploring the possibility to develop energy storage at a larger scale to provide new sources of flexibility. In 2021, the EMRA made it possible for energy companies to develop energy storage irrespective of the type of system (integrated with energy generation, integrated with energy consumption or standalone). [141] The Turkish TSO aims at using energy storage facilities to provide frequency services locally.

In Türkiye, the installation of smart meters for residential electricity consumers is not mandatory, but it is required for customers with a monthly consumption exceeding 2000 kWh. This threshold is set by the EMRA in the Electricity Market License Regulation. As part of the country's efforts to modernise the electricity grid and improve the efficiency of the distribution system, the EMRA also encourages smart meters to be installed and has set a

---

[138] IEA – National Energy Efficiency Action Plan 2017-2023

[139] EPİAŞ – Official Gazette dated 26/11/2017, numbered 30252 – Electricity Market Ancillary Services Regulation

[140] Mondaq – Türkiye Updates Rules For Ancillary Services in Electricity Market

[141] A. Colthorpe – Türkiye's energy storage market is 'now fully open' (2022)

target of having all electricity consumers equipped by 2023. The road to a smart management of measurement data is also set in the NEEAP where it is stated that a legislative framework should be developed (to meet EU standards) and data analysis should be given to the customers.

Main legislation

- **Turkey's National Energy Efficiency Action Plan 2017-2023**
- **Official Gazette, dated 14/04/2019, numbered 27200** on Electricity Market Balancing and Settlement Regulation.
- **Official Gazette, dated 26/11/2017, numbered 30252** on the electricity market ancillary services regulation.
- **Official Gazette, dated 17/05/2014, numbered 29003** on Market Import and Export Regulation.
- **Official Gazette, dated 01/10/2013, numbered 28782** on the Regulation for the Certification and Supporting of the Renewable Energy Sources.
- **Electricity Market Law 6446 of 2013** on ensuring the proper functioning of the electricity market.
- **Law 5346 of 2005** on the utilisation of Renewable Energy Sources for the purpose of generating electrical energy.

D. REGULATORY ANALYSIS OF LOCAL FLEXIBILITY MARKETS AND FLEXIBILITY SERVICES IN THE EXAMINED COUNTRIES

In order to have more precise information about the regulation impacting the development of LFM and FS, a questionnaire-based in-depth survey was conducted among the partners of the project. The goals of this questionnaire are:

- to confirm the regulation environment described in the countries' overviews;
- to deepen regulatory knowledge on certain technology issues;
- to obtain the view of experts participating in the electricity markets on the barriers and to identify best practices that accelerate the development of LFM.

The following analysis is based on the experts' answers from the different partner countries. The questionnaires for Romania, Italy and the Netherlands were filled based on an in-depth analysis of the documentation available as part of the countries' overviews.

1. Definitions of Market Actors and Market Characteristics

1.1. European Directives Transposition

The Clean Energy for all Europeans Package was adopted in 2019 and sets a common base for the development of the electricity market and renewable energies in EU countries. The transposition of the different directives should have been done by the end of 2021 but this process has been delayed in some countries.

Table 1: Transposition of EU Directives in the Examined Countries

Transposition	BG	FR	GR	IE	IT	NL	PT	RO	ES	TR
IEMD 2019/943	Part.	Yes	Yes	Yes	Yes	Part.	Yes	Part.	Part.	N/A
IEMD 2019/944	Part.	Yes	Yes	Yes	Yes	Part.	Yes	Part.	Part.	N/A
RED II 2018/2001	No	Yes	Yes	Yes	Yes	Part.	Yes	Part.	Part.	N/A

Table 2: Transposition of EU Directives in the Studies Countries' Legislation

Countries	EU Directives	Transposition
Bulgaria	**IEMD 2019/943**	**Energy Law** - Promulgated SG. No. 107 of December 9, 2003, last mod. SG. No. 11 of February 2, 2023 **Electricity Market Rules** - Promulgated SG. No. 66 of July 26, 2013, last mod. SG. No. 50 of June 9, 2023
	IEMD 2019/944	**Energy Law** - Promulgated SG. No. 107 of December 9, 2003, last mod.SG. No. 11 of February 2, 2023 **Rules for Electricity Trading** - Promulgated SG. No. 66 of July 26, 2013, last mod. SG. No. 50 of June 9, 2023
	RED II 2018/2001	Proposal for changes in the **RES Act** is under discussion in the Parliament (final approval expected until the end of 2023
France	**IEMD 2019/943**	**Ordinance 2021/237**, Modification of the Consumption Code and of the Energy Code
	IEMD 2019/944	**Ordinance 2021/236 and Ordinance 2021/237** Modification of the Consumption Code and of the Energy Code
	RED II 2018/2001	**Ordinance 2021/235 and Ordinance 2021/236** Modification of the Energy Code
Greece	**IEMD 2019/943**	**Law 4986/2022 and Law 5037/2023**
	IEMD 2019/944	**Law 4986/2022 and Law 5037/2023**
	RED II 2018/2001	**Law 4951/2022 and Law 5037/2023**
Ireland	**IEMD 2019/943**	**Electricity Regulation Act 1999** (revised 20/02/2023) Statutory Instruments (S.I.) 704/2020, S.I. 20/2022, S.I. 37/2022, S.I. 76/2022, S.I. 227/2022 Circular Economy and Miscellaneous Act 2022
	IEMD 2019/944	**Electricity Regulation Act 1999** (revised 20/02/2023) S.I. 704/2020, S.I. 20/2022, S.I. 37/2022, S.I. 76/2022, S.I. 227/2022 Circular Economy and Miscellaneous Act 2022

	RED II 2018/2001	**Electricity Regulation Act 1999** (revised 20/02/2023) S.I. 76/2022, S.I. 350/2022, S.I. 365/2022
Italy	**IEMD 2019/943**	**Legislative Decree 210, 8 November 2021**
	IEMD 2019/944	**Legislative Decree 210, 8 November 2021**
	RED II 2018/2001	**Legislative Decree 199, 8 November 2021**
The Netherlands	**IEMD 2019/943**	**1998 Electricity Act amended**
	IEMD 2019/944	**1998 Amended Electricity Act** The Electricity Law is under review and will transpose the IEMD 2019/944 Directive (May 2023)
	RED II 2018/2001	**Act of June 2021,** amendment of the Environmental Management Act and Amended Energy Transport Decree
Portugal	**IEMD 2019/943**	**Decree-Law 76/2019**
	IEMD 2019/944	**Decree-Law 15/2022**
	RED II 2018/2001	**Decree-Law 15/2022**
Romania	**IEMD 2019/943**	**Emergency Ordinance 143/2021** Modification of the Electricity and Gas Law 123/2012
	IEMD 2019/944	**Emergency Ordinance 143/2021** Modification of the Electricity and Gas Law 123/2012
	RED II 2018/2001	**Emergency Ordinance 143/2021 & 163/2022** Modification of the Electricity and Gas Law 123/2012
Spain	**IEMD 2019/943**	**Law 24/2013 (Electricity Act)**
	IEMD 2019/944	**Law 24/2013 (Electricity Act), Royal Decree 244/2019 & Royal Decree-Law 23/2020**
	RED II 2018/2001	**Royal Decree-Law 23/2020**

Türkiye	**IEMD 2019/943**	**Amended Electricity Market Law 6446, 14 March 2013**
	IEMD 2019/944	**Amended Electricity Market Balancing and Settlement Regulation (Official Gazette 27200)** **Amended Electricity Market Import and Export Regulation (Official Gazette 29003)**
	RED II 2018/2001	**Amended Law 5346 and Amended Regulation on the support for RES (Official Gazette 28782)**

Most of the analysed countries have transposed the IEMD 2019/943, IEMD 2019/944 and RED II 2018/2001. Some countries still have to implement parts of these directives in their national legislation. To better foster the development of LFM, the transposition of European Directives should be completed as soon as possible.

In general, the Clean Energy Package indirectly allows for the implementation of LFM and its components but still there is a need for more precise regulation of the LFMs to ease their development and to better understanding of that matter in the national legislations.

1.2. Market Actors Definitions

The Clean Energy for all Europeans Package defines new grounds for consumers by recognising the rights of citizens and communities to engage directly in the energy sector under EU law. The REDII 2018/2001 sets the framework for 'renewable energy communities' and the revised IEMD 2019/943 and 2019/944 introduce new roles and responsibilities for 'distribution system operator', 'transmission system operator', 'balance responsible party' 'aggregation', 'citizen energy communities', 'renewable energy communities' in the electricity sector.

Distribution System Operator (DSO)

Table 3: Definition and Regulation of the Distribution System Operator

Country	Definition of DSO
Bulgaria	Energy Act, Additional provision § 1. p.22.
France	Energy Code, Art. L344- 4 & 5.
Greece	Law 4986/2022, Art. 44 & 48 and in Law 4001/2011, Art. 127.

Ireland	Electricity Regulation Act 1999, Art. 2 (F13).
Italy	Decree 210/2021, Art. 23 and Decree 79/1999, Art. 2 & 9.
The Netherlands	1998 Electricity Law: Tasks and Obligation of the DSO.
Portugal	Decree-Law 15/2022, Art. 3 (xx) and Chapter III, Title II.
Romania	Law 123/2012, Art. 3 (70).
Spain	Law 24/2013, Art. 38 to 42, in the Royal Decree-Law 1048/2013, and in Royal Decree-Law 1955/2000.
Türkiye	Electricity Market Law 6446.

Transmission System Operator (TSO)

Table 4: Definition and Regulation of the Transmission System Operator

Country	Definition of TSO
Bulgaria	Energy Act, Additional provision § 1. p.20.
France	Energy Code, Art. L321-6.
Greece	Law 4986/2022, Art. 33 and Law 4425/2016, Art. 17.
Ireland	Electricity Regulation Act 1999, Section 33 (F27).
Italy	Legislative Decree 210/2021, Art. 22 and Legislative Decree 79/1999 Art. 2 (25) & Art. 3.
The Netherlands	1998 Electricity Law: Tasks and Obligation of the TSO.
Portugal	Decree-Law 15/2022, Art. 3 (zz) + Chapter IV, Title I.
Romania	Law 123/2012, Art. 3 (71).
Spain	Law 24/2013, Art 30 & 36.

Türkiye	Electricity Market Capacity Mechanism Regulation (18.12.2021) and Electricity Market Ancillary Services Regulation (26.11.2017).

Aggregation

Table 5: Definition and Regulation of Aggregation

Country	Definition of Aggregation
Bulgaria	Electricity Market Rules, SG. No. 66 of July 26, 2013, last mod. SG. No. 50 of June 9, 2023, Additional provision, § 1. p.1.[142]
France	Energy Code, Art. R314-1 (2).
Greece	Law 4986/2022, Art. 5 (1-(lz)) and Law 4342/2015.
Ireland	Electricity Regulation Act 1999, Art. 2 (F3).
Italy	Legislative Decree 210/2021, Art. 2 (2).
The Netherlands	No regulation.
Portugal	Decree-Law 15/2022, Art. 146.
Romania	Law 123/2012, Art. 3 (6).
Spain	Defined in the Law 24/2013, Art. 6 (i).
Türkiye	Market Law 6446.

[142] "*Aggregator of a group of objects*" is defined as a “company trading or producing electricity, holding a licence, supplemented with rights and obligations of a balancing group coordinator, whose group includes producer objects, consumer objects or electrical energy storage facilities, registered as direct members”

DE-RISK

Balance Responsible Party (BRP)

Table 6: Definition and Regulation of Balance Responsible Party

Country	Definition of BRP
Bulgaria	Electricity Market Rules - Promulgated SG. No. 66 of July 26, 2013, last mod. SG. No. 50 of June 9, 2023, Chapter V, Section I – Balancing Responsibility, Balance Responsible Parties.
France	Energy Code, Art. L321-15.
Greece	Energy Code, Art. 5 (3-(min)).
Ireland	Regulation on Balance Responsibility, Art. 5.
Italy	Legislative Decree 210/2021, Art. 3 (13).
The Netherlands	No regulation.
Portugal	Decree-Law 15/2022, Art. 164.
Romania	Law 123/2012, Art. 3 (78).
Spain	N/A
Türkiye	Electricity Market Balancing and Settlement Regulation (14.04.2019).

Self-consumers

Table 7: Definition and Regulation of Self-Consumers

Country	Definition of Self-consumers
Bulgaria	No regulation.
France	Energy Code, Art. L315-1 to L315-8.
Greece	Law 5037/2023, Section B, Chapter D, and Art. 63 to 67.
Ireland	S.I. 76/2022, Art. 4, 5 & 6.
Italy	Legislative Decree 210/2021, Art. 2 (2).

The Netherlands	No regulation. Collective self-consumption is allowed in a regulatory sandbox.[143]
Portugal	Decree-Law 15/2022, Art. 3 (f), Art. 81 & Art. 90.
Romania	Law 123/2012, Art. 3 (95).
Spain	Law 24/2013 Art. 9 and Decree 244/2019 (completes the regulatory framework promoted by Royal Decree-law 15/2018).
Türkiye	Unlicensed Electricity Production Regulation in the Electricity Market (12.05.2019).

Active consumers

Table 8: Definition and Regulation of Active Consumers

Country	Definition of Active consumers
Bulgaria	No regulation.
France	Energy Code, Art. L315-1 to L315-8 (self-consumption) and in Art. L332-6&7 (dynamic prices).
Greece	Law 4986/2022, Art. 52.
Ireland	Electricity Regulation Act 1999 (Art. 28A).
Italy	Legislative Decree 210/2021, Art. 3 (2).
The Netherlands	No regulation.
Portugal	Decree-Law 15/2022, Art. 3 (f), Art. 81 & Art. 90 (self-consumption) and in Art. 136 (m) (dynamic prices).

[143] «Regulatory sandboxes» are frameworks which, by providing a structured context for experimentation, enable where appropriate in a real-world environment the testing of innovative technologies, products, services or approaches for a limited time and in a limited part of a sector or area under regulatory supervision ensuring that appropriate safeguards are in place.

Romania	Law 123/2012, Art. 3 (18).
Spain	Royal Decree 244/2019 and Royal Decree-law 15/2018.
Türkiye	Unlicensed Electricity Production Regulation in the Electricity Market, (12.05.2019).

Renewable Energy Communities (REC)

Table 9: Definition and Regulation of Renewable Energy Communities

Country	Definition of REC
Bulgaria	REC definition in the RES Act under discussion in the Parliament (possibly to be approved in September 2023).
France	Energy Code "Book II, Title IX, Chapters I, III & IV".
Greece	Law 5037/2023, Section B, Chapter C, and Art. 45 to 62.
Ireland	S.I. 76/2022, Art. 8 & 9.
Italy	Legislative Decree 199/2021, Art. 31.
The Netherlands	There is definition of 'energy community' in Energy Law 2022 without making difference between REC and CEC. Energy associations and cooperatives are recognised by the law.
Portugal	Decree-Law 15/2022, Art. 189.
Romania	Emergency Ordinance 163/2022, Art. 2 (18) & Art. 22).
Spain	Law 24/2013, Art. 12a (introduced by Royal Decree-Law 5/2023, of June 28, Art. 183.2).
Türkiye	No regulation.

DE-RISK

Citizen Energy Communities (CEC)

Table 10: Definition and Regulation of Citizen Energy Communities

Country	Definition of CEC
Bulgaria	CEC is not regulated in Bulgaria. A proposal in the Energy Act is under discussion (likely to be approved before the end of 2023).
France	Energy Code “Book II, Title IX, Chapters II, III & IV”.
Greece	Law 5037/2023, Section B, Chapter G, Art. 86 to 103.
Ireland	Electricity Regulation Act 1999, Art. 2 (F6) and S.I. 76/2022, Art. 7.
Italy	Legislative Decree 210/2021, Art. 3 (3) & Art. 14.
The Netherlands	There is definition of ‘energy community’ in Energy Law 2022 without making difference between REC and CEC. Energy associations and cooperatives are recognised by the law.
Portugal	Decree-Law 15/2022, Art. 191.
Romania	Law 123/2012, Art. 3 (24).
Spain	Law 24/2013, Art. 12ter (introduced by Royal Decree-Law 5/2023, of June 28, Art. 183.3).
Türkiye	No regulation.

Other Market Actors

National Regulation Authorities (NRA) are defined in the legislation of each studied country and have a leading and independent role in ensuring the proper functioning of electricity markets. They also provide regulations and guidelines about market practices and market products (incl. flexibility services).

Electricity traders and suppliers are also defined in most studied countries as they buy their electricity on the market and are directly in contact with the end consumers.

Some market participants are specialised in providing flexibility services (such as Piclo in Portugal). These flexibility service providers are not specifically defined in regulations but can be considered as electricity traders.

Conclusion

The definition and regulation of energy communities and highlighting the roles of self-consumers and active consumers in the different national legislations make it possible to better integrate European citizens into the electricity markets so that they become active market players. The active role of citizens on the electricity markets is of paramount importance for the development of LFM and the delivery of flexibility services at decentralised levels.

This decentralisation also involves redefining the roles in the balancing of the electricity network. Historically devolved to the TSO, network security is now also in the hands of the DSOs. EU Directive 2019/944 allows DSOs to be purchasers of flexibility services in order to balance distribution networks locally. Within LFMs, they play a central and intermediary role between local actors (ECs, prosumers, self-consumers) and other actors in the electricity sector (NRA, TSO, etc.).

1.2.1. Cooperation between network operators

With the Clean Energy Package, the DSO-TSO cooperation evolves in a beneficial way for energy markets and consumers as well. Governance of how DSOs and TSOs interact and engage in network planning, as well as arrangements to facilitate effective coordination for system operation, especially for flexibility, have been the key regulatory concerns in this area for the last few years.

Table 11: Cooperation between the Transmission and the Distribution System Operators

Country	TSO-DSO Cooperation
Bulgaria	The cooperation between TSO and DSO is defined according to the Energy Act, the Electricity Market Rules and Regulation Rd-16-57 of Jan 28, 2008 on the activities of the operators of the electric energy system and of the distribution networks, last amended SG. No.70 of Aug 30, 2022.
France	ENEDIS (main DSO) and RTE (TSO) work together to organise the flexibility market through calls for tenders to recruit companies that could modulate their energy consumption or production. These types of calls for tenders started in 2020 and concern several dozens of localisations per call. There is an economic benefit for companies that participate in these projects. ENEDIS and RTE also propose the “Offre de Raccordement intelligente”: Electricity producers can join the grid at a low cost if they guarantee that they can modulate

	produced energy (in the limit of 5%) and can permanently guarantee the injection of at least 70% of the demanded power.
Greece	The differentiation between DSO-TSO is defined by the independent regulatory authority for energy (RAE). Their cooperation is regulated by RAE in compliance with EU directives 2019/944. Flexibility markets in Greece are not implemented yet.
Ireland	Collaboration between TSO and DSOs in Ireland is defined in the DSO/TSO Multi-Year Plan 2023-2027.[144] The TSO has developed a flexibility market called DS3 in Ireland which has been operating since 2011 and is a mature market for offering system services to the TSO. The DSO is currently developing the local flexibility market in Ireland under a Pilot phase under the National Network, Local Connections Programme. There is a DSO and TSO cooperation in place and as the DSO flexibility market develops, the market rules and coordination are being developed in coordination with the flexibility market (in line with the pilot phase) and is expected to be completed by 2025.
Italy	Good practice of cooperation between TSO-DSO can be found in a pilot project (SmartNet project) which aims to aggregate data on the electricity produced in real-time in order to facilitate the use of ancillary services. The DSO, Edyna, is monitoring the grid in real-time and is transferring the information to the TSO, Terna, which centralises the data and analyses them to take action if need be.[145]
The Netherlands	TSO and DSO have obligations about the technical aspects of the grid. Their collaboration is in the form of projects such as the GOPACS project.
Portugal	DSOs are responsible for the local distribution networks, while TSOs manage the transmission network and ensure the balance between supply and demand at the national level. E-REDES, as the DSO, is responsible for connecting sites to the network, for network security and reliability in supplying energy. It provides aggregated data on the consumption of delivery points or EV charging stations connected to the electric mobility network management entity (Mobi.E). Piclo Flex, an independent marketplace in Portugal, collaborates with system operators

[144] EirGrid – DSO/TSO Multi-Year Plan 2023 - 2027

[145] International Renewable Energy Agency (IRENA) – Co-operation between transmission and distribution system operators

	to procure local flexibility services to maintain a delicate balance of supply and demand in the grids.
Romania	TSOs have access to the balancing market, which is operated by OPCOM, a subsidiary of the TSO. DSOs have access to other markets but the cooperation between the two of them is not defined in the law.
Spain	There is only one TSO and several DSOs, which exchange data on the needs of the system. This cooperation is regulated by law 24/2013 of the electricity sector.
Türkiye	DSOs and TSOs consider the technical aspects of the grid. The organisation of the market is out of their interest.

Most of the studied countries rely on cooperation between TSOs and DSOs to procure flexibility services. While TSOs provide security to the grid at a larger scale, DSOs can balance their networks at a local scale, in a more decentralised way. A good example of this cooperation can be found in the Dutch project GOPACS[146] where the TSO Tennet and six DSOs created a platform dedicated to flexibility services. The goals of this project are:

- To decrease the cost of congestion management.
- To attract more FSPs to the market.
- To solve congestion in an area without creating congestion in another area.

GOPACS platform serves as an intermediary between FSPs and established markets (such as the Dutch intraday market or EPEX SPOT). For this platform to be created, the regulatory framework for congestion management had to be modified as follows:

- Possibility to have coordinated measures between TSO and DSO that can use each other's option to address their re-dispatch requirements.
- In case of local congestion, all system operators provide support to the local DSO (real-time communication between operators).
- Definition for a Congestion Management Service Provider (CSP) which is an aggregator for small capacities (smaller than 1 MW).

[146] Smart Energy Europe (smartEn) - Local Flexibility Markets (2022)

- Bilateral agreements (based on tendering process) that allow DSOs to procure long-term capacity products based on availability and/or activation fees.

1.2.2. Barriers to interactions between market participants

Flexibility services require close cooperation and coordination between different actors, such as electricity producers, distribution and transmission system operators, aggregators, consumers and energy service providers. Effective interactions allow for necessary information to be shared, optimising the use of flexible resources and ensuring balance management of the electricity system.

Table 12: Barriers to Interactions between Local Flexibility Market Participants

Country	Barriers between LFM Participants
Bulgaria	There is no legislation to regulate energy smart networks and services, which are, however, key to liberalisation and consumption planning. The slowdown of new technologies prevents the development of flexible tariffs on behalf of electricity traders to accurately cover individual consumption.
France	The procedure to integrate LFM is completely controlled by ENEDIS and RTE which ensure that LFM participants can technically assume their roles to stabilise the grid.
Greece	It is difficult to pinpoint a legislative barrier as of now. Although the transition in Greece might be challenging because there is only one DSO responsible for the distribution system in Greece.
Ireland	Even though energy communities are defined in the Irish legislation, there is a lack of regulatory framework for electricity sharing and energy community projects which complicate their involvement in a potential LFM.[147]
Italy	Complex legislation does not allow the LFM participants to have a clear picture of their role and their interactions with each other.
The Netherlands	The current legislative framework makes the establishment of LFMs difficult because of lack of regulation or guidelines on LFM participants and interactions.

[147] European Commission – Clean energy for EU islands Regulatory barriers in Ireland: findings and recommendations

	The complex and changeable policies regarding LFM development contribute to market player confusion. There are also difficulties in accessing loans, contracts or funding for LFM projects, because of the high number of rules at the national level which can result in less involved participants in the electricity market.
Portugal	There is a lack of standardised rules and regulations, which makes it difficult for LFMs to operate efficiently and for market participants to communicate effectively. Unaware consumers may also be a barrier to LFM participation, requiring legislation to promote renewable energy education.
Romania	The transposition of the EU Directives IEMD and RED II is recent and incomplete. Even with one main law about the electricity market, there are several complex pieces of legislation that are interfering with it which makes interaction between market participants more complicated.
Spain	Royal Decree 17/2022 establishes a minimum manageable power of 1 MW at each supply point in order to be eligible for demand response auctions in Spain. Previously, it was 5 MW. Although the trend is downward, small capacities are still not allowed, so the flexibility market is still limited to large consumers such as industries.
Türkiye	Licence requirements for participants should not be considered as an entry barrier, since the licence-obtaining procedure is well-defined and working. Peer-to-peer trading may be tricky but overall, regulations are not blocking interactions between LFM's participants.

There is a lack of standardised rules and regulations across different countries and regions in Europe, which makes it difficult for LFMs to operate efficiently and for market participants to communicate effectively.

Within LFMs, interactions between market participants must be regulated so that market balance takes place in a fluid and decentralised way. Network operators have a central role in the management of flexibility services and must be able to communicate with end-users providing flexibility. Electricity suppliers or aggregators can act as intermediaries between consumers and electricity markets.

Unaware consumers may also be a barrier to LFM participation, requiring legislation to promote renewable energy education. Proper information for users (prosumers, active consumers, ECs) is essential for them to better integrate into the different energy markets.

But there is also a need for regulatory stability to allow market actors to have time to assimilate all the rules in place. Communication is a key factor in order to have a variety of actors who can provide a wide range of flexibility products (depending on their needs and the network needs).

Communication of information and data transmission between the different participants of a LFM can also become easier with the integration of a blockchain system and smart contracts within LFM perimeter.

1.3. Development of the Network

1.3.1. Network planning

According to IEMD 2019/944, the network development plan published by the DSOs should provide transparency on the medium and long-term flexibility services and shall set out the planned investments for the next five-to-ten years, with particular emphasis on the main distribution infrastructure which is required in order to connect new generation capacity and new loads, including recharging points for electric vehicles. The network development plan shall also include the use of demand response, energy efficiency, energy storage facilities or other resources that the distribution system operator is to use as an alternative to system expansion.

Even if the contents of these plans differ depending on the country, all studied countries have network planning already in place to set objectives for the grid in the years to come.

Table 13: Regulation on Network Planning

Country	Network Planning
Bulgaria	Pursuant to Art. 4, para. 2, item 1 of the Law on Energy, the Ministry of Energy has to develop a Strategy for Sustainable Energy Development of the Republic of Bulgaria until 2030 with a horizon of 2050. According to that law, the Bulgarian DSO (ESO) established a Plan for the Development of the Transmission Electricity Network of Bulgaria for the period 2020-2029.[148]

[148] ESO - Ten-year development plan for transmission network (2020)

France	In 2019, a decennial development plan (SDDR 2019) was defined and extended for the period 2021-2035. The law 2023-175 of the 10th of March 2023 has been implemented to accelerate the development of production plants of REs in the next few years. It was done in order to (1) Schedule renewable energy projects, (2) Simplify the procedures, (3) Ease places for sun and wind power stations, and (4) Increase the share of RE values.[149]
Greece	The main vehicle for planning and scheduling of investments is the Ten-year Network Development Plan (TYNDP). According to the provisions of Law 4001/2011 and the Grid Code, IPTO prepares and issues the TYNDP for Greece, which has a rolling nature and is issued on an annual basis. The TYNDP includes the System development projects for each reference period, and the necessary infrastructures for RES penetration, as well as the time frames and estimated cash flows for their implementation.
Ireland	The network development plan is the responsibility of the Irish TSO, EirGrid, which produces a ten-year plan, revised every 2 years (currently 2023-2031). The goal is to provide the CRU with data ensuring the security of supply, the plan also sets the future needs of the network and the way to handle the unpredictability of RES electricity production.[150] DSOs such as ESB Networks have development plans for the electricity network (set out in Price Review 5). This programme was approved by the Commission for Energy Regulation.
Italy	The 10-year development plan is described in Legislative Decree 93/2011 and Legislative Decree 199/2021 which define the methods for electricity network planning. The only mention of flexibility is that the plan should include development for electric vehicles.
The Netherlands	TenneT developed and presented in April 2023 an initial picture of Target Grid, with the Target Grid Map, which is a vision of the electricity grid in 2045. It is the TenneT vision of an integrated and cross-border onshore and offshore electricity grid that fits into a climate-neutral energy system (in coordination with the

[149] Vie Publique - Law of March 10, 2023 on the acceleration of renewable energy production
[150] CRU.ie – Planning and Development

	Ministry of Economic Affairs and climate, among others, within the Energy System 2050 programme).
Portugal	The Development and Investment Plan for the Electricity Sector (PDIRT – Decree-Law 15/2022, Art. 124, initially defined with Decree-Law 80/2015, Art. 39) is the main instrument for defining the long-term development and investment plan for the Portuguese electricity. The PDIRT is developed under the ERSE supervision by the TSO and DSOs, and it is subject to public consultation before being approved by the government.
Romania	Art.35, Law 123/2012: *"The transmission system and network operators are required to draw up ten-year investment and development plans for the transmission system, based on the current state and future development of energy consumption and sources."* GEO 143 (66) also mentions that the electricity distribution network development should provide transparency on the required flexibility services in the medium and long term and presents the investments planned for the next 5 to 10 years.
Spain	The Sustainability Plan for 2023-2025 was developed by Redeia (global manager of essential infrastructures, the TSO, REE is one of the subsidiaries), to achieve the goals of the Commitment to sustainability for 2030. The plan is divided into 87 objectives and 190 actions to achieve them. The Commitment for sustainability for 2030 is organised into 4 pillars of action, which are: Anticipating change and taking action; Decarbonisation of the economy; Responsible value chain and Contribution to social, economic and environmental development.[151, 152]
Türkiye	There are 21 DSOs in Turkey, all are privatised. Their development plans are made for 5 years, as per Communique for Regulation of Distribution Tariff. The investment plan is prepared by DSO and submitted to EMRA (Regulatory Authority), so that their tariff for the 5-year term is defined. Although there is no specific definition for flexibility, "Service Quality and Performance Incentive" is defined in the Communique so that DSO has to plan their investments in order to provide a flexible operation regime.

[151] Redeia – Sustainability Plan 2023-2025. Overview
[152] Redeia – Commitment to sustainability

	DSOs usually publicly announce their investment plans on their web pages but there are only lists of investment projects, including name and location and sometimes the planned budget.

In all studied countries, network planning takes into consideration the growth of RES in the electricity mix. These energy sources are dependent on climate conditions and therefore do not have a constant electricity production.

Network development should consider flexibility services, especially the ones which can be provided at the local level (incl. energy storage).

The network planning process can be seen as a continuous improvement method, operating iteratively. Evolving needs, technologies and energy policies are all factors that must be considered to manage network expansion.

1.3.2. Network expansion

Table 14: Regulation on Network Expansion

Country	Network Expansion	
Bulgaria	Yes	The Plan for the Development of the Transmission Electricity Network of Bulgaria for the period 2020-2029 (established by ESO) contains information regarding the expansion of the grid.[153]
France	Yes	Energy Code, Art. L321-7: Taking account of the multi-annual energy plan, the TSO draws up the regional connection plan, including the facilities that need to be created or reinforced to adapt the network to the forecasts (RES connections, for example). According to the Energy Code, Art. L322-11, major DSOs (more than 100 000 consumers) also have the responsibility of drawing a 2-year local connection plan.
Greece	Yes	IPTO, the Greek TSO, has a plan to develop a European energy network for transfer of RES-generated electricity from North African and South-eastern Mediterranean countries to Europe via Greece and other Southern

[153] Association of traders with electricity in Bulgaria (ATEB) – Ten-year network development plan of ESO

		European countries. This effort will take place between 2025 and 2030, a development that would boost the European grid's efficiency by 55%.
Ireland	Yes	The Irish Transmission Development Plan 2023-2031 contains information regarding the expansion of the grid (especially through the planned projects in several areas, incl. Irish islands).
Italy	Yes	Grid development is defined in the Italian Grid Code, Chapter 2 and it details the development planning process, the data needed for the planning and the development plan.
The Netherlands	No	TenneT is building an offshore high voltage grid (3 500 MW) along the Dutch coast, in order to support sustainability targets from the government. TenneT is carrying out the modernisation of the existing grid, for example by replacing cables with the latest technology, thereby optimising the energy transition.
Portugal	Yes	The Regulation of the Electricity Networks and Public Service of Electricity (RNSESP) establishes the rules for the expansion, operation, and maintenance of the electricity networks. The RNSESP also includes provisions for RES integration, development of smart grids, and promotion of energy efficiency. Additionally, the national TSO, Redes Energéticas Nacionais (REN), is responsible for proposing and implementing network expansion plans in accordance with the guidelines and objectives set by the Portuguese government.
Romania	Yes	According to Art. 3 (45) of Law 123/2012, the development of the electrical distribution network of public interest belongs to the concessionary DSO that creates, in an area where there is no network, new distribution capacities and realises maintenance on the existing grid to connect one or more users to the network.
Spain	Yes	In compliance with the energy and climate commitments established by the PNIEC 2021-2030 (the National Energy and Climate Plan for 2021-2030), the Spanish TSO developed the Electricity Transmission Network Development Plan – Period 2021-2026 (construction of new lines, submarine interconnections and modernisation of existing networks).[154]

[154] S. Djunisic – Spanish govt approves EUR-6.96bn plan to boost the grid by 2026 (2022)

		The plan will enable the transmission network to be developed so that more REs can be connected and integrated. Infrastructure will be developed to connect 37,000 MW of new RE installations. By 2026, the aim is to achieve 67% of electricity production from RES. The objectives of the plan are to increase the reliability of supply, stimulate the development of new demand routes, and strengthen international connections and isolated systems.[155]
Türkiye	Yes	The Law for Using RES for the Purpose of Electricity Production, No 5346, Article 1 states that the purpose of this Law is (1) to expand the use of RES for electrical energy production; (2) to bring these resources to the economy in a reliable, economical and high-quality manner; (3) to increase the diversity of resources; (4) to reduce greenhouse gas emissions; (5) to evaluate waste; (6) to protect the environment; (7) to develop the manufacturing sector needed for the realisation of these goals. Flexibility for distributed generation and storage facilities of EV chargers should be considered for EMRA experts to approve investment plans.

Network extension should take into consideration the need for flexibility and its consequences. LFM can reduce the cost of the network by reducing the need for investments in the network. The electricity is managed locally instead of globally which avoids electricity transportation on the transmission networks.

1.4. Market Characteristics

Transparent and fair interactions between market players promote open and non-discriminatory access to flexibility services. This allows a wide range of market players, including small producers, aggregators and consumers, to actively participate in the flexibility market and provide services.

155 Ministry of Ecological Transition & REE – Network Development Plan 2021-2026

1.4.1. Market organisation

Table 15: Organisation of Local Flexibility Markets

Country	LFM Organisation	
Bulgaria	Platform	The organisation of the electric energy market in Bulgaria is regulated by the Electricity Market Rules. The market is organised by the Electricity System Operator (ESO) and operated by IBEX. Flexigrid is a Horizon 2020 project for which Bulgaria is a pilot site. It provides a transparent data management platform, disseminating information about network conditions in real time, with the objective to optimise market operation and network observability.[156] ESO's IT and real-time system (execution: Feb 2020 - March 2026) aims to modernise power system planning, control and maintenance by deploying cutting-edge digital tools and methods.[157]
France	Aggregation	In France, ENEDIS/RTE is supervising all the LFM operations and needs outside services to assure LFMs.[158]
Greece	Platform	Greek laws 4986/2022 and 5037/2023 define the general electricity market roles, in compliance with EU directive 2019/944. As of now, there is no LFM.
Ireland	Aggregation	In 2021, Ireland still had no local flexibility markets. But ESB Networks (Irish DSO) has a development plan for LFM.[159] The Single Electricity Market (SEM) is composed of a wholesale market (incl. day ahead, intraday, and balancing market arrangements) and a capacity market.

[156] FlexiGrid project
[157] ESO – Flexitranstore platform
[158] RTE – Enhance flexibilities
[159] ESB Networks – Phased Flexibility Market Development Plan

Italy	Platform	The implementation of a LFM (in Rome) through the Platone project[160] aims at implementing a real integrated market with innovative technologies (use of blockchain, smart metering system and new grid equipment). Retail and prosumers interact with aggregators and DSOs to access new flexibility services.
The Netherlands	Platform	Crowd Balancing Platform Equigy[161, 162] offers to TenneT access to flexibility services, such as storage capacity of a network of electric vehicles and charging points. Blockchain technology is used to enable decentralised data exchange. GOPACS project: the GOPACS platform is a coordination platform for Dutch operators that allow them to reduce congestion in the electricity grid. The aim is to go-live this platform in June 2023.
Portugal	Aggregation / Platform	LFM is organised through "Flexibility Management Platform" (FMP), managed by the country's TSO, Redes Energéticas Nacionais (REN). The FMP serves as a marketplace for trading of flexible energy products, including demand response, energy storage, and distributed generation. The platform allows market participants, such as aggregators and consumers, to offer their flexibility services to the system operator, which can then use them to balance the electricity grid in real-time. To participate in the LFM, market participants must register with the FMP and meet certain technical and operational requirements, such as the ability to provide reliable and accurate information on their flexibility capabilities and availability.
Romania	Platform	OPCOM is operating the markets[163] under the supervision of the ANRE. The TSO manages the operation of the electricity market and is also responsible for electricity exchanges with other countries. The TSO also purchases flexibility services in the balancing market. Market participants mainly use the day-ahead

[160] Platone project – Local flexibility market - Cutting barriers, unlocking flexibility

[161] TenneT – Crowd Balancing Platform - Blockchain Technology

[162] Equigy – Flexcity helps to build up the secondary reserve of the network managed by TenneT and offers new services to its partners

[163] OPCOM – Company Operator of the Electricity and Natural Gas Market

		and intraday market to balance the portfolio of bilateral contracts, availability of generation units and consumption forecast. In case of a power reduction, transactions occur at the dispatchable unit's level.
Spain	Platform	OMIE (the Spanish pole of the Iberian electricity market) has started a pilot project on LFM, called IREMEL that is expected to last until 2026. The framework considers two types of markets:[164] - Global/European Markets: Already existing in Spain, they permit negotiation of energy with agents in different points of the Iberic and European grid, without considering the geographical factor associated to the generator/consumer, if connected to the grid. - Zonal and flexibility Market: Given a certain condition of the distribution grid, to which the DERs are connected, the exchange needs to be done by (or is restricted to) assets located in a specific location. The negotiation is promoted or restricted by the DSO.
Türkiye	Platform	EPİAŞ (Energy Market Operation Inc.), a member of APEX and EUROPEX, is responsible for operation of intraday, day ahead, balancing and future markets for electricity and gas. EPİAŞ shareholders are 30% TEİAŞ (TSO), 30% Borsa İstanbul (Istanbul Stock Exchange) and 40% Market Participants. This platform provides access to both ordinary consumers and professional traders.[165, 166]

In most countries, LFMs are still at the stage of pilot projects and are organised through a platform to allow market participants to exchange flexibility services. There is no specific regulation at the EU level (and therefore at the level of the Member States) for LFMs.

One of the main issues to address is if LFMs should be independent or they should serve as intermediaries between participants and classic electricity markets (such as the intraday market in the GOPACS project).

[164] OMIE – Modelo De Funcionamiento De Los Mercados Locales De Electricidad (2019)
[165] EPİAŞ – Şeffaflık Platformu (Transparency Platform)
[166] EPİAŞ – EXIST Energy Exchange Istanbul

Regulations for market products

Table 16: Existing Regulation for Market Products

National Regulation	BG	FR	GR	IE	IT	NL	PT	RO	ES	TR
Market Entry and Exit	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market product characteristics	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes

Table 17: Regulation on Market Entry and Exit

Country	Market Entry and Exit	
Bulgaria	Yes	Market entry and exit are defined in the Energy Act, and the rules of IBEX.[167]
France	Yes	General Market entry and exit are defined in the Energy Code. For LFMs, as electricity exchanges are happening at a local level, participation of local players is subject to DSOs validation (Enedis, main French DSO, also launch tenders to have access to local flexibility).[168]
Greece	Yes	The wholesale market, regulated by RAE (Regulatory Authority for Energy), has strict regulation for market exit and entry.[169] TSO cannot refuse the entry to any generating installation or energy storage that is eligible to do so (by satisfying the national regulations set by RAE).
Ireland	Yes	There are standards and requirements to be an aggregator. This is being assessed at present by the Irish Regulator, Commission for Regulation of Utilities. The National Network, Local Connections programme, is developing and piloting local flexibility markets on a phased plan under guidance from the CRU.[170]

[167] IBEX – Exchange Operational Rules

[168] ENEDIS – Local Flexibility tender

[169] HEnEx – Procedure for acquiring the Member capacity, Membership resignation and other Membership issues of the Financial Energy Market (Derivatives Market) of HEnEx

[170] CRU – Roadmap for the Clean Energy Packages Electricity and Renewables Directives

Italy	Yes	GME (Gestore dei Mercati Energetici SpA) regulates the access to the Italian Power Exchange (IPEX). Participants have to submit a Market Participation Application and a Market Participation Agreement to be approved by the GME and, then, can enter into the Register of Market Participants.[171] All the requirements are defined in the "Integrated Text of the Electricity Market Rules" (Art. 11).[172]
The Netherlands	Yes	Art. 95a of 1998 Electricity Act: It is forbidden without a permit to supply electricity to customers who have on a connection to a network with a total maximum permeability of no more than 3*80 A.[173]
Portugal	Yes	Regulamento de Relações Comerciais do Setor Elétrico (RRCE) is one of the main regulatory frameworks for LFMs. It structures commercial exchanges between the various players in the electricity market, i.e., consumers, producers and traders, but also defines the conditions of participation (in terms of standardisation, reference and pre-qualification of products) of market agents in the LFM.
Romania	Yes	Several Orders from ANRE are regulating the market entrance and exit for participants and their functioning; the main one is the ANRE Order 37/09/06/2021.
Spain	Yes	In Spain, system and electricity market stakeholders are intensifying the debate on the figures of the aggregator and flexibility products, in response to European guidelines, but there is still much reticence due to the technical and regulatory complexity. For the time being, the law is conservative and there are no rules on these products. The figures of storage, aggregation and independent aggregators, renewable energy communities, hybridisation or regulatory testbeds, all of which were regulatory testbeds, were incorporated into the regulation by means of Royal Decree-Law 23/2020.

[171] Gestore Mercati Energetici (GME) – Electricity Market – how to participate
[172] GME - Integrated Text of the Electricity Market Rules
[173] Climate Laws – Electricity Act 1998

DE-RISK

Türkiye	Yes	As a prerequisite, a licence should be obtained as per Electricity Market License Regulation, dated 02.11.2013 and published in Official Gazette Nr. 28809. Financial criteria should be satisfied to be enrolled in the EPİAŞ trading platform. A guarantee letter or cash collateral may be required.

Access to LFMs and to national electricity markets is subject to similar requirements in the studied countries. As there is no specific legislation for LFM entry/exit, the legislation for electricity market entry/exit is applied. If transposition of an EU Directive is incomplete, this could be an issue for the correct implementation of LFMs.

As the needs of LFMs are different from those of the traditional electricity markets, it is important to have a legislative framework that is more precise and adapted to these specific needs.

Table 18: Regulation on Market Product Characteristics

Country	Market Product characteristics Regulation
Bulgaria	Electricity Market Rules (Promulgated SG. No. 66 of July 26, 2013, last mod. SG. No. 50 of June 9, 2023) regulate the electricity market and its structure (Chapter II) by defining each type of market, including the balancing market (Section IV) and the reserve and ancillary services market (Section V).[174]
France	Requirements are indicated by ENEDIS based on the different possible markets.
Greece	For the effective implementation of the Balancing Market, the Balancing Market Rulebook is supplemented by methodologies decided by the Regulatory Authority for Energy (RAE), following a proposal by IPTO.[175]
Ireland	The TSO has guides and regulations for the DS3 flexibility market and a programme is underway to develop the DSO LFM.
Italy	In the Italian Grid Code[176] (made by Terna, supervised by ARERA), Chapter 4 defines Flexibility Products, their characteristics and requirements for enabling resources.

[174] State Energy and Water Regulatory Commission – Electricity Market Rules (2013)
[175] IPTO – Methodologies and Technical Decisions
[176] Terna – Italian Grid Code

The Netherlands	TenneT, the Dutch TSO has made some amendments, based on the EU's Electricity Network Codes and Guidelines (EU-wide network codes for electricity contribute to making energy more secure, competitive and affordable for consumers). In particular, the document Implementing Rules with regard to the electricity network defines various ancillary services and their operating conditions.[177]
Portugal	Pre-qualification, standardisation and the reference base for products and services on LFMs are regulated and supervised in Portugal. The RRCE defines the rules and procedures for commercial relations between traders, consumers and producers. In addition, the PNEC is a national plan that sets out the country's strategy for the ecological transition, in terms of policies and objectives. It aims to promote the development of LFMs. Companies operating on LFMs can be assisted by industry associations and organisations, such as the Portuguese Association for the Promotion of the Smart Grid (GridPT), the Portuguese Renewable Energy Association (APREN) and the Portuguese Association for Energy Storage (APESB).
Romania	Article 23, Amended Law 123/2012 authorises bilateral PPA or bilateral capacity reservation agreement. Long-term supply contracts between market players are regulated in ANRE President Order 65/2020.
Spain	There is a methodology established by Red Electrica (TSO) for the pre-qualification of consumers that can participate in capacity markets, as well as for the calculation of the baseline, which takes into account the expected energy purchase or sale of that user for that period.
Türkiye	Guides and Regulation can be found on EPİAŞ website[178], in particular concerning contracts, orders and matching of orders, which are described in the Power Future Market Operation Procedures and Principles. The various constraints related to certificates and registrations are outlined in Yek-G System and Organized Yek-G Market Operating Procedures and Principles. The responsibilities of the market operator are covered in Collateral Procedures and Principles.

[177] TenneT – General Documents
[178] EPİAŞ - Board Resolutions

	Regulations concerning the Day-Ahead market are contained in Procedures and Principles Regarding the Structures of the Day-Ahead Market Orders and Evaluation of Orders.

In most cases, national regulations allow for flexibility services and other market products without providing sufficiently detailed information. Details can be found in regulation from the NRAs and guides are provided by the markets' operators or the networks' operators. A lack of regulation regarding flexibility services can pose several risks to the implementation of LFMs in European countries. These risks include uncertainty and inconsistency in market rules that can hinder the effective participation of market actors. Access to flexibility markets may be limited or biased towards established market participants, which means limited market access to smaller or new participants such as aggregators or energy communities. The absence of clear regulation may also deter investors from committing capital to LFM projects due to higher perceived risks and reduced attractiveness.

To mitigate these risks, it is important for regulatory authorities to establish clear and comprehensive regulations that define the framework for flexibility services in electricity markets. They should provide guidance on market design, technical requirements, market access rules, remuneration mechanisms, and standardisation. They should also aim to promote competition, facilitate the participation of various participants, and ensure a level-playing field for all market actors.

1.4.2. Electricity exchange contracting

Table 19: Regulation on Contracting for Flexibility Services

Country	Contracting	
Bulgaria	Yes	Contracting for flexibility services is defined in the Electricity Market Rules - Promulgated SG. No. 66 of July 26, 2013, last mod. SG. No. 50 of June 9, 2023
France	Yes	Regulation and guidelines are proposed by ENEDIS. A contract with the flexibility role of the prosumer is provided after requirements are verified for the prosumer.
Greece	Yes	There are no specific guidelines for LFMs but regulation about contracting flexibility services in Greece is in compliance with EU directives 2019/944 and 2019/943.

DE-RISK

Ireland		There are no guidelines specific to LFM. Currently, the Single Electricity Market Operator (SEMO) is responsible for providing a competitive, sustainable and reliable wholesale market. SEMO established several regulations such as the Trading and Settlement Code for the Balancing Market and the Capacity Market Code to ensure good practices in the wholesale market.[179]
Italy	Yes	Provisions for the flexibility market can be found in the Electricity Market Rules but there is no specific regulation for LFMs.
The Netherlands	Yes	The contracting of flexibility services is mainly regulated by the Law on the networks' management. (Wet Onafhankelijk Netbeheer Elektriciteit en Gas).
Portugal	Yes	LFM contracts and calls for tender are governed by regulations and guidelines. A tendering mechanism governs the contracting process for LFM services. Market players submit bids to provide the system operator with flexibility services. The best bids are selected to provide the required services, based on economic and technical criteria. The market players are paid according to the price they have offered for the services provided, in a pay-as-you-go mechanism.
Romania	Yes	Contracting details can be found in the ANRE Orders for the different markets but there is no specific regulation for flexibility services.
Spain	Yes	Contracting for flexibility services is defined in several articles of the Law 24/2013 (for example with Art. 23 "Bid system on the daily electricity production market").
Türkiye	Yes	Guides and Regulation can be found on EPİAŞ website (as in the previous table).

There is no specific regulation on flexibility services for LFM but guides and regulations exist about the contracting of flexibility services in most of the analysed countries.

The contracting of flexibility services can play a significant role in encouraging new LFMs by bringing clarity and transparency to them. By establishing precise guidelines for flexibility

[179] SEMO – Single Electricity Market

services, each market player is aware of its rights, obligations and the terms under which flexibility services are provided.

This greater clarity of standardised rules would facilitate access to and participation in the market for a wider variety of players (including aggregators, FSPs, ECs and prosumers). In the context of LFMs, locally adapted requirements should be envisaged to enable a new player to participate in a LFM. Simplified procedures for smaller potential participants who do not have the same administrative support as the major players in the sector could also be a possibility.

Contracting is also an opportunity to define risk allocations and reward mechanisms for making flexibility available on the market. EU and national legislation should provide financial incentives for market players to provide flexibility services in order to contribute to the optimal functioning of LFMs.

The long-term visibility offered by contracting is also an advantage for the emergence of new LFMs, as it provides security that makes it easier to attract investment (in infrastructure or in the technologies used). These contracts must also take account of the technologies used, and a degree of regulatory flexibility must be possible, especially through regulatory sandboxes.

1.5. Local Flexibility Market Development – Risks and Good Practices

Table 20: Risks and Benefits of Regional/Local Regulation on Local Flexibility Market Development

Country	Risks	Benefits
Bulgaria	At the moment, the Bulgarian legislation lacks many of the details, which, if available, could better stimulate activity among market players. There is still no possibility to create off-grid communities, REC and CEC are not defined, and conditions for construction of own electricity systems and sale of produced energy to the network are highly restrictive and time-consuming.	N/A
France	N/A	N/A

DE-RISK

Greece	Greece passed the legislation to comply with EU directives 2019/944 & 2019/943 in October 2022; it is difficult to pinpoint a regulation barrier as of now.	Based on their nature, some Greek islands (Rhodes, Antikithira, Agathonisi) are isolated from the national energy grid (still owned by the national DSO) and own an autonomous energy generation that could facilitate the implementation of a LFM.
Ireland	N/A	Incentives for energy efficiency projects are uplifted by 50% for projects on Irish islands allowing inhabitants to install renewable energy systems such as solar panels or wind power systems which can participate in a potential LFMs.[180]
Italy	The situation of LFMs development is slowly evolving, mainly due to the disagreement between the TSO and DSOs.[181]	N/A
The Netherlands	N/A	N/A
Portugal	Investment in RES and energy efficiency (EE) measures is one of the actions that need to be taken if Portugal is to achieve its targets. The same applies to legal and regulatory obstacles. These are challenges that need to be overcome if LFMs are to be developed.[182]	LFMs are encouraged by various regulations and provisions. The National Smart Grid Network (REN4.0) aims to promote RES integration and smart grids development. The National Energy and Climate Plan set targets for improving EE and for production of RE. The regulation on EC allows collective management of RE systems by organisations and individuals. The Portuguese EE Fund provides financial support for EE projects.

[180] European Commission – Clean energy for EU islands Regulatory barriers in Ireland: findings and recommendations

[181] FEVER – D4.1 Flexibility related European electricity markets

[182] Direção Geral de Energia e Geologia (DGEG) - Risk-preparedness Plan for the Portuguese Electricity Sector

		There is also a storage regulation to support the RES integration that allows deployment of energy storage systems. The principle of net metering allows energy consumers with on-site RE systems to sell their surplus energy back to the grid. The participation of new players (such as energy service companies and aggregators) in the energy market is encouraged through the development of Market Agents Regulation.
Romania	N/A	GEO 143 & 163 has transformed the electricity market to make it more suitable for RES to connect to the grid and for generation to provide FS. Amendments to the process for connection to the network (Order No 81, 82 and 83/2022) aim at simplifying and speeding up connection to the network for RES. While not being specific to LFM, those regulations set a solid ground for further legislative evolution.
Spain	In Spain, energy competences are state-owned, and only some competences in regions such as Basque Country or Navarra can be of local nature. For example, the simplified compensation of surpluses of self-consumption facilities in Navarra has been different from the rest of Spain. Still, the bulk of legislation is state legislation.	N/A
Türkiye	Before formally applying for a connection to a transformer substation, an investor may not be informed if there is available capacity. This could be considered an entry barrier at the feasibility	N/A

DE-RISK

	stage. It would be better to have an open, transparent investment plan and announcement of the available capacity in the mid-term, forced by regulation.	

Regional and local regulations play a crucial role in the development of LFMs in Europe. While these regulations can bring both benefits and risks, they provide a custom environment for the integration of local flexibility products.

Among the main risks is the risk of fragmented regulations arising when different regions or localities implement divergent rules and requirements. This can create barriers to the creation or the efficient operation of LFMs, as different rules and procedures may hinder harmonisation efforts.

Inconsistencies in regulations across regions can also lead to confusion and uncertainty for market participants. Varying requirements for market access, technical standards, and administrative procedures can increase transaction costs and limit the scalability of local FS.

On the other hand, regional and local regulations can favour the emergence of LFMs and support national regulations by allowing for customization and adaptation to local specifications, needs, and resources. This enables the development of tailored market designs and incentive mechanisms that reflect the local characteristics and potential of flexibility services. Such regulations empower local stakeholders, such as ECs, local authorities, and small-scale participants (prosumers, active consumers…), to actively participate in the electricity market and become FSP. This enhances local engagement, promotes decentralisation, and supports the energy transition at the local level.

These regulations can provide a testing ground for innovative market models, technologies, as well as business models. By allowing for experimentation, pilot projects, and regulatory sandboxes, LFMs can foster innovation and facilitate the scaling-up of successful projects.

There is a need to have a standardised approach on regulation for LFM Uptake (at European, National and Regional level) but adaptation to local specificities must stay a possibility to better LFM projects and ensure their efficiency.

2. Policy and Regulatory Framework for Local Flexibility Markets Uptake

2.1. Local Flexibility Markets in National Electricity Network Policy

National Action Plans for Climate and Energy in Europe typically outline a country's strategies and goals for addressing climate change and promoting renewable energy. While the specific content may vary from one country to another, these plans often contain information relevant to LFM.

Table 21: Development of Local Flexibility Markets in Energy Action Plans

Country	Energy action planning
Bulgaria	The Bulgarian Integrated Plan in the field of Energy and Climate 2021 – 2030[183] includes "National common objectives regarding increase of flexibility of the national energy system, in particular through use of own energy sources, optimization of consumption and energy storage".
France	In the SDDR 2019 (p.37)[184], the development and spread of LFMs are meant to have the following goals: - Use of smart grid solutions to quickly reduce energy peaks using LFMs - Multiplying LFM initiatives to be able to stabilise grids in critical times even for a short period
Greece	Because Greek law that included EU directive 2019/944 and 2019/943 is relatively new, the targets for development and spread of LFMs in the Energy Action Plans are not sufficiently clear.
Ireland	The Government has included the development of local flexibility markets within the Climate Action Plan 2023 (especially with the National Network, Local Connections Programme).[185]
Italy	The National Energy and Climate Plan (NECL) includes national objectives for the flexibility services expansion but there are no specific targets for LFM development. It promotes the development of energy communities, self-consumers and technologies (such as smart meters, storage systems). The NECL states that: *"in the*

[183] https://energy.ec.europa.eu/system/files/2020-06/bg_final_necp_main_en_0.pdf
[184] RTE – 10-year network development plan (2019)
[185] Government of Ireland - Climate Action Plan 2023

	long-term, the dispatching model itself will be aligned with market developments, tending towards models that are better tailored to a distributed resource system”. This document announces the possibility of decentralised electricity markets to be able to provide preventive measures to the grid.
The Netherlands	The Flexibility Market Plan aims to create a more flexible energy system and encourages the development of LFMs.
Portugal	The Portuguese National Energy and Climate Plan (NECP) includes targets for renewable energy but it does not mention LFMs. However, the NECP does mention the promotion of demand-side flexibility, which could indirectly support the development and spread of LFMs.
Romania	The Romanian National Integrated Plan for Energy and Climate Change 2021/2030[186] states that RES development objectives will provide an increased amount of flexibility in the electricity grid. The planned liberalisation of energy markets should provide wider energy security, especially at a local level. There are objectives regarding FS (to foster demand response consumption, to encourage storage facilities …) but not a specific target regarding LFMs.
Spain	Without specific mentioning of LFM, the Spanish NECP describes objectives regarding the development of storage and demand management (an additional storage of 6 GW by 2030 to support the integration of RES in the electricity network - Measure 1.2). Flexibility is also presented as an opportunity for greater participation of citizens in the energy system.
Türkiye	Issued by the Ministry of Energy and Natural Resources, the Strategic Plan 2019-2023 includes objectives to improve the environment to foster LFM: - Objective 1.1 - Ensuring that the ratio of installed capacity based on domestic and renewable energy resources to the total installed capacity will be increased from 59% to 65% - Objective 2.2 - A market infrastructure will be established for demand-side participation in the electricity network Further, EPİAŞ Strategic Plan 2019-2023 mentions the following objectives: - Strengthening the Sustainability and Predictability of Energy Markets - Developing New Products and Services in Energy Markets

[186] European Commission – The 2021-2030 Integrated National Energy and Climate Plan – Romania (2020)

Although National Energy and Climate Plans (NECPs)[187] across EU countries do not explicitly address the development of LFM, they often include recommendations and targets related to the flexibility that can indirectly support the growth of LFM.

NECPs generally set objectives and targets related to the integration of renewable energy sources, energy efficiency and decarbonisation. These objectives require the deployment of flexibility services to manage the variability of renewable production, optimise energy consumption and reinforce grid stability which indirectly support the development of LFM.

NECPs often highlight the importance of demand response and demand-side flexibility to achieve energy transition goals. These measures allow consumers to actively participate in the energy market by adjusting their electricity consumption habits or by offering flexibility from distributed energy resources. NECPs can emphasise the need for supportive policies, market mechanisms and awareness campaigns to unlock the potential for demand-side flexibility.

NECPs usually recognise the role of energy communities, local initiatives and prosumers in the energy transition and the involvement of local participants, such as households, businesses and local authorities, in the production, consumption and sharing of energy. They can define measures to empower the local actors, encourage peer-to-peer energy trading and facilitate the integration of the flexibility resources into the network. These efforts can lay the foundation for LFMs.

NECPs often address the integration of Distributed Energy Resources (DERs), including rooftop solar panels, small-scale wind turbines, and energy storage systems. Efficient use of these DERs requires flexibility services to manage their intermittency and optimise their operation. NECPs can promote regulatory and market frameworks that enable the participation of DERs in flexibility markets, indirectly promoting the development of LFMs.

It is important that policymakers and stakeholders further recognise the potential of LFMs and consider including specific recommendations and guidelines for their development in future revisions of NECPs. This can help ensure that the benefits of local flexibility are fully realised and that the necessary regulatory and market frameworks are in place to support their growth.

---

[187] European Commission – National energy and climate plans

2.2. Bureaucratic and Administrative Barriers

Bulgaria

During the last years some of the bureaucratic and administrative barriers for LFM in Bulgaria have been overcome, but mainly in regard to the self-production of solar energy without connection to the network. The lack of supportive government policy for the development of energy communities and for empowering consumers to be part of the energy market with the energy produced by their RES systems hinders the development of LFM.

Table 22: Bureaucratic and Administrative Barriers for Local Flexibility Markets in Bulgaria

When flexibility producers connect to the grid		
Complicated application procedure	No	With the last changes in the Law on Territorial Development, the requirement for a construction permit for solar panels with a capacity of up to 20 kW for own needs is no longer required, a notification has only to be submitted to the chief architect of the municipality and to the relevant energy company.
Uncertainty of approval	No	Art. 24 of the RES Act states that the regional operators have no legal basis to refuse connection to the network of energy facilities for electrical energy production from RES, in the following cases: - PV with a total installed capacity of up to 30 kW incl., planned to be built on roof and facade structures of buildings connected to the electricity distribution network; - PV with a total installed capacity of up to 200 kW incl., planned to be built on roof and facade structures of buildings for production and storage activities connected to the power transmission or power distribution network in urbanised areas; - when submitting a request for PV connection, the investor declares that preferential prices for the produced energy will not be used. Connection to the network can be refused in case of lack of capacity.
High costs	No	Financing for PV roof installations for electricity production and domestic hot water for citizens and SMEs under the Recovery and Resilience Plan of Bulgaria is available.

Time consuming procedure	No	In 2022, the changes in the RES Act significantly have simplified the procedures for connection of new capacities with a total capacity of up to 1 MW (roof and facade structures), reducing the deadlines for study and issuing an opinion on the conditions and method of connection to up to 40 days.
Other	N/A	
When operating the grid		
for System Operators	Yes	Network operators and market participants may be subject to a licensing system (see below).
for prosumers / aggregators	N/A	
for BRP	Yes	
Other	N/A	

According to the Energy Law, Art. 39, no licence is required for production of electrical energy by a person owning a plant with a total installed electrical capacity of up to 5 MW; in the other cases a licence is issued before the construction of the energy facility and the licence contains the conditions for the construction and a deadline for starting the licensed activity. When a person who applies for the issuance of a licence for any activities or holds such a licence, meets the requirements for a balancing group coordinator, the relevant licence contains the rights and obligations related to the activities of a balancing group coordinator.

France

In general, every participant to LFM needs to validate administratively its participation with ENEDIS. This can be simple (client prosumers) or complex, following a centralised ENEDIS proposal to recruit participants. A recent law (Law 2023-175 of March 10th, 2023) on the acceleration of renewable energy production was implemented to remove administrative barriers.

Table 23: Bureaucratic and Administrative Barriers for Local Flexibility Markets in France

When flexibility producers connect to the grid		
Complicated application procedure	Yes	According to the French policy for the development of RES[188], application procedure can be straightforward at an individual level (<36 kVA) but more challenging for large producers (call for tenders at a high production level).
Uncertainty of approval	Yes	High voltage users that go through a tender procedure do not have the certainty to be accepted.
High costs	No	The cost of connecting to the grid is based on the amount of electricity possibly reinjected to the grid.
Time consuming procedure	Yes	Procedure can be time consuming if RTE has to re-dimension the grid and make the appropriate modifications.
When operating the grid		
for System Operators	No	
for prosumers / aggregators	Yes	Depending on specific cases, it will be easier for residential prosumers to connect but more complicated for high voltage prosumers.
for BRP	Yes	Flexibility can be taken as a constraint that can shift schedules and deliveries.

[188] Ministry for Ecological Transition and Territorial Cohesion & Ministry for Energy Transition – Renewable energy support schemes

Greece

The transposition of EU directives 2019/944 and 2019/943 is relatively recent in Greece. Therefore, the different bureaucratic and administrative barriers for LFMs are still unclear due to a lack of practice under the new regulation. The main restraint comes from the need for adaptation of the various market players to the new legislation.

Table 24: Bureaucratic and Administrative Barriers for Local Flexibility Markets in Greece

<table>
<tr><th colspan="3">When flexibility producers connect to the grid</th></tr>
<tr><td>Complicated application procedure</td><td>Yes</td><td>Historically, administrative and bureaucratic procedures are quite complex in Greece.</td></tr>
<tr><td>Uncertainty of approval</td><td>No</td><td>As an incentive for the implementation of LFMs, bureaucratic procedures are simplified and accelerated.</td></tr>
<tr><td>High costs</td><td>No</td><td>Greece has already funded numerous installations (PVs, batteries).</td></tr>
<tr><td>Time consuming procedure</td><td>No</td><td></td></tr>
<tr><th colspan="3">When operating the grid</th></tr>
<tr><td>for System Operators</td><td rowspan="3">N/A</td><td rowspan="3">Because Greek law that included EU directive 2019/944 & 2019/943 is relatively new it is not sufficiently clear.</td></tr>
<tr><td>for prosumers / aggregators</td></tr>
<tr><td>for BRP</td></tr>
</table>

Ireland

Administrative and bureaucratic procedures are quite complex and require project applicants to interact with several administrations. In the case of energy communities which do not have access to the substantial resources (human and financial) of a large company, it can jeopardise the project.

Table 25: Bureaucratic and Administrative Barriers for Local Flexibility Markets in Ireland

When flexibility producers connect to the grid		
Complicated application procedure	Yes	These are yet to be defined for LFMs. But for classic market procedures, permitting procedures can be quite complex, especially in a case of land-use conflicts. Spatial planning legislation imposes restrictions on RES installations.[189]
Uncertainty of approval	Yes	Even when a connection assessment is issued to a project, there is still the uncertainty of securing a planning permission within 2 years. If a project fails to do so, the capacity on the grid goes to another project.
High costs	No	
Time consuming procedure	Yes	
When operating the grid		
for System Operators	No	Licensing procedures are defined in the grid code and there is no confusion for network operators.
for prosumers / aggregators	No	
for BRP	No	

[189] European Commission – Clean energy for EU islands Regulatory barriers in Ireland: findings and recommendations

Italy

The National Energy and Climate Plan (2019) outlines the need to simplify the authorisation procedures (especially for Energy Storage – Pumping Systems).

Table 26: Bureaucratic and Administrative Barriers for Local Flexibility Markets in Italy

When flexibility producers connect to the grid		
Complicated application procedure	No	No, the Grid Code provides the necessary information to connect to the grid.
Uncertainty of approval	Yes	There are requirements to connect to the grid and provide flexibility services, so they are always at risk of being rejected by a network operator or the market authority.
High costs	Yes	Depending on the location of the project and the technical requirements for the grid connection, the connection can be a barrier. FiT and other incentives moderate this financial risk.
Time consuming procedure	Yes	Despite a change in legislation to simplify procedures, connecting to the grid can be time consuming depending on the complexity of the project and the variety of stakeholders.
When operating the grid		
for System Operators	Yes	Licensing process can involve significant bureaucratic and administrative procedures.
for prosumers / aggregators	Yes	Aggregators must register with GSE (Energy Services Manager) and comply with technical requirements.
for BRP	Yes	BRPs need authorisation from ARERA to operate and have technical and operational requirements (incl. submitting reports on their activity).

The Netherlands

The diversity of rules and procedures at the national level can lead to administrative and bureaucratic barriers for the development of LFMs in the Netherlands.

Table 27: Bureaucratic and Administrative Barriers for Local Flexibility Markets in the Netherlands

When flexibility producers connect to the grid		
Complicated application procedure	Yes	Connecting to the grid can be challenging because of the need to coordinate with grid operators and to obtain permits and authorisations. The more stakeholders are involved (such as local authorities), the higher is the risk.
Uncertainty of approval	Yes	Lack of experience with LFM and difficulty in accessing loans/contracts/funding for LFM projects can lead to a project not being approved.
High costs	Yes	A high return on investment may be contradictory to the nature of a LFM and their long-term outlook.
Time consuming procedure	No	Relatively efficient and well-organised administrative system.
When operating the grid		
for System Operators	Yes	There may be administrative procedures (such as permits or licences) to complete for interconnection, coordination with network operators or different market participants, but also for interoperability or data management. These various constraints are imposed in order to establish technical and security standards.
for prosumers / aggregators		
for BRP		

Portugal

The granting of licences and authorisations is a bureaucratic and administrative obstacle that LFMs may face in Portugal. There are also obstacles relating to network connection and access.

Table 28: Bureaucratic and Administrative Barriers for Local Flexibility Markets in Portugal

When flexibility producers connect to the grid		
Complicated application procedure	Yes	Grid connection procedures can be long and complicated for flex-fit producers. They generally involve administrative, legal and technical requirements. Moreover, the process can be affected by conflicting regulations or delays in obtaining permits.
Uncertainty of approval	Yes	There is uncertainty about approval when flexibility producers connect to the grid. The requirements and procedures that make up the approval process can be open to interpretation and are not necessarily clearly defined. Network operators are also involved in the approval process. Moreover, the network may be subject to technical constraints such as a limitation in its capacity. This could limit the number of possible connections, and therefore the number of flexibility producers. This could generate a competitive process for access to the network.
High costs	Yes	The various costs are linked to the connection to the network, operation of the system and metering. Costs may vary depending on the characteristics of the flexibility project, such as size, type of project or location of the grid connection. However, there are financial support programmes that can reduce this risk, depending on the type of project. If the project is operated efficiently, income can be generated from participation in the LFM.
Time consuming procedure	Yes	It is possible for the connection process for flexibility producers to be time-consuming, especially if there are complicated application procedures or if there is uncertainty regarding approval. This can result in delays and additional costs for the flexibility producer.
Other	Yes	Technical problems may arise when flexibility producers are connected to the grid, such as problems relating to system protection, energy quality or grid stability.

		There may also be contractual problems relating to pricing, service levels and payment conditions, in connection with the agreements and contracts signed with the DSOs. Environmental issues may also be a constraint, particularly in terms of resource consumption, emissions and waste. Finally, there may be social problems linked to potential interactions with local communities (land use, noise, visual pollution). Finally, market access and participation can be difficult, particularly because of market design, competition with other market players and existing regulations.
When operating the grid		
for System Operators	No	Concession contracts are sufficient for DSOs to operate the network; there is no need to acquire a licence or additional compensation.
for prosumers / aggregators	Yes	In Portugal, prosumers and aggregators who wish to participate in the electricity market and offer flexibility services are required to obtain a licence from the Energy Services Regulatory Authority (ERSE).
for BRP	Yes	In order to act as a BRP, companies must obtain a licence and meet certain conditions, particularly in terms of financial and technical capacity. Indeed, it is necessary to ensure that companies can assume their responsibilities, within their customer portfolio, to manage imbalances between consumption and production. The company's ability to manage imbalances and comply with market regulations and rules is assessed in detail during the licensing procedure.
Other		Some actors may need quotas or licences to operate on the network. For example, energy traders participating in electricity markets may need a licence issued by the national regulator.

Romania

Table 29: Bureaucratic and Administrative Barriers for Local Flexibility Markets in Romania

When flexibility producers connect to the grid		
Complicated application procedure	Yes	Grid connection is regulated by the ANRE (Order 59/2013) but the legislation is often evolving (twice in 2022).[190] Changes in legislation make the application procedure challenging for connection applicants.
Uncertainty of approval	Yes	Changes in legislation also generate a lack of clarity concerning the approval of new grid connection.
High costs	No	
Time consuming procedure	Part.	Depending on the type of generation, several administrative procedures are mandatory to construct and operate an electricity generation facility (required by different authorities).[191]
When operating the grid		
for System Operators	N/A	N/A
for prosumers / aggregators		
for BRP		

[190] Bondoc & Asociatii – Grid connection of renewables in Romania - challenges, endeavours, solutions
[191] D.Pachiu & M. Nita – D&B David and Baias SCA – Electricity regulation in Romania: Overview (2020)

Spain

Although the legislation is at the national level, the processing of self-consumption files (including collective ones) is regional. The delays and the differences in processes and efficiency between the different regions, as well as the delays in the procedures before the DSO, represent a huge problem for the promotion of collective self-consumption. The delays from the execution of the installation to its authorisation are about six months.

Table 30: Bureaucratic and Administrative Barriers for Local Flexibility Markets in Spain

When flexibility producers connect to the grid		
Complicated application procedure	Yes	Procedures can be complex and involve several stakeholders.
Uncertainty of approval	Yes	Projects that are going through a tendering procedure have no guarantee to be approved.
High costs	No	
Time consuming procedure	Yes	The delays during administrative procedures can be quite long (especially for authorization).
When operating the grid		
for System Operators	Yes	The DSO does not receive a great incentive.
for prosumers / aggregators	No	
for BRP	No	

Türkiye

For licensed renewable investments, EMRA usually accepts applications within a time frame of few months and then, no new time frame is announced for several years. This approach creates two main problems:

- An investor has to wait until a time frame starts. Until then, the economic indicators may change, the cost of capital may change and the investor may decide not to invest.
- Some companies tend to apply for a licence even if they do not have intention to realise the investment. Then, if obtained, that licence becomes an asset itself. An investor needs to purchase that licence from the licensee. That increases the investment cost. Also, that disturbs the forecasts, as there are licences obtained for investment but no one knows if the investment will be realised or not.

Table 31: Bureaucratic and Administrative Barriers for Local Flexibility Markets in Türkiye

When flexibility producers connect to the grid		
Complicated application procedure	No	Application procedure is well defined and documented.
Uncertainty of approval	Yes	The application may be rejected due to the lack of capacity at the transformer substation. The applicant does not the capacity availability before going through the procedure.
High costs	Yes	For small investors, costs of engineering and procedures are high.
Time consuming procedure	No	
When operating the grid		
for System Operators	No	
for prosumers / aggregators	No	
for BRP	No	

Conclusions[192 193 194]

Table 32: Summary of Administrative and Bureaucratic Barriers in Europe

Barriers	BG	FR	GR	IE	IT	NL	PT	RO	ES	TR
When flexibility producers connect to the grid										
Complicated application procedure	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No
Uncertainty of approval	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
High costs	No	No	No	No	Yes	Yes	Yes	No	No	Yes
Time consuming procedure	No	Yes	No	Yes	Yes	No	Yes	Part.	Yes	No
When operating the grid										
for System Operators	Yes	No		No	Yes		No		Yes	No
for prosumers & aggregators	N/A	Yes	N/A	No	Yes	N/A	Yes	N/A	No	No
for BRP	Yes	Yes		No	Yes		Yes		No	No

With the development of renewable energy, the development of LFMs in the European Union faces several administrative and bureaucratic risks. However, new regulations are being introduced in some countries (notably in Italy and in France) to simplify administrative procedures and speed up the implementation of renewable energy projects.

On the administrative side, certain problems are recurrent in the analysed countries, such as cumbersome and lengthy administrative procedures, complex and fragmented regulations,

[192] EDSO - Position Paper on Local Energy Communities (2017)
[193] CEER - Regulatory Aspects of Self-Consumption and Energy Communities (2019)
[194] +CityxChange Project – D2.3: Report on the Flexibility Market (2019)

and unclear roles and responsibilities for market players. This results in a lengthy process for setting up LFMs, with onerous licensing requirements. EU countries may adopt simplified administrative procedures and regulatory frameworks (e.g. French law in 2023) specifically designed to facilitate the participation of local flexibility providers. This could include simplified permit applications, standardised licensing procedures, and clear guidelines on roles and responsibilities. Encouraging regulatory sandboxes and pilot projects can also provide a testing ground for new LFM concepts, enabling iterative improvements.

Limited access to market platforms and imbalanced settlement mechanisms can restrict the participation of smaller players in LFMs. New entrants can be discouraged by unequal treatment in market access and pricing (especially local energy communities and small flexibility providers). It is thus essential to ensure fair and non-discriminatory access to market platforms and balancing mechanisms.

Studied countries can implement diverse measures (through new legislation or regulation and guidelines provided by NRAs) such as simplified registration processes, transparent market rules and market platforms that facilitate the participation of various stakeholders, including aggregators, prosumers and energy communities.

In order to mitigate the risk of additional costs when connecting to the grid and during the operation of installations, some countries provide financial incentives for renewable energy projects, providing flexibility services and setting up LFMs (Cf. 3.5). Better dissemination and harmonisation of these practices could accelerate the development of LFMs.

However, it should be noted that numerous changes in regulations (reported by Greece and Romania) can cause confusion for market players. It is therefore important to group together legislative changes as much as possible and to communicate directly with industry actors to ensure that they understand the new legislation.

3. Flexibility Services in a Local Flexibility Market

3.1. Flexibility Services Regulation

Flexibility services are "the services provided by individual or aggregated (residential, commercial or industrial) prosumers to flexibility requesting parties (DSO, BRP, and TSO) or prosumers themselves, in reaction to external signals (price signal or activations), by modifying the consumption and/or production pattern, in order to facilitate the reliable and cost-effective management of variability and uncertainty in the electricity system".[195] Flexibility services specifically focus on deliberate, time limited changes to the 'normal' energy profile.[196]

LFMs provide an opportunity for consumers to play a significant role in the operation of the electricity grid by reducing or shifting their electricity usage in response to time-based rates or other forms of financial incentives. DR programmes are currently being used by some electricity system planners and operators, using mainly the flexibility provided by large industrial facilities connected to the high-voltage grid, as resource options for balancing supply and demand. Therefore, LFMs development will foster flexibility services at DSO level using residential and tertiary buildings flexibility.

Congestion

Table 33: Definition and Regulation of Congestion

Country	Definition of Congestion
Bulgaria	Congestion definition and regulation is included in the Rules for Management of the Electricity System[197] issued by the EWRC.
France	Congestion is regulated by the CRE and the article L.321 of the Energy Code which state that RTE (French TSO) is responsible for congestion management. DSOs contribute to solving congestion issues by ensuring good coordination with RTE at a local level.

[195] A. Nixiang – Flexibility services in Citizen Energy Communities (Master's thesis), University of Technology Eindhoven, the Netherlands (2020)

[196] USEF White Paper – Energy and Flexibility Services (2019)

[197] DKER – Rules for the management of the electricity system

Greece	Congestion management is the responsibility of the TSO (Law 4986/2022, Art. 33) with the support of the DSOs (Art. 44), while RAE monitors the proper implementation of interconnection access rules, including congestion management.
Ireland	Congestion is regulated by the Electricity Regulation Act 1999 (Art. 2 F9).
Italy	Congestion is regulated by ARERA through the Resolution ARG/elt162/11 and by Terna with its Italian Congestion Management Rules.
The Netherlands	TenneT, the Dutch TSO, is responsible for the balance of the grid and therefore takes measures to handle congestion.[198] After an evolution of the grid code by the Authority for Consumers and Markets (ACM), Congestion service providers (CSPs) are now acting as intermediaries to help manage congestion.[199]
Portugal	Congestion management is handled by the System Operator (REN) and involves measures such as curtailment of renewable energy production, activation of demand response programs, and activation of flexible assets. The regulation for congestion management is defined by the Portuguese Regulatory Authority for Energy (ERSE) in coordination with REN.
Romania	Congestion is defined in Art. 3 (28) of the amended law 123/2012.
Spain	Congestion is not properly defined in Spanish legislation. However, the National Commission of Markets and Competition (CNMC) published a resolution 16964 (Dec. 10, 2020) about the adaptation of the operating procedures for the grid balance.[200] Congestion Management is covered in this resolution (6.1.7).
Türkiye	Transmission System Operator acts as per internal guide.

[198] TenneT – Congestion management

[199] E. Bellini – pv magazine –Netherlands changes grid code to reduce congestion, host more renewables

[200] CNMC – Resolution 16964 which approves the adaptation of the system operating procedures to the operating procedures of the system to the balance sheet

Demand Response

Table 34: Definition and Regulation of Demand Response

Country	Definition of Demand Response
Bulgaria	There is no specific definition or regulation for Demand Response (DR) in Bulgaria.
France	A Demand Response call for tender is a scheme defined under Article L.271.4 of the French Energy Code and managed by RTE. This allows the French TSO to have access to the needed volume of DR to maintain the balance of the electricity network in exchange for an additional remuneration to the capacity mechanism.[201] The Block Exchange Notification of Demand Response mechanism (NEBEF) is an alternative way for RTE to have access to DR by involving smaller market participants under an aggregation form (by becoming a demand response aggregator or through a third-party aggregator).[202]
Greece	Demand response is defined in the Greek Law 4986/2022, Art. 2 and in the Law 4001/2011, Art. 48D. Article 32, Law 4986/2022 describes the requirements to participate in DR.
Ireland	Demand Response is defined in the Electricity Regulation Act 1999 (Art. 2 F10).
Italy	Implicit and Explicit DR are both regulated and promoted in the Italian Regulation and Development. Art. 8 of Legislative Decree 210/2021 regulates contracts with dynamic electricity tariffs to provide new flexibility in the grid.
The Netherlands	Demand Response is defined in the Amended Dutch Electricity Law 1998.
Portugal	The Portuguese NRA (ERSE) has established a framework for DR that includes rules for its implementation, operation, and management. The framework also sets out guidelines for the remuneration of DR providers and the calculation of their compensation.
Romania	Demand Response is defined in Art. 3 (29) of the amended law 123/2012.

[201] RTE – Benefit from a support mechanism for the demand response industry
[202] RTE – Participate in the NEBEF mechanism

Spain	An auction for Demand Response has been organised (period between November 2022 and October 2023) to ensure a 497 MW capacity of DR (Royal Decree-Law 17/2022).[203]
Türkiye	Demand Response is defined in Electricity Market Ancillary Services Regulation, dated 26.11.2017 and published in Official Gazette Nr. 30252.

Balancing

Table 35: Definition and Regulation of Balancing

Country	Definition of Balancing
Bulgaria	Electricity Trading Rules issued by the EWRC, Additional provision, § 1, p.1a "*Balancing services*" are balancing energy and/or balancing power, p.1b "*Balancing energy*" is the energy used by the TSO to carry out balancing and supplied by a balancing service provider (BSP). p.1c, "*Balancing power*" is defined as reserve power that a BSP has agreed to maintain and in respect of which has agreed to submit bids for a corresponding amount of balancing energy to the TSO for the duration of the contract. Balancing definition and regulation are also included in the Rules for the Management of the Electricity System issued by the EWRC.
France	RTE is responsible for ensuring the balance of the network. He has access to the different markets, especially the balancing market to achieve this task. Market participants can offer their electricity by answering to the different needs of RTE depending on the flexibility services they can provide.[204]
Greece	The Greek TSO is responsible for ensuring the balance of the network and is operating the Balancing Market (Law 4986/2022, Art. 33 (f) (p)).
Ireland	Balancing is defined in the Electricity Regulation Act 1999 (Art. 2 F5).
Italy	Terna is responsible for the grid balance. Flexibility services (Grid Code) and imbalance fees are available to ensure the network safety (ARERA Resolution ARG/elt107/09, section 3).

[203] Red Eléctrica (REE) – The peninsular electricity system has available an active demand response service of nearly 500 MW to balance generation and demand at specific times (2022)
[204] RTE – Be remunerated for your generation and consumption flexibilities

The Netherlands	FCR, aFRR, mFRRda and mFRRsa are defined in The Netherlands and allow the TSO to ensure the network balance with frequency services.[205]
Portugal	The Portuguese TSO (REN) is responsible for ensuring the balance between electricity production and consumption in real-time. REN manages the balancing market, where market participants can offer balancing services. The ERSE oversees REN's balancing activities and ensures that they are carried out in a fair and efficient manner.
Romania	Balancing is defined in Art. 3 (39) of the amended law 123/2012.
Spain	Balancing is not properly defined in Spanish legislation. However, the CNMC published resolution 16964 (Dec. 10, 2020) about the adaptation of the operating procedures for the grid balance. Balancing and frequency services are covered in this resolution (13).
Türkiye	Balancing is defined in the Electricity Market Balancing and Settlement Regulation, dated 14.04.2009 and published in Official Gazette Nr. 27200.

Ancillary services

Table 36: Definition and Regulation of Ancillary Service

Country	Definition of Ancillary service
Bulgaria	Regulation about ancillary services can be found in the Electricity Trading Rules[206] and in the Rules for Management of the Electricity System[207], Art. 92-100, both issued by the EWRC. Art. 94 states: "Ancillary services include: 1. participation of production units in primary frequency regulation; 2. participation of production units in secondary regulation of frequency and exchange capacities; 3. participation in tertiary power regulation - fast tertiary reserve; 4. provision of cold reserve - slow tertiary reserve."

[205] TenneT – Balancing markets
[206] lex.bg – Electricity trading rules
[207] DKER - Rules for the Management of the Electricity System

France	Ancillary services are defined by the Energy Code and regulated by the French National Regulation Authority (CRE). Frequency ancillary services can be provided to RTE by market participants approved by the CRE.[208]
Greece	Ancillary services are defined in the Law 4986/2022 through the missions assigned to the TSO (Art. 33) and to the DSO (Art. 48).
Ireland	Ancillary service is defined in the Electricity Regulation Act 1999 (Art. 2 F4).
Italy	Ancillary services are defined by the Grid Code (Resources for dispatching).
The Netherlands	In the Netherlands, Ancillary services include balancing reserves, reactive power, redispatch, black start facility, compensation of losses.[209]
Portugal	Regulation concerning ancillary services is primarily governed by the ERSE (National Regulatory Authority). The regulation requires that the system operator procure various ancillary services, incl. frequency control to ensure the safe and efficient operation of the grid. ERSE sets the technical and economic rules for the procurement of these services, and the TSO is responsible for contracting with providers.
Romania	Ancillary services are defined in Art. 3 (106) of the amended law 123/2012.
Spain	Ancillary services are not properly defined in Spanish legislation. However, the CNMC published: - Resolution 16964 of Dec. 10, 2020 about the adaptation of the operating procedures for the grid balance. Frequency services are covered in this resolution (13.2). - Art.5 of the resolution 18423 of Dec. 23, 2019 about balancing services.
Türkiye	Ancillary services are defined in the Electricity Market Ancillary Services Regulation, dated 26.11.2017 and published in Official Gazette Nr. 30252.

[208] RTE – Providing frequency ancillary services
[209] INTERRFACE: TSO-DSO-Consumer INTERFACE aRchitecture to provide innovative Grid

Non-frequency ancillary services

Table 37: Definition and Regulation of Non-Frequency Ancillary Service

Country	Definition of Non-frequency ancillary service
Bulgaria	N/A
France	Art. L344-9 of the Energy Code defines non-frequency ancillary service by authorising DSOs to negotiate with market participants the necessary contracts to meet their obligations (which include flexibility services).
Greece	Non-frequency ancillary services are defined in the Law 4986/2022, Art. 2 (q) as the necessary services for the management of the transmission and distribution networks excluding frequency services and congestion management.
Ireland	Non-frequency ancillary service is defined in the S.I. 20/2022 (Art. 4 (h)) that amends Regulation 2/2000.
Italy	Non-frequency ancillary services are defined by the Grid Code (Resources for dispatching).
The Netherlands	Non-frequency ancillary services are defined in accordance with EU Directives. Together with the ACM, TenneT (Dutch TSO) and DSOs define the services they need and the requirements for participating in the flexibility market.[210]
Portugal	The transmission system operator, REN, is responsible for procuring non-frequency ancillary services from market participants through a competitive tender process. The regulatory framework for ancillary services in Portugal is established by the ERSE in accordance with EU regulations.
Romania	Non-frequency ancillary services are defined in Art. 3 (107) of the amended law 123/2012.

[210] TenneT – Dutch Ancillary Services

Spain	Non-frequency ancillary services are defined in the Resolution 15755 (Dec. 8, 2022) of CNMC about the applicable conditions for non-frequency services and other services for the operation of the Spanish peninsular electrical system.[211]
Türkiye	Non-frequency ancillary services are defined in the Electricity Market Ancillary Services Regulation, dated 26.11.2017 and published in Official Gazette Nr. 30252.

The main elements of regulation of flexibility services are defined in national laws. Regulatory authorities have the responsibility to oversee and regulate the electricity market, including flexibility products. Therefore, most of them define rules and guidelines for the provision, the procurement and the compensation of flexibility services, ensuring fair competition and protecting the interests of market participants and consumers.

Established in 2011 by the Third Energy Package, the European Union Agency for the Cooperation of Energy Regulators (ACER) should help harmonise regulations of flexibility services through EU countries and propose standardisation of flexibility products for a better understanding of market players.

TSOs are currently at the core of flexibility services because they are buyers of different flexibility services coming from various market participants. They also define the technical requirements and specifications for participating in the flexibility market.

The main problem is that, currently, DSOs do not seem to be really involved in the FS management (at least from a legislative point of view) and only intervene in support of TSOs for maintaining the balance of networks. This point is crucial and may hamper the establishment of LFMs, just like the absence of specific regulations on this subject for LFMs.

3.2. Technologies

Flexible resources, such as energy storage systems, electric vehicles, and distributed generation facilities, need to be seamlessly integrated into power grids. This requires appropriate regulation to facilitate access to flexible resources, manage energy flows and guarantee grid stability.

[211] CNMC – Resolution 15755 which approves the conditions applicable to non-frequency and other services for the operation on the Spanish peninsular electricity system

3.2.1. Energy storage

Energy storage contributes to the development of renewable energy because it is an effective means of counter-balancing the variability in the production of certain energies (solar, wind). Whether integrated into the electricity grid or operated by external companies, electricity storage facilities provide flexibility services to the grid.

Table 38: Regulation and Policy regarding Energy Storage

Country	Regulation and Policy regarding Energy Storage
Bulgaria	In SG No. 11 of 02.02.2023, legislative amendments to the Energy Act were promulgated, adopted with the aim of accelerating the development of the RES sector: a completely new legal regime for electricity storage facilities (batteries).
France	Energy storage is regulated through Art. L352 of the Energy Code. Public electricity should not own, develop or exploit storage installations.
Greece	According to the existing legislation Law 5037/2023, energy storage is being addressed as a conventional energy source. The reform of the regulatory and licensing framework is under development by the Greek Government. As an exception, existing energy generation permission can be changed in energy storage permission, only until the end of June 2023, with storage capacity in MW up to half the MW in existing generation permission.
Ireland	Energy storage is defined by the Electricity Regulation 1999 (Art. 2 F22/23) and regulated by S.I. 20/2022. Network operator should not operate energy storage facilities.
Italy	Energy storage development is defined in the legislative decree 210/2021, article 18. Article 19 states that TSO and DSO can own and manage energy storage facilities if they are integrated in the network. The National Energy and Climate Plan also encourages the development of storage facilities to improve the flexibility of the system and to keep over-generation to a minimum. The goal is to have an increased capacity of 6000 MW split between pumping and electrochemical production (between 2019 and 2030) and an additional 4000 MW of distributed storage facilities. Hydrogen synthesis from excess renewable electricity is also a possibility to explore to have more flexibility.

The Netherlands	The Energy Transition Fund provides financial support for projects related to energy storage (among others projects) but there is currently no specific legislation about energy storage.[212] Roadmap for Integration of Energy Storage in Dutch Power Mix has been produced in 2022.
Portugal	In Portugal, energy storage is defined in Art. 3 (d) of the Decree-Law 15/2022 as a system or device that is capable of storing electrical energy and releasing it when needed. Art. 11 of the same regulation defines the exercise of the activities of production and storage of electricity (incl. licensing procedure). There are several ongoing discussions and projects related to energy storage, such as the promotion of pilot projects, the development of new technologies and the adaptation of regulations.
Romania	Energy storage is defined in Art. 3 (57/121) & Art. 10 of the Law 123/2012. In the law, energy storage only appears alongside energy production and is subject to a licensing process.
Spain	Royal Decree-Law 23/2020, of June 23, allows the use of batteries as generation assets and therefore its connection to the grid.
Türkiye	Energy storage is defined in the Energy Market Storage Activities Regulation, dated 09.05.2021 and published in Official Gazette Nr. 31479. There are four categories defined, as follows: - Energy storage unit integrated to production facility - Energy storage unit integrated to consumption facility - Independent energy storage unit - Energy storage unit installed by system operators Energy storage units are incentivized through energy storage units integrated into production facilities. System connections allowance for renewable power production facilities are easier when combined with a storage facility.

[212] CMS Expert Guides –Energy storage regulation in the Netherlands

DE-RISK

In each studied country, energy storage is considered to be a major component of the electricity network especially with the necessity to handle the production variability of renewable energy and the rising need of flexibility.

Electricity storage can provide a rapid response to fluctuations in supply and demand by providing flexibility services to network operators and therefore help to stabilise the grid. At a local level, energy storage facilities are often associated with RES to stock excess electricity or to provide electricity when wind or solar energies are not generating enough electricity (e.g. industries, energy communities). Resilience of the network can be improved by storage systems that can also provide backup power when there are outages or disturbances on the grid (especially in microgrid or off-grid systems).

As part of a LFM, electricity storage can be used for peak shaving where electricity is stored during off-peak hours and released during peak demand. This helps to maintain the grid balance at times of high electricity consumption, reducing the need for additional generation capacity and investment in network infrastructure. It also enables load management by shifting electricity consumption from peak to off-peak hours, optimising energy use and reducing costs.

To summarise, electricity storage brings significant value to LFMs by providing flexibility, enabling demand response, supporting network operators to balance and stabilise the grid, facilitating the integration of renewables and providing backup and resilience. By harnessing the capabilities of storage systems, LFMs can optimise the use of local resources, improve grid efficiency and create a more flexible and responsive local electricity system.

3.2.2. Electric vehicles

With the gradual electrification of the European car fleet, electric vehicles (EV) are set to become a major consumer of electricity in the years ahead. Electricity grids need to adapt to meet this new demand without causing congestion. In the context of LFMs, recharging electric cars is also a new source of flexibility for local networks.

Table 39: Existing Regulation on Electric Vehicles

	BG	FR	GR	IE	IT	NL	PT	RO	ES	TK
Existing Regulation	No	Yes	No	N/A	N/A	Yes	Yes	N/A	N/A	No

DE-RISK

Legislation in the various countries studied is inadequate (when existing) given the stakes in this area. It is important to integrate the electrification of the European vehicle fleet into electricity network planning in the years to come. There is also little mention of the role of electric vehicles in local flexibility markets. Currently flexibility from EV is included in existing markets as ancillary services. However, it is important to develop legislation and a new framework to encourage their participation in LFMs. EV flexibility is useful for distribution grids because it can delay or avoid costly reinforcements and provide a more efficient use of the existing infrastructures.[213] National Regulation Authorities need to adapt the role of DSOs for LFM by allowing them to have an active management approach and by directly involving EV owners.

For example, electricity tariffs should be designed to reflect the value of the flexibility offered by EV. With dynamic pricing mechanisms, car owners should be financially encouraged to charge their EV during periods of low demand or when there is an oversupply of electricity.

Developing a smart charging infrastructure that is capable of effectively managing the electricity demand of electric cars is another solution to include EV in LFMs. This can include charge control devices that adjust charging speed according to network needs and capacity constraints.

3.2.3. Smart metering

Effective communication and real-time information sharing between market players is necessary to anticipate variations in demand and supply, to make informed decisions on the use of flexible resources and to ensure the responsiveness necessary to maintain the balance of the electrical network.

Table 40: Regulation and Policy regarding Smart Metering Systems

Country	Regulation and Policy regarding Smart Metering Systems
Bulgaria	Art. 120 of the Energy Law defines the use of smart meters. At present, the three energy companies - Energohold, Energopro and EVN - have installed almost 2 million smart meters using their own resources and relying on financing from the Modernisation Fund. This process will continue in the next few years.

[213] F. Gonzalez, M. Petit, Y. Perez – Electric Vehicles as Flexibility Providers for Distribution Systems (2019)

France	Smart meters are present in almost 80% of French electricity sites. They give information to the DSO that can use them to limit congestion of the grid by controlling flexibility.
Greece	The transition from a non-smart to a smart energy metering equipment (early stage) is gradually implemented in compliance to EU directives 2019/944.
Ireland	Smart metering systems (SMS) are defined in the law S.I. 37/2022 on internal market in electricity. Residential sector should be equipped with smart meters before the end of 2024. SMS which do not meet the current technical requirements should be replaced before 2031. Further requirements (on data management) are implemented through the Smart Meter Data Access Code. The current system is adapted to LFM with suppliers who are able to offer dynamic electricity price contract. System services that support markets will be enabled as the markets develop under guidance from the Irish Regulator.
Italy	Art. 9 of the legislative decree 210/2021 defines the objectives in terms of smart metering. The technical details are defined in the Grid Code, Chapter 5. On the field, 80% of households were equipped with smart meters by 2020. A second generation of SMS is currently deployed.
The Netherlands	Smart meters are rather widespread in the Netherlands. In 2022, 85% of customers with a small connection are equipped with SMS (90 % for customers with a large connection). PowerMatching City tests the use of smart grids and home energy management systems to enable households to participate in a LFM.
Portugal	Portugal has implemented SMS as part of its efforts to support LFM. The system, known as the "Digital Metering System" or "Sistema de Medição Eletrónica" (SME), enables real-time metering data collection and communication between customers, energy suppliers, and distribution network operators. The implementation of smart metering systems is the result of Ordinance 231/2013 and a government decree to ensure that all end customers will have SMS by the end of 2024.
Romania	Prosumers & Consumers (>10kW) should have SMS by the end of 2023 and other consumers by the end of 2028 (Art. 66, Law 123/2012) which is late compared to other EU countries. Dynamic prices contracts for electricity supply are defined in the law (Art. 3 (32)) and are adapted for LFMs.

Spain	99,22% of 2.0 tariffs (< 15kW) have smart metering with telegestion of hourly based data. Only very small local DSOs don´t have smart meters. For 3.0 tariffs (>15 kW) there is not so broad deployment of smart metering.
Türkiye	Smart meters are widely used by DSOs at the consumer and prosumer sides but they are not an integral part of the LFM.

Measuring consumption in real-time generates a better understanding of household routines and allows network operators to take steps in reducing electricity demand during peak hours. By installing smart meters, electricity suppliers can offer their customers dynamic electricity pricing. This provides households with a financial incentive to consume electricity during off-peak periods, thereby reducing peak consumption on a large scale and smoothing out electricity demand over time.

Smart meters also make it easier for individuals to participate in LFMs by enabling them to modulate their electricity consumption according to market signals. If they are prosumers and produce electricity from RES, or if they have storage capacity, they can sell their electricity when electricity prices are high and consume their electricity (or store it) when market prices are lower.

Therefore, smart metering encourages individuals to get involved in managing their consumption, and encourages them to take a stake in local flexibilities markets.

3.3. Flexibility Services Providers and Buyers

Studied countries have a large range of electricity markets depending on their needs and according to national legislations. Even if LFMs will be mainly concerned by the wholesale market (Explicit demand-side flexibility) and local optimisation (Implicit demand-side flexibility), there is a need to have a wider picture of European electricity markets and to know who is involved in which market.

Table 41: Energy Markets where Flexibility can be Exchange

	BG	FR	GR	IE	IT	NL	PT	RO	ES	TK
Constraint Management	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adequacy	Yes*	Yes*	No	Yes*	Yes*	Yes*	Yes*	Yes*	Yes*	No

Balancing	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wholesale	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

* Adequacy market is not properly defined in most of the analysed countries. However, capacity markets are implemented in a majority of those countries (Bulgaria, France, Ireland, Italy, the Netherlands, Portugal, Romania and Spain).

Table 42: Constraint Management Market Participants

Constraint Management		BG	FR	GR	IE	IT	NL	PT	RO	ES	TK
FSP	**Prosumers**	No	Yes		No	No	No	Yes	No	No	
	Aggregation	Yes	Yes		No	No	Yes	Yes	No	No	
	Large Generation	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	
Buyers	**TSO**	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	
	DSO	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	
	Aggregation	Yes	No		No	No	No	Yes	No	No	
	BRP	Yes	No		No	No	No	No	No	No	

Table 43: Balancing Market Participants

Balancing		BG	FR	GR	IE	IT	NL	PT	RO	ES	TK
FSP	**Prosumers**	No	Yes	No	No	No	No	Yes	No	No	No
	Aggregation	Yes	Yes	No	No	No	No	Yes	No	No	Yes
	Large Generation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Other	No	No	No	No	No	No	Yes	No	Yes	No

Buyers	**TSO**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	DSO	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No
	Aggregation	Yes	No	No	No	No	No	No	No	No	No
	BRP	Yes	No	No	No	No	No	No	No	No	No

Table 44: Wholesale Management Market Participants

Wholesale		**BG**	**FR**	**GR**	**IE**	**IT**	**NL**	**PT**	**RO**	**ES**	**TK**
FSP	**Prosumers**	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
	Aggregation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
	Large Generation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Other	No	No	No	No	No	No	Yes	No	Yes	No
Buyers	**TSO**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
	DSO	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
	Aggregation	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
	BRP	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
	Other	No	No	No	No	No	No	Yes	No	No	No

Flexibility is mainly exchanged on the balancing market and the wholesale market, which provide short-term flexibility services.

The constraint market acts as a backup to the previous two markets, enabling operators to vary the flexibility services to which they have access to manage the problems that networks may encounter. The capacity market enables network operators to purchase long-term flexibility.

In the context of a LFM, the balancing market is not necessarily ideal, as it will mainly have large generation units or industries as providers and the TSO as the main buyer, even though DSOs are beginning to be integrated into this market. Indeed, the Clean Energy Package expands the role of DSOs as flexibility buyers in various markets.

For LFMs, the key market remains the wholesale market, where DSOs purchase various flexibility services and where other market participants can also buy and sell flexibility (independently or with the support of an aggregator).

3.4. Available Flexibility Services

Table 45: Flexibility Services in the Constraint Management Market

Constraint Management	BG	FR	GR	IE	IT	NL	PT	RO	ES	TK
Voltage Control	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes
Grid Capacity Management	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Congestion Management	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controlled Islanding	Yes	No	No	Yes	No	No	Yes	No	No	No
Optional Downwards Flexibility Management	Yes	No	No	No	No	Yes	Yes	No	No	No
DSO Constraint Management	Yes	No	No	No	Yes	No	Yes	No	Yes	Yes
Other	No	No	No	No	Yes*	No	No	No	No	No

DE-RISK

* Italy has an additional service “Interruptible Load Service” which consists in the availability of end-consumers to interrupt the load (when the resources supplied on the market for dispatching services are insufficient to maintain the balance of the grid).[214]

In the studied countries, flexibility services in constraint management mainly consist of Voltage Control, Grid Capacity Management and Congestion Management.

Table 46: Flexibility Services in the Adequacy Market

Adequacy	BG	FR	GR	IE	IT	NL	PT	RO	ES	TK
Capacity payment	Yes	No	No	No	No	No	No	No	No	Yes
Capacity Market	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Strategic reserve	Yes	No	No	No	No	Yes	No	No	Yes	Yes
Hedging	Yes	No	No	No	No	No	No	No	Yes	No

As previously announced, the adequacy market mainly comes down to the capacity market in 9 of the 10 analysed countries.

Table 47: Flexibility Services in the Balancing Market

Balancing	BG	FR	GR	IE	IT	NL	PT	RO	ES	TK
Dynamic Containment	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Frequency Containment Reserve (FCR)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Automatic Frequency Restoration Reserve (aFRR)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Manual Frequency Restoration Reserve (mFRR)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[214] Terna SpA. – Grid Code – Chapter 4 – Dispatching regulations

Replacement Reserve (RR)	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes

The balancing market is very well regulated in European countries and frequency ancillary services are often defined in the main legislation and not only in guidelines from National Regulation Authorities. As a result, flexibility services in the balancing market are already quite standardised at the European level.

Table 48: Flexibility Services in the Wholesale Market

Wholesale	BG	FR	GR	IE	IT	NL	PT	RO	ES	TK
Day-ahead optimisation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intraday optimisation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Self/passive balancing	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Generation optimisation	Yes	No	Yes	No	No	No	Yes	No	Yes	Yes
Exceeding Maximum Export/Import Capacity	Yes	No	No	Yes	No	No	Yes	No	Yes	No
Offsetting	Yes	No	No	No	No	No	Yes	No	No	No

The wholesale market and particularly the day-ahead and intraday markets are very well regulated and even integrated at the European level. Day-ahead markets of Romania, Hungary, the Czech Republic and Slovakia are coupled thanks to the 4M Market Coupling project. In 2021 Bulgaria-Romania day-ahead market coupling took place; thus, the Southeast Europe (SEE) region was fully integrated in the single day-ahead coupling.

Table 49: Implicit Demand-Side Flexibility Services

Local Optimisation	BG	FR	GR	IE	IT	NL	PT	RO	ES	TK
ToU Optimization	No*	Yes	No	Yes	Yes	No	No	Yes	Yes	No
kWmax control	Yes	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes

Self-balancing	No	No	No	Yes	Yes	No	Yes	No	No	Yes
Emergency power supply	Yes	No	No	No	No	No	Yes	No	Yes	Yes
Smart Contracts	Yes	No	No	Yes	Yes	No	Yes	No	No	No
Collective Self-consumption	No	No	No	Yes	No	No	Yes	Yes	Yes	No
Transmission Charge Management	Yes	No	No	No	No	No	Yes	No	Yes	Yes
Distribution Charge Management	Yes	No	No	No	No	No	Yes	No	Yes	Yes

* In Bulgaria, there is day and night tariff for use of electricity.

Electricity suppliers, in most of the analysed countries, offer dynamic electricity tariffs where energy is cheaper during off-peak hours and more expensive during recurring peaks in consumption. Similarly, with kWmax control, prosumers are financially incentivised to modulate their grid injection/consumption according to grid needs.

More generally, local optimisation enables the use of flexibility services at a local level, close to end consumers, while moving away from conventional electricity markets. In the context of a LFM, this range of services is to be favoured in order to involve users as much as possible, as well as small electricity producers who inject electricity into low- and medium-voltage networks. These services involve the DSO and electricity suppliers, who are responsible for network security, and for ensuring that the appropriate flexibility services are in place and operating smoothly.

Conclusions

The **constraint market** provides the grid operators with the opportunity to overcome the difficulties encountered by the grid when transferring electricity from the production site to the consumption zone. The main flexibility services within this market consist in modulating the electricity production of producers considered as FSPs according to the needs of the network. The study confirms that the main FSPs are large power generation units and aggregators. These are the two main market participants that can modulate, with significant amplitude, the injection of electricity into the grid.

The **balancing market** keeps the network frequency stable in real-time. The flexibility services inherent in this market are generally offered by large generation units and supplied to the TSO. In most of the studied cases, the TSO is also the operator of this market. Although the DSO's role has expanded in recent years as a result of the Clean Energy Package, its involvement in this market remains fairly marginal. Similarly, certain participants in the electricity sector (energy communities, prosumers, self-consumers, etc.) are rarely involved in the balancing market (and usually through aggregators).

The **capacity market** is a mechanism ensuring the availability of sufficient electricity generation capacity to meet the needs of the grid in the future and its security. This market is particularly interesting for large generation units with predictable power output over time. In the context of an LFM, the capacity market does not seem relevant for FSPs.

In the context of the LFM, it is interesting to see **how flexibility services can be articulated between the various participants**. At the local level, the DSO plays a key role in ensuring grid balance. It is therefore common for the DSO to be the main purchaser of flexibility within the LFM. Whether it is via a dedicated platform (ideal for allowing electricity to be sold locally without passing through the high-voltage network) or via conventional markets (especially the wholesale market), the DSO calls on the SF offered by local electricity producers and/or consumers.

Through a convenient operation and efficient price signals, the **wholesale market** encourages market participants to optimise their energy production and consumption which lead to the stimulation of the participation of local energy stakeholders (such as prosumers and ECs for example) in LFMs. For the **explicit demand-side flexibility services**, intraday and day-ahead markets are particularly adapted for market actors to offer their flexibility (at short-term).

For **implicit demand-side flexibility services**, local optimisation is also an option to be favoured for local electricity market players, especially for end-consumers with dynamic pricing (ToU Optimisation) and for prosumers with kWmax control. Moreover, technologies such as blockchain with the implementation of smart contracts within an LFM could provide transparency, trust and security in flexibility trading and will thus provide money saving by simplifying and automating the engagement of market players.

3.5. Incentives for Flexibility Services and Local Flexibility Market Uptake

Bulgaria

The Bulgarian Electricity System Operator (ESO) is implementing a project under the Recovery and Resilience Plan for "Digital transformation and development of the information and real-time systems" (Feb 2020 - Mar 2026) with the objective to digitalise the transmission network and increase the capacity for production of wind and solar energy, as well as the transnational transmission capacity. Moreover, ESO is actively involved in Horizon 2020 projects in the field of flexibility development, such as:

- *X-FLEX*[215] which proposes a set of integrated solutions facilitating the optimum combination of decentralised flexibility assets, both on the generation (DER) side and on the demand side (V2G, power-to-heat/cold/gas, batteries, DR), enabling all parties, and final prosumers, to offer their flexibility on the market creating benefits to all actors in the smart grid value chain. Under this project, Bulgarian partners implement a pilot in Albena resort electric network.
- *FLEXITRANSTORE*[216] under which an innovative mobile power-flow control solution was installed on the Bulgarian transmission system (provided by a global power technology company for grid congestion reduction); it can significantly increase the amount of RE and unlock cross-border electricity flows.

France

Flexibility participants are rewarded by RTE in exchange for cuts in their consumption. For prosumers, a net billing system is also in place, enabling them to feed part of the electricity they produce into the grid in exchange for a fixed tariff (feed-in tariff).

France also has a number of financial schemes to support residential and industrial renewable energy projects (i.e. Investment Plan France 2030). Depending on the specifics of the project, the state or the region may subsidise part of the project.

[215] X-FLEX project "Integrated energy solutions and new market mechanisms for an extended flexibility of the European grid" H2020, Duration 1.10.2019-30.09.2023
[216] FLEXITRANSTORE "An Integrated Platform for Increased Flexibility in smart Transmission grids with Storage Entities and large penetration of Renewable Energy Sources ", H2020, Duration 1.11.2017-31.10.2021

Greece

IPTO, the Greek TSO, began researching for a Transitory Flexibility Remuneration Mechanism and recently launched an auction. Moreover, IPTO participates in the EU *FLEXITRANSTORE* project. The *FLEXITRANSTORE* project was focused on developing a next generation of Flexible Energy Grid (FEG), which provides the technology basis to support the valorisation of flexibility services, enhancing the existing European Internal Energy Market (IEM). From a market perspective, state-of-the-art information and communication technologies / control improvements were applied to develop an enhanced market model on an integrated platform, for flexibility services and to support cross border auctioning and trading of energy.

Ireland

There are several programmes in Ireland providing incentives to FSP. DS3 System Services is a programme launched by the Irish TSO to offer financial incentives for conventional and renewable electricity generation that provides flexibility services.[217]

National Network, Local Connections programme by ESB Networks (Irish DSO), follows a market-based approach providing incentives to FSP (generation, storage, and demand).

Prosumers have access to a feed-in tariff when selling the electricity they produce to the grid. Depending on the project, tax incentives and grants can also be provided.

Italy

“Scambio sul posto” scheme for metering promotes the role of prosumer as well as the “Ritiro Dedicato” scheme. RES producers can sell their electricity production to GSE, which will sell it on the electricity markets on their behalf with a guaranteed minimum price. If the electricity price is higher, prosumers will receive an annual adjustment.

A tax reduction mechanism is also in place for RES producers. Electricity generation from solar and wind energy has a reduction of 10% on the VAT for investments in their plants.

[217] Renewables Grid Initiative – DS3 System Services

The Netherlands

The flexibility market programme, launched in 2019, gives incentives for households and businesses to change their energy consumption and generation. It also encourages the development of LFMs.

There is no real incentive for the flexibility of the grid, but rather tools (like the ValueFlex) which encourage companies to use energy in a more flexible way by highlighting the possible savings.

Portugal

There are incentives and stimuli in Portugal to promote flexibility services such as the capacity market, which aims to ensure the availability of sufficient generation and demand-side resources to meet peak electricity demand. This mechanism provides financial incentives to flexible resources (incl. DR, energy storage and flexible generation) to participate in the market and provide capacity when needed.

In addition, Portugal also has, as incentive, the feed-in tariff which provides a guaranteed price for RES producers (incl. wind, solar, biomass, and hydropower) for a fixed period. Moreover, tax incentives, grants, reduced VAT rates for energy-efficient equipment, tax deductions for investments in energy efficiency were implemented to promote the uptake of LFMs.

Romania

The Romanian Integrated National Energy and Climate Plan states that the law on renewable energy prosumers should introduce incentives and financial support for RES projects. According to Art. 45^1 of law 123/2012, ANRE creates a regulatory framework by which distribution operators are incentivised to purchase flexibility services.

Spain

The Spanish Integrated Plan for Energy and Climate (PNIEC) includes as a specific line of action (Measure 1.3.) "*Adaptation of electricity grids to integrate renewables*", which includes, among its objectives that *"incentives should be provided to optimise network connection capacity, including through the hybridisation of renewable and/or storage technologies".*

PNIEC is currently being updated to comply with European regulation and new upwardly revised climate targets.

Regarding collective self-consumption and energy communities, the legislation continuously increases the distance between generation and consumption sites which supports the creation of LFM.

Türkiye

There is no clear incentive to foster flexibility in the network development plan. However, DSOs' investment plan for the 5 years is thoroughly inspected by EMRA experts. If EMRA experts decline the investment plan due to a lack of flexibility, DSOs have to revise it.

3.6. Net Metering

Net metering is a billing arrangement that allows electricity consumers with renewable energy systems, such as solar panels, to receive credit for the excess electricity they generate and feed it back into the grid. With net metering, the consumer's electricity meter measures both the electricity consumed from the grid and the excess electricity generated, effectively "netting" the difference. This excess electricity is usually credited to the consumer's account and can offset future electricity consumption from the grid.

Table 50: Existing Regulation on Net Metering

	BG	FR	GR	IE	IT	NL	PT	RO	ES	TK
Existing Regulation	No	No	Yes	Yes	Yes	Yes & No	Yes	Yes	Yes	No

Table 51: Regulation and Policy regarding Net Metering

Country	Regulation and Policy regarding Net Metering
Bulgaria	Net metering is not allowed in Bulgaria.
France	Art. L315-1 of the Energy Code defines self-consumption and allows prosumers to consume all the electricity they produce or to sell it all. Prosumers can also consume their electricity and sell the excess to the grid but the tariff for selling excess electricity is specific (FiT) and is not the "classic" electricity price. Although France rewards selling excess electricity, this is a net billing scheme rather than a net metering system.

Greece	Net metering is allowed and regulated in Greek law, although only few have been installed.
Ireland	Net metering is allowed in Ireland since 2021 and is regulated by the Micro-generation Support Scheme (MSS).[218]
Italy	The "Scambio sul Posto" scheme allows prosumers to consume the electricity they produce or to feed produced electricity into the grid. This system can be used by prosumers with installed capacity lower than 500 kW (Art. 2bis,2 E612/2014/R/eel) and is based on the balance between self-consumption and electricity fed into the network (Art. 1, 2 570/2012/R/efr). The prosumer pays the supplier for the import electricity and GSE gives credit for the electricity fed in. If more electricity is fed in than consumed, prosumers will receive an economic compensation (Art. 6 570/2012/R/efr). Otherwise, the difference has to be paid by the prosumer to the supplier.[219]
The Netherlands	The Netherlands have implemented net metering but the Dutch parliament has approved, in 2023, a proposal to phase out the net metering scheme in the years to come.[220]
Portugal	Net-metering is allowed in Portugal for renewable energy systems up to 200 kW. The excess energy generated by the system is injected into the grid, and the consumer is credited for this amount. This credit can be used to offset the electricity consumption from the grid when the renewable energy system is not generating enough energy.
Romania	With the GEO 143/2021, prosumers/ECs/industrial are stimulated to make investments in RES. The Ordinance raises the size limit for being under the net metering regime from 100 to 400 kW (solar power).
Spain	Spain has implemented net metering through the Royal Decree 244/2019.

[218] pv magazine – Irish government approves net metering, rebate scheme for solar and renewables (2021)
[219] RES LEGAL Europe – Net-Metering (scambio sul posto) in Italy (2019)
[220] E. Bellini – pv magazine – Dutch parliament approves proposal to phase out net metering (2023)

Türkiye	For prosumers, as per EMRA Board Resolution Nr. 10892, dated 31.03.2022, the amount of electricity supplied to the grid will be priced according to graded tariff principles. Meter works both ways. Instead of net-metering, netting of the invoices is applied.

Prosumers who have access to net metering are also potential FSP who can actively participate in the electricity market. Consumers benefiting from net metering arrangements can potentially use their excess generation as a flexibility resource in a LFM. By participating in both net metering and LFMs, consumers with renewable energy systems can maximise the value and use of their generation assets. They can benefit from net metering financial credits for their excess production and also earn additional income by offering their flexibility resources to the LFM when their production exceeds their consumption.

However, the extent to which the net metering and LFMs are integrated, and the specific arrangements vary depends on the regulatory framework and market design. It is important to note that the level of integration and the specific rules and incentives for participation may differ between regions and countries.

4. Blockchain and Data Management in Local Flexibility Markets

Blockchain technology has the potential to transform the energy sector. Of the many use cases for blockchain, energy and sustainability are often less recognised. The energy industry has been consistently catalysed by innovations including rooftop solar panels, electric vehicles, and smart metering. The blockchain presents itself as the next technology to spur growth in the energy sector through smart contracts and systems interoperability. A joint report issued in 2018 by the WEF, Stanford Woods Institute for the Environment, and PwC identified more than 65 existing and emerging blockchain use-cases for the environment. These use cases include new business models for energy markets, real-time data management, and moving carbon credits or renewable energy certificates onto the blockchain; the blockchain also offers unique solutions for renewable energy distribution. A range of blockchain products can be tailored to address various energy or sustainability applications, including the following: wholesale electricity distribution; peer-to-peer energy trading; electricity data management; commodity trading; utility providers; etc.

4.1. Definitions and Permissions

The EU supports the development of European rules for blockchain to avoid legal and regulatory fragmentation and has adopted a comprehensive package of legislative proposals for the regulation of crypto-assets with the aim to increase investments and ensure consumer and investor protection. The package includes some financial market rules for crypto-assets, and creates a legal framework for regulatory sandboxes of financial supervisors for using blockchains in the trading and post-trading of securities in the EU.

The blockchain and distributed ledger technologies (DLT) have also great potential to create an infrastructure for reliable, decentralised services beyond the financial sector.

Blockchain in the energy sector

Table 52: Existing Regulation about Blockchain

	BG	FR	GR	IE	IT	NL	PT	RO	ES	TK
Existing Regulation	No	Part.	Part.	No	Part.	No	No	Part.	No	No

Table 53: Regulation on Blockchain or Digital Currencies in the Energy Sector

Country	Blockchain regulation
Bulgaria	At the moment, in Bulgaria, there is no formal legislation on the use of decentralised ledger technology for the issuance, acquisition and settlement of crypto assets that can be accepted for financial instruments. The latest technologies are coming to the Bulgarian government through the first amendments to the Law on the Protection of Financial Instruments (FIS), prepared by the Ministry of Finance, still not approved by the Parliament. The law designates the Commission for Financial Supervision as the competent body to monitor the implementation of the market infrastructures, based on the decentralised ledger technology, which has the right to issue and take away their permits.
France	Blockchain is defined as part of the IT vocabulary[221] and is partially regulated in the PACTE Law (2019 - French legislation for markets in digital assets).
Greece	The blockchain sector is mostly unregulated but blockchain operations fall under the Greek Law 4514/2018.

[221] Legifrance – IT vocabulary (list of adopted terms, expressions and definitions)

Ireland	Blockchain technologies are not regulated in Ireland. Only the Central Bank has issued a warning regarding crypto currencies.
Italy	Blockchain is defined in the Italian law (Law Decree 135/2019) but there is no regulation about it. Therefore, the use of blockchain in the energy sector is not forbidden.
The Netherlands	There is no specific regulation about the blockchain technology in the 1998 Electricity Law, but some projects are under development, for example TenneT's project about the Equigy Crowd Balancing platform[222], which is a blockchain-based cross-border data platform.
Portugal	Blockchain is not yet regulated in Portugal but its use has no formal restriction. The development of blockchain technology is promoted through initiatives such as the "BlockStrat" programme, which supports start-ups in the development of blockchain-based projects. Portugal has also been exploring the use of digital currencies to pay energy bills (with some energy suppliers).
Romania	Blockchain is not regulated in Romania. Only cryptocurrencies are regulated since 2019 regarding the taxation of obtained income (Law n°30/2019) and to fight money laundering (Law 129/2019). The Romanian electricity supplier "Restart Energy" launched the RED Platform which is a blockchain-based decentralised energy trading platform for energy consumers and producers to trade energy with "MWAT tokens".[223]
Spain	Blockchain is partially regulated in Spain (only cryptocurrencies are regulated since 2022). Currently blockchain is used in the energy sector in Pilot projects such as the project CONFÍA developed by Endesa in Malaga. Blockchain is used to fight energy poverty by speeding up information sharing between energy suppliers and municipal social services.[224]
Türkiye	Blockchain is not regulated in Türkiye. Only crypto assets are defined by the Central Bank Regulation and regulated by the Law 5549 on the Prevention of Laundering of the Proceeds of Crimes.

222 Equigy Crowd Balancing platform

223 Restart Energy Democracy (RED) – MWAT Token

224 Endesa – Endesa to use blockchain technology to speed up energy poverty cases (2019)

Smart contracts

In the regulation on harmonised rules on fair access to and use of data (Data Act)[225], the European Parliament defined Smart Contracts as computer programmes on electronic ledgers that execute and settle transactions based on predetermined conditions.

In the energy sector, such contracts can be established for peer-to-peer transactions.

Table 54: Existing Regulation about Smart Contracts

	BG	FR	GR	IE	IT	NL	PT	RO	ES	TK
Existing Regulation	Yes	Part.	Part.	No	Part.	No	Yes	No	Yes	No

Table 55: Regulation on Smart Contracts

Country	Smart Contracts regulation
Bulgaria	The smart contract can be equated to a written document, insofar as according to Article 3, Paragraph 2 of the Law on Electronic Documents and Electronic Authentication Services, the written form will be considered respected if an electronic document containing an electronic statement is drawn up.
France	Electronic contracts are regulated by the articles 1112 to 1122 of the French Civil Code but Smart Contracts are only defined (not regulated) as part of the vocabulary of digital assets.
Greece	In the Greek Law 4961/2022 on Emerging Technologies, smart contracts are defined as a “set of coded computer functions concluded and executed through Distributed Ledger Technology in automated electronic format with the use of instructions on the performance of actions, omissions or tolerance, which are based on the existence or absence of specific conditions, according to terms directly recorded in computer code, programmed commands or a programming language”.
Ireland	Smart contracts are not regulated in Ireland and are, therefore, considered as standard contracts.

[225] EUR-Lex – Data Act

Italy	Smart contracts are defined as a software programme that operates on Distributed Ledger Technologies and whose execution automatically binds two or more parties.
The Netherlands	Smart contracts do not have specific regulation but they are considered as legally enforceable contracts (Dutch Civil Code). The Dutch Civil Code contains several articles with regard to automated and electronic contracting, but there is no specification of the applicable conditions of this legal framework for smart contracts.[226]
Portugal	In 2019, Portugal approved a law that explicitly defines and regulates smart contracts. The law grants legal validity to smart contracts and sets out the legal requirements for their use in different areas, including the energy sector.
Romania	Depending on the type of smart contract and its circumstances, smart contracts can be considered as legal contracts but there is no specific regulation about this subject yet.
Spain	In Spain, smart contracts are legal and are considered an evolution of digital contracts. In sectors such as transport of goods, or insurance, they are already used, although their use is incipient.
Türkiye	Smart contracts are not regulated in Türkiye.

Conclusions

According to France, blockchain technology should be encouraged for LFMs but there is currently a lack of general regulation and no guidelines for its development in LFMs. For Spain, it is quite difficult to implement blockchain in such a regulated energy market. For Türkiye, EMRA may act as a facilitator in order for companies to develop blockchain applications for the energy market. EMRA already gathers R&D project ideas from DSOs twice a year and evaluates the ideas.

[226] R.Schulpen – Smart Contracts in the Netherlands - A legal research regarding the use of smart contracts within Dutch contract law and legal framework (2018)

At present, there is little or no national legislation concerning blockchain and smart contracts in the studied countries. Most of existing legislation confines itself to define terms and is beginning to regulate the use of cryptocurrencies (taxation).

Other possible applications of blockchain (including in the energy sector) are not addressed in national legislations. The absence of regulation has two opposing effects: the possibility of using blockchain without constraints in LFM projects; the risk that future legislation will alter the viability of projects by imposing new requirements.

An EU regulation on Markets in Crypto-assets (MiCA)[227] was implemented in 2023, but it essentially regulates crypto currencies and does not address other blockchain applications.

The automation, that blockchain (and smart contracts) brings to LFMs projects, simplifies and accelerates the exchange of data between market participants. Today, this application is carried out within the framework of pilot projects and in the knowledge that regulations will arrive/evolve in the future (thus creating uncertainties for project developers). By legislating on blockchain and its applications, European countries will be able to remove these uncertainties and make it easier to create LFM projects that include blockchain applications.

4.2. Blockchain Applications in Local Flexibility Market Perimeter

4.2.1. Blockchain technology for flexibility services transactions

Bulgaria - FlexiGrid[228] Project

The Bulgarian DSO Energo-Pro is a partner in the FlexiGrid project and has the task to test and validate the concept of smart gird flexibility by demonstrating a DSO-consumer flexibility market platform. Under the Demo case, the DSO obtains flexibility from consumers and producers with the goal to manage DSO grid stability. The DSO flexibility platform includes: IoT-enabled information systems[229] whose goal is to secure real-time information flow regarding customer status and performance at the interconnection point; as well as blockchain-based flexibility market platform that would enable DSO in identifying needs and participants to place bids on services related to these needs. After that, the system will

[227] Regulation 2023/1114 on markets in crypto-assets (MiCA)

[228] FlexiGrid - FlexiGrid

[229] Nonstandard computing devices that connect wirelessly to a network and are able to transmit data

automatically clear the tender by selecting the best deal, and the transaction would be recorded via smart contract.

As all of this would be recorded in the blockchain, the delivery track would be available at any time.

Italy – Platone Project[230]

The Platone project (PLATform for Operation of distribution NEtworks) aims at increasing the observability of renewable energy resources and exploiting their flexibility with the development of advanced management platforms which link users, aggregators and operators of the market. The pilot site of the Platone project in Italy aims to create a LFM and uses a local blockchain based flexibility market.[231]

A blockchain based platform is acting as the access layer to generators and customers' flexibility in order to facilitate their integration by providing certified measures to all players. Another blockchain application is operating at an upper layer to provide an open market platform to link the LFM and the TSO (to ensure an efficient system).

The Netherlands – Equigy [232, 233]

Equigy is a crowd balancing platform (CBP), designed to help balance the grid and ensure security of supply for the energy transition. Using blockchain technology, TSOs and aggregators can track all electricity transitions in a secure and permanent ledger, thus validating the flexibility of small distributed resources in real-time. Therefore, the project allows smaller prosumers to participate and play an active role in the electricity market by offering their flexibility to reduce and/or increase the total electricity exchanged with the grid.

[230] Platone project

[231] J.S. Jones – Smart Energy International – Italy's Areti launches flexibility pilot in Rome (2021)

[232] Equigy – Crowd balancing platform

[233] Terna SpA – Spotlight on the new "Equigy" platform: shared know-how for a more secure electricity system

Portugal – P2P (peer-to-peer) energy trading [234]

P2P energy trading applications are available in Portugal. P2P energy trading schemes are a form of LFM services that enable the trading of locally generated electricity between individuals or entities within a local community. The way of managing electricity supply and demand is therefore more flexible and sustainable by encouraging the development of RES at a local level. For example, Power Ledger has partnered with the largest DSO in Portugal (E-REDES), to launch a P2P energy trading platform. The platform allows consumers to trade excess energy generated by their solar panels with other consumers in their community.

In addition, there are other P2P energy trading platforms, such as the one developed by WePower and E-REDES, which allows consumers to buy and sell green energy directly from each other. Both P2P platforms are based on digital ledger technology (DLT).

4.2.2. Barriers to use blockchain in local flexibility markets

In Spain, the fact that the Spanish electricity market is centralised limits the possibility for blockchain integration. The existence of bilateral contracts that are merely financial instruments (PPA) does not exempt the system from having to be informed and regulate any activity between two parties that involves the use of the transmission or distribution networks. The operators of these networks are the ones which legally control the data (consumption, production, etc.) and which have legal validity, without decentralised systems such as blockchain being able to replace them.

In Türkiye, a prosumer does not have the possibility to sell electricity directly to another consumer without obtaining an electricity supply licence. Therefore, decentralised energy trading (P2P) using blockchain technologies is not a viable option. In terms of using blockchain technologies as a financial tool (crypto coins), accounting would be a problem. The invoices should be issued in Turkish Lira (even if they are issued in USD/EUR, the books are kept in Turkish Lira) and the bank transactions should be compatible with the books.

In other countries such as Bulgaria, Ireland, Italy and the Netherlands, the main barrier is the absence of regulation which blocks future steps towards blockchain implementation.

[234] R.A. Perdigão de Oliveira – Implementing blockchain technology for P2P energy trading and evaluation on users' adoption of energy communities (2021)

4.3. Data Management and Protection

According to the General Data Protection Regulation 2016/679, data aggregation should not violate the privacy and security of the customers. This regulation also removes obstacles to ensure a better transfer of personal data while protecting natural persons. LFMs process energy consumption data and should not infer personal information especially when sharing data with third parties.

4.3.1. Data management

Table 56: Regulation about Data Management and Personal Data Protection

Country	Regulation that guarantees the security of consumer's consumption data
Bulgaria	The protection of personal data is based on the Law on Protection of Personal Data and all applicable by-laws that relate to Data Processing and Protection and the GDPR (EU) 2016/679.
France	Regulation on data management is based on the GDPR.
Greece	Consumers' data are safe according to Greek Law 4577/2018 and European Union's GDPR (EU) 2016/679.
Ireland	Data management is regulated by the GDPR and the Data Protection Act 2018.
Italy	The Italian regulation on data management follows the European regulation GDPR.
The Netherlands	The 1998 Electricity Act guarantees the use of the data within the framework imposed by the GPRD, that the data used are only those related to the electricity consumption, and that only authorised stakeholders (subject to the GPDR) have access to these data.
Portugal	Portuguese legislation about personal data follows the GDPR.
Romania	Data gathered are treated according to the GDPR and the Law 190/2018.
Spain	The General Data Protection Regulation (Regulation (EU) 2016/679) ('GDPR') has been implemented with the Organic Law 3/2018 of 5 December, on the Protection of Personal Data and Guarantee of Digital Rights.

Türkiye	Turkish data management is regulated by the Law on Protection Of Personal Data (DPL) 6698.

EU Member States studied in DE-RISK have GDPR-compliant regulation. Türkiye has a national regulation according to which personal data sharing as part of an LFM should follow the same principles regarding data protection (especially transparency in data processing).

4.3.2. Cybersecurity

Table 57: Regulation about Cybersecurity

Country	Regulation about Cybersecurity (to ensure the security of the grid)
Bulgaria	Cybersecurity is regulated by the Measures Against Money Laundering Act SG. No. 94 of November 13, 2018.
France	Cybersecurity issues are treated by the National Cybersecurity Agency of France (ANSSI). Among its missions, ANSSI is responsible for responding to cyber threats, supporting product development for governmental use, providing information and advice, and raising awareness on digital risks.
Greece	Greek Law 4577/2018 and European Union's GDPR (EU) 2016/679 ensures the security of the grid.
Ireland	Cybersecurity is regulated by the S.I. 360/2018 on measures for a High Common Level of Security of Network and Information Systems (transposition of the EU Directive 2016/1148).
Italy	Cybersecurity is regulated by the Law Decree 82/2021 on defining the national cybersecurity architecture and on the establishment of the National Cybersecurity Agency.
The Netherlands	Cybersecurity is regulated by the Network and Information Systems Security Act (NISSA)[235] which is implementing the NIS Directive (EU) 2016/1148.
Portugal	In Portugal, the security of the grid is regulated and overseen by the national regulatory authority for energy, the Entidade Reguladora dos Serviços Energéticos

[235] Network and Information Systems Security Act

	(ERSE), and the national transmission system operator, Rede Elétrica Nacional (REN). In terms of cybersecurity, the NIS Directive was transposed by Law 46/2018. The Decree-Law 69/2014 provided the basis for the establishment of the National Cyber Security Center (CNCS).
Romania	There is no specific regulation about cybersecurity other than the one on data protection. However, the law 362/2018 transposed partially the Directive (EU) 2016/1148, the Network and Information Security Directive, known as the NIS Directive).
Spain	Red Electrica Española (TSO) has a comprehensive risk system (ISO 31000) but there are no specific legal provisions on cybersecurity in the energy sector.[236]
Türkiye	According to the National Cyber Security Strategy and Action Plan 2020-2023, the cybersecurity measures are defined. But pages 36-115 of the document are not publicly available. Cybersecurity Regulation for Industrial Control Systems to be used in the Energy Sector, dated 13.07.2017 and published in Official Gazette Nr. 30123 is publicly available but partially covers the issue.

Each country has its own regulations on cyber security. Most of these regulations follow the requirements of the European NIS Directive. Some countries also have more specific guidelines in certain areas, drawn up by national cyber security agencies (France, the Netherlands, and Portugal) or by national regulatory authorities (in the energy sector).

4.3.3. Smart metering data management

Table 58: Approach on Smart Metering Data Management

	BG	FR	GR	IE	IT	NL	PT	RO	ES	TK
Centralised data hub (CDH) / Decentralised data Infrastructure (DDI)	CDH	CDH	DDI	CDH	DDI	CDH	CDH	CDH	CDH	CDH

236 Elcano Royal Institute – Cybersecurity in the energy sector

There are currently two main approaches to smart metering data management. While most of the analysed countries have opted for a centralised data hub, others (Greece, Italy) prefer a more decentralised system where data activities are distributed among market players (usually DSOs which are covering the data issued on their grid).

Table 59: Risks and Benefits of the Current Smart Metering Data Management

Country	Management of smart metering data	
	Risks	**Benefits**
Bulgaria	The centralised model assumes the connection of all clients to the server where data is stored. Therefore, all information goes through the host computer and, in case the server resources are limited, it can only work effectively with a certain number of network members. Illegal use of large information arrays by persons with access to the information arrays is a risk.	The coverage of large data sets, fast import of new data, real-time processing of information in short deadlines, analysing different types of information, revealing regularities between different sources and arrays of data and real-time information analysis can be used to improve the systems.
France	Cybersecurity risks are higher with a centralised model.	A centralised model allows a better control of the grid and better information for the end-users.
Greece	N/A	N/A
Ireland	N/A	N/A
Italy	The cost of several structures is higher than one central hub.	A decentralised system enables a better adaptation to local needs in terms of data use. Information is not shared as widely as in a centralised hub.
The Netherlands	N/A	N/A

Portugal	Cybersecurity risks are higher with a centralised model. Incorporate new technologies or adapting to new market conditions is also more challenging for a centralised data hub, which is as well less flexible.	A centralised data hub enables a better use of the data by market players, including a quicker response time to customers' queries and complaints.
Romania	There is more data exposed in case of a cyber-attack.	The cost is lower than several decentralised structures.
Spain	The falsity of measurement data is considered a very serious infraction by the law of the electricity sector in Spain. However, the current system is not exempt from the risk of cyber-attacks or data fraud by the data custodian (DSO) or a third party.	The smart meters feed the database of the DSO. The DSO provides the data to the retailer, the consumer and any other parties involved (market operator). The DSO is responsible for hosting the data. The benefits are: - universal access to the participants' information, ensuring its security and privacy; - agile provision of aggregated information; - a secure and agile system of authorisation of access to third parties, preventing consumer data from being processed by third parties to whom the consumer has not given his or her consent; - avoid duplication of data servers, simplify the data extraction process and avoid increased communication costs, thus minimising the costs of the adopted solution.
Türkiye	N/A	DSO is responsible for storing and securing the smart metering data.

A centralised data hub is likely to bring benefits in terms of increased competition by reducing transaction costs for market actors whose business model relies on access to metering data. On the other hand, a decentralised data infrastructure offers benefits in terms of data protection and customer sovereignty and is more adapted in the frame of an LFM.[237]

5. Conclusions

EU Directives from the Clean Energy Package have to be fully transposed in national legislations in order to have standardised definition of electricity market actors and their interactions. In the specific context of LFMs, actors need to be mapped and their roles properly designed to ensure the effectiveness of the LFM, particularly with regard to the role of DSOs towards flexibilities services (for and from the grid) and the role of consumers (participation in energy communities, as prosumers or thanks to dynamic electricity tariffs).

Regulations concerning market characteristics (entry, exit, contracting) are also currently applicable to LFMs. In order to have efficient services at a local level, these legislations need to be standardised and adapted.

In several aspects of LFM (market actors and characteristics, objectives, flexibility services, etc.) the absence of specific regulations for LFMs is a challenge. LFMs aim to enable the participation of local actors, such as prosumers, communities, or aggregators, in the provision of flexibility services. However, without dedicated regulations addressing the role and responsibilities of DSOs and the operational aspects of LFMs, the implementation of LFMs may be hindered. This why LFMs development should be clearly included in National Energy and Climate Plans and in energy planning by setting objectives (flexibility capacity provided through LFMs for example).

In addition to the necessity to specify legislation for LFMs, there is also a need to simplify the regulations for connecting to and operating the network (and thus remove bureaucratic and administrative problems). This simplification must extend to flexibility services, so that the necessary regulations and information can be grouped together (and not scattered between laws, NRA guides and network operators).

[237] F. Tounquet and C. Alaton – Benchmarking smart metering deployment in the EU-28, Final Report (2019)

The research highlights the need to define and standardise who can provide/purchase flexibility services within LFMs (and probably have specific regulation for flexibility exchanged within an LFM as the role of network operators evolves).

The analysis also highlights a need for financial support for the provision of flexibility services, which would have additional effect of helping to improve the deployment of LFMs. Incentives for renewable energies also remain essential in the context of LFMs (particularly energy storage and electric vehicles, which can mitigate the variability of RES and improve network resilience). However, net metering is not unanimously supported in the studied countries, with some preferring the net billing system, which is less unpredictable in terms of the feed-in tariff.

Smart metering is of utmost importance for LFMs in order to manage and analyse a great amount of data. Thanks to the Clean Energy Package, most of the 10 studied countries already have such technology for consumers of the residential sectors and can, therefore, involve consumers in the electricity markets by authorising dynamic pricing.

Regarding data, the analysis shows that regulations in European countries should be more transparent about the data generated in order to have a clear view on the market players' access to data, their use and protection, especially in a LFM.

A decentralised data infrastructure controlled by the DSO and managed with the help of blockchain technologies seems to be the best way to ensure a secure and efficient use of consumer data.

E. POLICY RECOMMENDATIONS

1. Country Recommendations and Proposal for Regulation Evolution

1.1. Bulgaria

Recommendations for the creation of a local flexibility market

The new legal proposals on the RES Act, currently under discussion in the Parliament (July 2023), and the incoming changes in the legislation will influence the layout of the LFMs in Bulgaria. New ideas and players are put out, including aggregators and citizen/renewable energy communities, in order for the related laws to be put in line with the corresponding EU directives. Contractual agreements, competitive bidding, and market settlements must all be adjusted to the LFM in addition to the regulations currently in place for the electricity market. LFMs are likely to need cutting-edge metering infrastructure, as well as IT systems that can handle the data efficiently. Last but not least, LFMs creation will be fostered when citizens and households will be part of the free energy market which is planned to happen in 2026.

Recommendations for the uptake of flexibility services

The flexible services are a natural solution to allow all members of society to become active participants in the energy market, thereby enabling and supporting the transition to renewable sources and the use of new technologies so that the energy system can be managed and balanced effectively.

An appropriate regulatory framework for implementation is needed in order to allow flexibility in the market. The introduction of net and virtual energy metering could be also considered.

Recommendations for regulation to better foster local flexibility market uptake

The decrease of the administrative and bureaucratic procedures will ease the development of closed networks, and will better define how citizens access the network – as producers or energy users, etc. Even with some improvements in the Law on Territorial Development, a user or energy community must go through several different institutions to achieve their goal.

The development of energy markets foresees that all current players will remain active in the sector, but their functions will change under the influence of new entrants in the market, namely the prosumers, aggregators, energy communities, building and home energy management systems. Discussions about the proper regulation of aggregators in the framework of the Bulgarian legislation are actively ongoing, but at the moment, this business model has to be upgraded, it is only being presented as another responsible party for balancing - another type of balancing group; there is no dedicated licensing regime for them as well.

The energy communities are another new market entrant still without a specific legislative framework, though their creation is not prohibited and there are already some good examples in this area. To foster the creation of more energy communities, there is a need for specific regulation.

1.2. France

Recommendations for the creation of a local flexibility market

The decentralisation of electricity markets is a necessity to avoid/reduce additional cost on the network to increase its capacity. Less centralisation is possible by allowing local authorities/municipalities to manage LFM implementation and contribute to their development.

Recommendations for the uptake of flexibility services

There are increased needs for flexibility in order to meet electricity demand at peak times and to stabilise variations in production due to RES. Therefore, the use of energy storage will become crucial in the decades to come, enabling injection and withdrawal requirements to be dealt with symmetrically. Regulations must facilitate the installation of storage systems and offer financial incentives at the time of construction or operation of the installation.

Now that smart meters are widely deployed in the residential sector, public authorities and suppliers need to provide more information about dynamic prices and encourage consumers to participate in the electricity markets by explaining to them the potential financial savings.

France is among the few countries in Europe having commercial DSO flexibility markets which help develop flexibility services at the local level. These good practices could be studied and followed by other European countries.

Recommendations for regulation to better foster local flexibility market uptake

Rising electricity prices due to the energy crisis were a strong driver to incentivise energy communities in the country. Operating energy communities need to communicate about their results and good practices to encourage local authorities and citizens to set up new projects and, therefore, have a wider variety of participants in LFMs.

LFMs are more needed as renewable energies develop. Thus, there is a need for more incentives (for citizens and RES project owners) and for better promotion of RES that can be supported by coercive regulation to implement PV on every new building.

As specified in the "Clean Energy for all Europeans Package", DSOs are only authorised to operate a storage facility under a derogation system. Removing this measure would allow DSOs to set up and manage energy storage facilities, bringing stability to the local network from a technical point of view.

1.3. Greece

The development of the National Energy and Climate Plan for 2030, combined with the Greek energy privatisation plan and the impressive increase of RES in its power production is the basis for the strong position of Greece as an important participant in the European energy market.

Recommendations for the creation of a local flexibility market

Greece has an overall successful implementation and satisfactory performance of the functioning electricity market, with important results being the reduction of prices in the balancing market and the increase of the intraday market liquidity.
However, several challenges are identified. Greece has opened their ancillary services markets to DSF but there are still prohibitive barriers. FCR, aFRR and mFRR markets are fully opened in Greece since July 2022. The markets were opened fully with both demand-side flexibility and aggregation allowed, 1 MW min bid size, no BRP agreement required and an asymmetrical product design.[238]

[238] smartEn – 2022 Market Monitor - For Demand Side Flexibility (2023)

Recommendations for the uptake of flexibility services

Key policies include an increase in the share of renewable electricity generation to 61% by 2030, and goals to boost the share of renewables in transport and buildings through increased electrification. Greece also aims to increase grid flexibility through the deployment of electricity storage and demand-side Response measures.

There is a need to foster the technological upgrade and digitalisation of energy networks, which is the basis for maximising not only the operation but also the flexibility of the energy system.

The continuous improvement of competition and the smoothing of large fluctuations in the energy market will improve competition that will lead to reducing energy costs for all participants by broadening consumer choices, promoting quality services and new services, and prices that reflect costs from production to energy supply.

Recommendations for regulation to better foster local flexibility market uptake

In Greece, there is still a need to reduce barriers to licensing and grid connections for RES. There have been two major updates to legislation (Law 4685/2020 and Law 4951/2022) that aim to reduce the duration of the licensing process from an average of 5 years (with some projects taking much longer) to 24 months, to facilitate the granting of licences to 12 GW of renewable energy projects by 2030. The Law 4951 goal is to decrease grid congestion, while the TSO and DSO have to make significant investments to expand grid infrastructure and reduce the waiting time to connect renewables generation.

1.4. Ireland[239]

Recommendations for the creation of a local flexibility market

DSO should prospect, together with local authorities, the potential flexibility that an area could provide (through the residential sector, industries and electricity generators) for a potential LFM to be created and tailor the grid development to the anticipated need growth.

[239] European Commission – Clean energy for EU islands – Regulatory barriers in Ireland: findings and recommendations (2022)

Storage facilities are a key technology to handle the electricity production variability coming from RES by providing flexibility in a potential LFM. Therefore, incentives for their development should be offered to help cover storage investment costs and the use of innovative technologies.

The use of regulatory sandboxes should be considered to develop LFM and have a new regulatory framework for flexibility services and market players. Using innovative technologies such as blockchain and smart contracts can also be encouraged in this type of regulatory environment.

Recommendations for the uptake of flexibility services

National Regulator should prioritise further development of regulation regarding energy communities (social support, permitting procedures, financing) with attention to local specificities (i.e. island configuration). To level the playing field between professionals and community, incentives such as loans, grants, up-front financing should be available. A larger communication should also be made to promote local RES projects (self-consumption, ECs, prosumers …). Incentives should also be adapted to the area specificities (like the "grant uplift" of 50% for Irish islands).

Recommendations for regulation to better foster local flexibility market uptake

Regulation about a revision of permitting procedures should be implemented to limit the number of administrative bodies with which project stakeholders have to deal with. Simplification of procedures must be done in order to involve smaller entities such as local self-consumption projects, energy communities to be part of a LFM. Governments and local authorities should better support the development of LFMs by establishing clear objectives in the National Energy and Climate Plan and in network planning.

1.5. Italy

The absence of specific regulation for LFMs hinders their development. Currently, regulations for general electricity markets are applied to local flexibility market but some specifications (i.e. for license procedure or for contracting flexibility services) could be useful and help to further develop LFM and FS (incl. simplifying procedures for local market participants).

Even with ancillary service markets open to demand-side flexibility, Italy has requirements that are prohibitive for FSP.[240] There is a need to simplify access to the purchase and sale of flexibility through new regulations or guidelines (while guaranteeing network security).

1.6. The Netherlands

The Netherlands is a leader in the development of DSO flexibility markets in Europe but this growth is hindered by the incomplete transposition of EU Directives IEMD and REDII and the lack of regulation's adaptation to local energy systems. Regulations and guidelines are needed in order to have specifications for FS at the local level and for local market participants (prosumers, energy communities, etc.).

It would also be interesting to speed up the development of harmonised and flexibility services for local flexibility markets through flexibility registers at national level (or even EU level), based on a set of harmonised rules which can be adapted to accommodate future forms of flexibility. Within the registered products, specific services for decentralised market would be available and shared among Member States to have standardised FS for LFMs.

1.7. Portugal

Due to increased renewable generation targets and the introduction of faster performing frequency services, there is a growing need for flexibility in Portugal. As a result, Portugal expects a market transition towards a model more open to demand-side flexibility within the next 2-5 years.

Recommendations for the creation of a local flexibility market

In order to encourage the deployment of LFM technologies there is a need to further develop the regulatory framework by ensuring that the regulatory structure is sufficiently flexible to accommodate new and innovative business models; this has to include also the collaboration between stakeholders in the energy sector by the establishment of public-private partnerships, joint investment initiatives, and other forms of collaboration to foster innovation and progress in the sector.

[240] smartEn – 2022 Market Monitor for Demand Side Flexibility

Recommendations for the uptake of flexibility services

Encouraging experimentation with and piloting of new technologies and business models will raise the culture of innovation. Smart contracts and implementing regulations to support their use in the energy sector would help to improve transparency, reduce transaction costs, and increase the efficiency of transactions related to flexibility services. A better collaboration and information sharing between DSOs, TSOs, and other stakeholders in the energy sector is a key contributing to the uptake of flexibility services. Financial incentives for the uptake of flexibility services are also a solution to be considered. Mechanisms such as subsidies, tax credits, or other forms of financial support would help to overcome some of the perceived barriers related to the costs of implementing new technologies and business models.

Recommendations for regulation to better foster local flexibility market uptake

To incentivise the uptake of LFMs there is a need for policies and regulatory frameworks that promote the development of LFMs and enable access to the grid for small-scale generators and consumers. Improvement of standards and protocols for the interoperability of LFM technologies will also help to reduce the complexity and costs associated with implementing these systems. Development of data management frameworks for LFMs will ensure the security and privacy of consumer data while enabling the efficient sharing of data between stakeholders. This could include introducing clear guidelines for data sharing, establishing data protection standards, and promoting the use of decentralised data infrastructure. The use of blockchain can be supported by developing clear and consistent legal frameworks for the blockchain technology in the energy sector. This can be enabled by recognising smart contracts as legal contracts, setting standards for data privacy and security, and providing support for the application of blockchain-based energy platforms.

1.8. Romania

Even with the electricity market opened to new participants and new FSP, there is a need to further activate flexibility services by setting national targets for the exchange of flexibility (i.e. in the NECP). For local market players and citizens, the decentralisation of the electricity market and the role they can have, is mostly unknown. New regulation could, thus, be developed to ensure the variety of innovative business models that enable local market participants to provide flexibility to the distribution grid. It should also mention that active consumers are welcome to participate through implicit or explicit scheme to provide flexibility with automation (i.e. blockchain, smart meters) that should ease their interaction with the system.

1.9. Spain

Recommendations for the creation of a local flexibility market

The National Recovery, Transformation and Resilience Plan offers an ideal framework to accelerate the development of demand flexibility and incorporate this resource as a key element of the Spanish electricity system, favouring the participation of all consumers, as well as new actors in the energy transition such as the independent aggregator and the energy communities.[241]

In Spain, collective self-consumption (CSC) is allowed using the public network without the formation of a legal entity. This lowers start-up costs and enables participation from a wide range of users. As a result, there are examples of CSC schemes including energy co-operatives, local energy communities, municipalities and energy utilities. Nevertheless, the requirements for CSC schemes to participate/operate in flexibility markets should be revised, as the minimum size to pre-qualify in flexibility markets at the moment is 1 MW, which is difficult to reach at the residential level.

Recommendations for the uptake of flexibility services

The use of dynamic production sharing coefficients in collective self-consumption is necessary for the deployment of a large number of products related to LFMs. Allow the use of really dynamic coefficients of distribution of energy production among users of collective self-consumption.

The DSO revenue model needs to be substantially modified. The DSO payment system should be determined by the free market. Steps have to be taken to use models that actually generate revenue for the DSO by favouring flexibility or innovation.

Also, the role of the aggregator should be fostered in the energy market in order to unlock a larger volume of flexibility.

Recommendations for regulation to better foster local flexibility market uptake

The regulatory bodies and agents involved in the Spanish electricity sector have to accelerate the necessary changes concerning the transposition of Directive (EU) 2019/944 to allow, and

[241] Sympower – Manifesto for the development of demand side flexibility in Spain

encourage, the development of demand-side flexibility by opening the balance markets to more market participants and not only through a marketer.

1.10. Türkiye

Recommendations for the creation of a local flexibility market

Consumers require both flexible financial support measures and access to the appropriate technologies to respond to market signals through DSR. Grid infrastructure must be ready for the future decentralised smart energy systems.

New business models are evolving in the dynamic market for smart charging, particularly in the EV sector. They are using smart technologies with automation to optimise charging and deliver maximum economic benefits to consumers and the grid. The regulatory framework evolves in parallel with them. All consumers should have the right to adopt a smart meter with at least hourly resolution, and a communication system for record and reward of the DSR actions or a smart meter with higher resolution for providing ancillary services. Financial support for distributed energy production and storage units would be also useful.

After broad development of distributed energy generation, net metering can be replaced with other remuneration schemes, such as net-billing or buy-all/sell-all, where the real costs of the system will be reflected on the prosumers. This will incentivise load shedding and load shifting as well as the use of behind-the-meter battery storage for consumers.

In addition, it should be permitted to create energy communities within a neighbourhood. Installing solar panels on the roof of an apartment building, and sharing the produced electricity among the residents is a complicated procedure and needs to be also simplified.

Recommendations for the uptake of flexibility services

Delivery of power is impacted by physical system constraints, i.e. where the power lines are at capacity, requiring generation to be limited in the congested area, and increased in another area, to ensure the power flow to the area of demand. A study[242] identified nine key areas for addressing challenges associated with DER integration in Turkey and defining measures to increase cost-reflectivity, transparency and accountability in charging mechanisms, including

[242] Shura Energy Transition Center – Unlocking demand-side response in Turkey: A white paper

network tariffs and imbalance costs, as well as technical solutions to improve DER visibility and therefore integration.

To overcome these barriers, renewable generation variability needs to be managed at a system-wide level. In a truly efficient market, network operators would have a full range of capacity options, not only calling upon the supply-side to increase generation but also calling upon consumers providing DSR services in case of system imbalance. Such services would compete to provide the least-cost solution. Balancing the electricity system through DSR rather than by increasing generation would reduce network losses, as a certain amount of electricity is wasted when conveyed over long distances.

It is also recommended peer-to-peer energy trading to be allowed, without complicated licence procedures. For instance, instead of obtaining a Charging Network Operator Licence for EV charging stations or a certificate issued by a Charging Network Operator, individuals / companies should be allowed to sell energy to an EV.

Recommendations for regulation to better foster local flexibility market uptake

Electricity suppliers can provide DSR aggregation services, yet experience from more developed DSR markets suggests that without external competitive pressure, incumbent electricity suppliers will not develop the services needed to access the untapped flexibility embedded in the demand-side. Therefore, to enter the market, there is a need to “unbundle” these flexibility services from supply and to regulate the relationship between energy services entities or aggregators and incumbent energy suppliers or retailers.[243]

For this reason, there is a need to establish a regulatory framework for individual aggregators and other innovative business models and flexibility services, distinct from the energy supply. They could include actions like free access to end-customer data; customers able to contract with an individual aggregator without any discrimination from their supplier; provisions to enable individual aggregators and customers to become BSPs, providing balancing services to the system operator, etc.

[243] P. Baker, M. Hogan, S. Keay-Bright – The regulatory Assistance Project – Demand Response, Aggregation, and the Network Code for Electricity Balancing

2. General Recommendations

Recommendations for the creation of a local flexibility market

The revision of the National Energy and Climate Plans has to set higher targets about renewable energy and energy communities in order to increase the flexibility available at the local level. Promotion of RES has to be done for citizens to invest in them (directly at a household level or through bigger projects such as energy communities for instance). Flexibility services can also be directly promoted by NECP and network planning by setting up ambitious goals in accordance with DSOs planning. LFM and the decentralisation of energy markets should also be mentioned in energy planning as a means of reducing investment costs in network infrastructure, balancing the network at a local level and involving citizens in the energy sector. Decentralisation also means that local authorities need to be involved in energy planning and in LFM creation and/or management and have a role to play to facilitate interactions between local participants in the energy sector.

As part of the policy of decentralisation of electricity markets, energy storage and electric vehicles have a key role to play by handling the variability of RES electricity production at a local level. Therefore, the development of both industries has to be continued and accelerated.

Recommendations for the uptake of flexibility services

The electricity sector needs a new regulation at the EU and national levels to specifically define LFMs and relevant flexibility services. A new EU Regulatory framework on LFMs and FS will provide the standardisation of flexibility products and adjust the current legislation about electricity markets to the specifics of local electricity markets. For instance, the decentralisation of electricity markets provides the opportunity for customers to be active in the LFM and also gives the DSO a central role as a buyer of flexibility services to balance its network.

Flexibility services should be properly defined at the EU level in order to have a standardisation of products and to have a clear legal framework (and not fragmented information). Flexibility services as part of a LFM should be defined and encouraged (practices such as P2P trading, dynamic pricing, etc.).

Incentives have to be set up in the electricity sector to promote the wider deployment of LFMs and FS by encouraging participation in electricity markets and fostering innovation in technologies. Financial supports, such as subsidies, grants or tax incentives, have to be offered to FSP to reduce upfront costs and risks associated with adopting new technologies and solutions. Mechanisms such as net metering, net billing or buy all/sell all are also important to support local energy producers (prosumers, ECs, etc.) and encourage them to sell the electricity they produce when the grid needs it. For larger local RES electricity production projects, tenders can be launched to select the most sustainable projects and guarantee them subsidies for infrastructure development, financial bonus when selling electricity or a fixed price for buying electricity. Finally, Demand-Side Management programmes that reward consumers for adjusting their electricity consumption based on market signals have to be implemented when not already done.

Recommendations for regulation to better foster local flexibility market uptake

Completion of the transposition of the EU Directives IEMD and RED II is necessary in order to have new stakeholders in the electricity markets and to have an up-to-date regulatory framework for electricity networks and markets.

Another area for improvement is by providing better information to end users about their potential role in the electricity markets. Suppliers should offer dynamic prices to their customers and provide information about it. National and local authorities should provide information about RES installation for households and about collective self-consumption and energy communities. To summarise, electricity consumers should be aware of the different schemes that would allow them to save money. Cooperation between electricity market players should also be encouraged in order for the electricity sector to be efficient. The regulatory framework should ensure fairness and competition in the adoption and operation of LFMs and in providing/buying FS.

Procedures (incl. licences) for connecting to the grid, selling electricity and providing flexibility should be simplified to encourage customers to become active in the energy market and to participate in electricity generation. Requirements to provide flexibility services should be adapted to the local flexibility market to ease the participation of local stakeholders (prosumers, ECs), knowing that they do not have the administrative support of major actors. Administrative and bureaucratic procedures can be time consuming and have a high cost which can lead to difficulties to set up and finance a project. Electricity sector participants need to have guarantees and a clear view of the process and associated costs so as to be able to mitigate possible risks.

Smart metering deployment has to be completed in Europe in order to allow market participants to collect data about households' consumption and their routines in real-time.

New generation of SMS with cutting-edge technology should be considered for the future deployment. Such data allow suppliers to offer customised dynamic electricity pricing which will increase the flexibility available at a local level. By making people change their consumption through financial incentives, dynamic pricing is a key FS for LFMs and must be publicly promoted and encouraged to guarantee the success of LFMs and local electricity balancing of the grid. Blockchain can simplify and accelerate the exchange of data between market participants while smart contracts can provide automation to some flexibility services. Both are insufficiently regulated and mainly focused on crypto assets. Therefore, regulation has to be implemented at European and national levels to provide a framework for blockchain applications (outside of crypto assets), especially in the energy sector, to foster innovation and ease the operation of LFMs and FS.

F. FINAL CONCLUSIONS

Achieving regulatory quality for the Energy Transition is accompanied by growing pace of technological changes and globalization that pose substantial challenges of what and how to regulate. The performed analysis within the context of the current EU energy regulation and defined recommendations help outlining the roadmap for broad deployment of local flexibility markets in the studied countries (highly replicable across EU), and making the necessary modifications for the energy policies and regulations to pave the way to reach EU energy targets 2030 and 2050 in terms of consumer participation as empowered stakeholder in the grid.

More generally, the RIA has an impact on several of the project's objectives. The changes in legislation highlighted by the analysis mean that the role of customers can be standardised and that they can be better integrated into the electricity markets by removing certain regulatory and administrative barriers, thus facilitating the Customer Behaviour Journey and helping increase users' engagement and active participation in LFMs.

The study of the definitions and roles of the various players in the electricity markets sheds light on the business models that need to be put in place to ensure long-term and sustainable benefits across the LFMs value chain.

By listing the main incentives that encourage the implementation of LFMs and, above all, flexibility services, the RIA highlights good practices that can be replicated in other EU countries and contribute to the sustainable financing of projects.

Overall, the recommendations presented in this report and the future roadmap of policy developments regarding LFMs and the exploitation of flexibility are designed to have a positive impact on the deployment of LFMs and relevant flexibility services.

Finally, the state-of-the-art regulatory analysis of the local flexibility markets provides open, evidence based, modern and transparent guidelines targeting high impact on local, national and EU policy makers.

Annex 1: Questionnaires

1. RIA Questionnaire on Local Flexibility Markets_Bulgaria
2. RIA Questionnaire on Local Flexibility Markets_France
3. RIA Questionnaire on Local Flexibility Markets_Greece
4. RIA Questionnaire on Local Flexibility Markets_Ireland
5. RIA Questionnaire on Local Flexibility Markets_Italy
6. RIA Questionnaire on Local Flexibility Markets_Netherlands
7. RIA Questionnaire on Local Flexibility Markets_Portugal
8. RIA Questionnaire on Local Flexibility Markets_Romania
9. RIA Questionnaire on Local Flexibility Markets_Spain
10. RIA Questionnaire on Local Flexibility Markets_Türkiye

1. Bulgaria

DEAR PARTICIPANT,

The following questionnaire is developed under the DE-RISK project in order for a thorough study to be performed to provide an overview of how the regulatory environment in ten European countries and at European Level evolved. The results of the survey will contribute to the Regulatory Impact Analysis (RIA) to deeply assess the current regulatory framework that is enabling or acting as a barrier for the large deployment of Local Flexibility Markets (LFM) and the potential flexibility services.

We invite you to complete this survey to collect your experience and views regarding:

- Awareness of European, national and local policies regarding the regulation on Local Flexibility Markets
- Perceived legal risks and benefits
- Impact of the regulation - barriers and incentives
- Legal background of innovative technologies - block chain transactions and flexibility services
- Perceived legal risks and benefits
- Recommendations about future legal development of the LFM in your country and at European Level.

ABOUT DE-RISK PROJECT

This survey is being conducted as part of the DE-RISK Project funded by the European Union (EU) under Horizon Europe program.. The DE-RISK project will support the market uptake of Renewable Energy Sources (RES) by de-risking the adoption of Local Flexibility Markets to increase the RES hosting capacity of the distribution network.

ABOUT YOUR PARTICIPATION

Your participation in this study is fully voluntary and all data collected will be treated confidentially. Participation is free and there are no mandatory requirements. The research outputs resulting from this work will only include collated data, without the possibility for anyone to identify your individual answers. Your contact details will be used on a need-to-know basis and will be strictly confidential until the end of the project’s lifetime. By submitting this form:

- you confirm that you have read and understood this information.
- you agree to participate in this research study and your answers to be included in our analysis and resulting from its research publications.
- you agree that we will process the data in line with DE-RISK project policy of confidentiality that is in accordance with GDPR 2016/679.

Country:	**Bulgaria**
Organization:	**SEA SOFENA**
Name of expert answering the survey:	**Nadya Nikolova-Deme**
Contact details: (mail, phone, other)	**nnikolova@sofena.com** **+359 894 355 088**
Date:	**30 April 2023**

1. LFM Regulation - Definitions of Market Actors and Market Characteristics

The European Commission promotes flexibility markets as they can contribute to the European Union in becoming a climate-neutral continent by 2050. The new market development is taking place in Europe with the transposition in the different Member States of the Clean Energy Package (specifically the Electricity directive EU 944/2019) with new roles for DSOs entering into new activity areas. DSO-TSO cooperation evolves in a beneficial way for energy markets and for consumers as well. Governance of how DSOs and TSOs interact and engage in network planning, as well as arrangements to facilitate effective coordination for system operation, especially for flexibility, have been the key regulatory concerns in this area for the last few years.

Local flexibility markets allow the use of flexibility at local level by distribution and transmission system operators. This means using flexibility from decentralized energy resources (DERs) to solve congestion management problems, minimize power outages and avoid grid expansions. Flexibility markets help energy networks to monitor energy flows and create market signals to motivate changes in energy supply and demand, integrating smart meters and appliances, renewable energy resources and energy efficient resources accordingly. The Clean Energy Package defines and offers an enabling legislative framework for Local Energy Markets participants. The analysis of the LFM regulation will be conducted including some of the following topics that characterize the market:

LFM topic	**Sub-topic**
Market actors	• Aggregator • Balance Responsible Party (BRP) • Citizen energy communities • Distribution System Operator (DSO) • Market operator
Market and product characteristics	• Market entry and exit and market platforms • Product characteristics (e.g., prequalification, standardization of FS)
Infrastructural issues	• Smart metering systems • Energy storage • Network expansion
Contract, bidding, and settlement	• Contract. Bidding, billing, and settlement
Data security issues	• Access to data, data security, privacy protection

The Clean Energy for all Europeans Package defines new ground for consumers by recognizing under EU law, the rights of citizens and communities to engage directly in the energy sector. It also sets out legal frameworks for LFMs. Participants of the whole DR value chain are defined in the laws of the Clean Energy Package. The revised Renewable Energy Directive (EU) 2018/2001 sets the framework for 'renewable energy communities' and the revised Internal Electricity Market Directives (EU) 2019/943 & 2019/944 introduce new roles and responsibilities for 'citizen energy communities', 'aggregation', 'distribution system operator', 'transmission system operator' and 'balance responsible party' in the energy system covering all types of electricity. (Look at Annex 1)

1. *Are the Directives on common rules for the internal market for electricity 2019/943 & 2019/944 already transposed into your national legislation?*

Yes ☐ **No** ☐ **Partially** X

Is the revised Renewable Energy Directive (EU) 2018/2001 already transposed into your national legislation? **Yes**

☐ **No** X **Partially** ☐

*1.1. If your answer is **Yes,** indicate the national / regional / local legislation that defines it and explain it:*

IEMD 2019/943:
IEMD 2019/944: Energy Law - Promulgated SG. No. 107 of December 9, 2003, last mod.SG. No. 11 of February 2, 2023

REDII 2018/2001:

*1.2. If your answer is **Partially,** and there is some regulation concerning the definitions below, please, specify:*

For example: Explain if regulation is available, or concepts are under development, or discussions are ongoing, etc.

Aggregation	Distribution System Operator (DSO)	Transmission System Operator (TSO)	Balance Responsible Party (BRP)
Rules for electricity trading Issued by the SCEWR, Additional provision, § 1. p.1. "Aggregator of a group of objects" is a company trading or producing electricity, holding a license, supplemented with rights and obligations of a balancing group coordinator, whose group includes producer objects, consumer objects or electrical energy storage facilities, registered as direct members.	Energy Act Additional provision § 1. p.22.	Energy Act Additional provision § 1. p.20	RULES for electricity trading Issued by the SCEWR, Additional provision, § 1, p.1a "Balancing services" are balancing energy and/or balancing power., p.1b "Balancing energy" is the energy used by the TSO to carry out balancing and supplied by a balancing service provider. , p.1c, "Balancing power" is defined reserve power that a balancing service provider has agreed to maintain and in respect of which it has agreed to submit bids for a corresponding amount of balancing energy to the TSO for the duration of the contract

Self-consumers	Active consumers	Renewable energy communities (REC)	Citizen energy communities (CEC)
na	na	na	na

1.3. Are there other LFM participants in your country? How are they defined?

NRA x Suppliers x Traders x Other x

2. How do DSOs and TSOs cooperate to organize the flexibility market?

Please, specify if there is any guidance or regulation defining it. According to the Energy Act

3. How is the Local Flexibility Market organized in your country?

Platform x Aggregation ☐ Other model ☐

Please, specify. Give the name, link, info about the applicable model in your country. **https://flexigrid.org/** https://www.eso.bg/doc?flexitranstore

4. *Are there any legislative barriers which block the reinforcement of interactions between LFM's participants and slow down the development of LFMs? Please, indicate below:*

There is no legislation to regulate energy smart networks and services, which are, however, key to liberalization and consumption planning. The slowdown of new technologies prevents the development of flexible tariffs on the part of electricity traders to accurately cover individual consumption.

5 Are there national regulations concerning the market products?

For example: Explain if regulations or guidelines are available, or discussions are ongoing, etc.

5.1. Market entry and exit: *Yes x* *No ☐*

Explain: *Market entry and exit is defined in the Energy Act.* But three of the manufacturers under the Bulgarian Energy Holding cap hold a share of 85% of the liberalized energy market, which limits the competition

5.2. Market Product characteristics (e.g, Are there guides and regulations on product prequalification, standardization and baseline):

Yes X *No ☐*

Explain:

The EE Act contains a legal definition of energy: energy products, fuels, thermal energy, energy from RES, electrical energy or any other form of energy according to the definition in Art. 2, letter "d" of Regulation (EC) No.1099/2008 of the European Parliament and of the Council of October 22, 2008 on statistics for the energy sector (OJ, L 304/1 of November 14, 2008).

6 Infrastructural issues concerning the LFMs.

6.1 Regulation on Smart Metering Systems. Are they adapted to the LFMs? Are they installed?

Yes x No ☐

Explain: At present the three energy companies /Energohold, Energopro, EVN/ have installed almost 2 million smart meters in the country using own resources and relying on the financing from the Modernization Fund. This process will continue in the next years.

6.2 Regulation on Energy Storage: How is energy storage defined in your regulation? Is there any guideline, or discussions ongoing, etc.?

Yes x No ☐

Explain:

In SG No. 11 of 02.02.2023, legislative amendments to the Energy Act were promulgated, adopted with the aim of accelerating the development of the RES sector: a completely new legal regime for electricity storage facilities (batteries).

7 Contract, bidding, and settlement. Explain if any specific regulations or guidelines for LFM are established.

Yes x No ☐

Explain:
Defined in the RULES FOR ELECTRICITY TRADING, effective from 26.07.201, issued by the State Commission for Energy and Water Regulation

According to IEMD 2019/944 the network development plan published by the DSOs should provide transparency on the medium and long-term flexibility services and shall set out the planned investments for the next five-to-ten years, with particular emphasis on the main distribution infrastructure which is required in order to connect new generation capacity and new loads, including recharging points for electric vehicles. The network development plan shall also include the use of demand response, energy efficiency, energy storage facilities or other resources that the distribution system operator is to use as an alternative to system expansion.

8 Is there any legislation about development plans for the electricity network in your country?

Yes x No ☐

8.1 If your answer is Yes, indicate the legal regulation that defines it, its statement and how flexibility is included into it.

Pursuant to Art. 4, para. 2, item 1 of the Law on Energy, the Ministry of Energy developed a Strategy for Sustainable Energy Development of the Republic of Bulgaria until 2030 with a horizon of 2050.

8.2 Are there any stimuli or incentives to create flexibility or/and to include flexibility in network development plans? Please, indicate below:

n.a.

8.3 Regulation on Network Expansion in compliance with the IEMD 2019/944?

Yes x **No ☐**

1.

Explain:

3. REGULATION No. 3 of 21.03.2013 for licensing of the activities in the energy sector

4.

9 Can you note if there are any provisions or regional/local regulations that present legal risks and behave as barriers to the development of Local Energy markets:

At the moment, the Bulgarian legislation lacks many of the details, which, if they do not hinder in an absolute way, certainly do not facilitate or stimulate more activity among market players.

10 Can you describe any act provisions or regional / local regulations that bring benefits and behave as enablers to LFMs:

At the moment, the Bulgarian legislation lacks many of the details, which, if they do not hinder in an absolute way, certainly do not facilitate or stimulate more activity among market players. However, the regulations laid down in Directive 2018/2001 to promote the use of energy from renewable sources (RED II) have not been fully implemented in Bulgaria

11 Are there any administrative and bureaucratic procedures that hinder LFMs' development and play a restrictive role in their broader application? If yes, please, explain.

Many citizens try to build their own installations, but encounter either bureaucratic difficulties or ambiguity as to whether they are joining the network - as producers or consumers. What bills they have to pay and who can guarantee them to build a smart grid if they continue to pay network service charges. There is no comprehensive regulation of the possibilities for virtual net metering of consumed/spent energy.

12 Would you suggest what kind of legal provisions in your country will contribute most to the activation of the interested parties (citizens, commercial and industrial players) to participate in LFMs?

The energy regulations in Bulgaria, however, were created for the time when the energy sector was dominated by large industrial production installations. The further energy decentralization process will provide more independence and economic security to individual energy users.

13 Can you define any recommendations for improvement of the legislation concerning LFMs in your country or on EU level?

Even with some improvements in the Law on Territorial Development, a user or community must go through several different institutions to achieve their goal. There is a need to decrease the administrative and bureaucratic procedures, to allow net metering, to ease the development of closed networks, to better define how citizens access the network – as producers or energy users, etc.

2. Policy and Regulatory Framework for LFMs Uptake

14 Does your National (Regional / Local) Energy Action Plans include targets for development and spread of LFMs?

Please, explain:

"National common objectives regarding increasing the flexibility of the national energy system, in particular through the use of own energy sources, the optimization of consumption and energy storage:

• Maintenance and development of the transmission capacity of the electricity transmission networks;
• Optimization of consumption in the energy system through the development of energy markets;
• Increasing the storage capacity of electric energy by developing existing and building new storage facilities"

From the Integrated Plan in the field of Energy and Climate of the Republic of Bulgaria 2021 – 2030.

15 What kind of bureaucratic and administrative barriers LFMs can experience

15.1 When flexibility producers connect to the grid?

15.1.1 Complicated application procedure: *Yes* ☐ *No x*

Explain:

With the last changes in the Law on Territorial Development the requirement for a construction permit for solar panels with a capacity of up to 20 kW for own needs is no longer required, a notification has be submitted to the chief architect of the municipality and to the relevant energy company.

15.1.2 Uncertainty of approval: Yes ☐ No x

Explain: In case of energy facilities for electrical energy production from RES under Art. 24, of the RES Act, namely: -PV with a total installed capacity of up to 30kW incl., planned to be built on roof and facade structures of buildings connected to the electricity distribution network; -PV with a total installed capacity of up to 200kW incl., planned to be built on roof and facade structures of buildings for production and storage activities connected to the power transmission or power distribution network in urbanized areas; - for PV, when submitting a request for connection, the investor declares that he will not use preferential prices for the produced energy; In these cases the regional operators have no legal basis to refuse their connection to the network

15.1.3 High costs: Yes ☐ No x

Explain:

15.1.4 Time consuming procedure: Yes ☐ No x

Explain:

The changes in the RES Act in 2022 define significantly easing the procedures for connection of new capacities with a total capacity of up to 1 MW (roof and facade structures), reducing the terms for research and issuing an opinion on the conditions and method of connection from 15 to 40 days.

15.1.5 Other: *Yes ☐* *No x*

Explain:

15.2 When operating the grid (allowance /licensing)?

Energy Law, Art. 39. (1) The activities subject to licensing under this law are:

1. production of electric and/or thermal energy;
2. transmission of electrical energy, thermal energy or natural gas;
3. distribution of electrical energy or natural gas;
4. storage of natural gas;
5. trade in electrical energy;
6. organizing an electric energy market;
7. public supply of electricity or natural gas;
9. transit transfer of natural gas;
10. supply of electrical energy or natural gas from final suppliers;
11. management of the electricity system;

(2) The license permits the implementation of some of the activities under para. 1 under the conditions specified therein and is an integral part of the decision to issue it.

(3) When to carry out any of the activities under para. 1, a license is issued before the construction of the energy object for the implementation of this activity, the license contains the conditions for the construction of this object and a deadline for starting the licensed activity.

No license is required for:

1. production of electrical energy by a person owning a plant with a total installed electrical capacity of up to 5 MW;
2. production of thermal energy by a person owning a plant with a total installed thermal capacity of up to 5 MW;
3. transfer of heat energy by a person owning a heat transmission network to which plants with a total installed capacity of up to 5 MW are connected;
4. production of thermal energy only for own consumption.

(5) When the person who applies for the issuance of a license for any of the activities under para. 1, items 1 - 3, 5 - 8, 10 and 11 or holds such a license, meets the requirements for a balancing group coordinator, the relevant license contains the rights and obligations related to the activities of a balancing group coordinator.

15.2.1 for System Operators: *Yes x* *No ☐*

Explain: See above

15.2.2 for prosumers/aggregators: *Yes ☐* *No x*

Explain: No definition of *prosumers/aggregators*

15.2.3 for BRP *Yes x* *No ☐*

Explain: See above

15.2.4 other: *Yes ☐* *No x*

Explain:

3. Flexibility Services in a Local Flexibility Market

Flexibility services are "the services provided by individual or aggregated (residential, commercial or industrial) prosumers to flexibility requesting parties (DSO, BRP, and TSO) or prosumers themselves, in reaction to external signals (price signal or activations), by modifying the consumption and/or production pattern, in order to facilitate the reliable and cost-effective management of variability and uncertainty in the electricity system"[1]. Flexibility services specifically focus on deliberate, time limited changes to the 'normal' energy profile[2].

LFM provides an opportunity for consumers to play a significant role in the operation of the electric grid by reducing or shifting their electricity usage in response to time-based rates or other forms of financial incentives. DR programs are currently being used by some electric system planners and operators, using mainly the flexibility provided by large industrial facilities connected to the high-voltage grid, as resource options for balancing supply and demand. Therefore, LFMs development will foster flexibility services at DSO level using residential and tertiary buildings flexibility (Look at Annex 2).

This questionnaire concerns the legal side of the applicability of the Flexibility Services in LFMs.

16 In your country, is there some regulation concerning the definitions below? If Yes, please, specify.

Congestion	Balancing	Demand Response
Included in the Rules for the management of the electricity system issued by the SCEWR	**"Balancing of a network user"** is compensation of the difference between the energy actually consumed/produced and the agreed according to the delivery schedules for each single market interval. **"Balancing group"** is an association of users that covers arbitrary parts of the electric power system, precisely defined in	Not specifically

[1] Nixiang, A. Flexibility services in Citizen Energy Communities (Master's thesis), University of Technology Eindhoven, the Netherlands. (2020)

[2] USEF White Paper: Energy and Flexibility Services, 2019

	relation to the places of exchange of electric energy with the electric transmission network and/or with other balancing groups." *Defined in the Rules for the management of the electricity system issued by the SCEWR*	
Ancillary service	Non-frequency ancillary service	Energy storage
yes		yes

17 What kinds of flexibility services are available in your country?

Constraint Management x Adequacy x Balancing x Wholesale x

17.1 Which participants are flexibility providers?

17.1.1 Constraint Management

Prosumers ☐ Aggregators x Large Generation x Other ☐

17.1.2 Adequacy

Prosumers ☐ Aggregators x Large Generation x Other ☐

17.1.3 Balancing

Prosumers ☐ Aggregators x Large Generation x Other ☐

17.1.4 Wholesale

Prosumers ☐ Aggregators x Large Generation x Other ☐

17.2 Which participants are flexibility buyers?

17.2.1 Constraint Management

TSO x DSO x Aggregators x BRP x Other ☐

17.2.2 Adequacy

TSO x DSO x Aggregators x BRP x Other ☐

17.2.3 Balancing

TSO x DSO x Aggregators x BRP x Other ☐

17.2.4 Wholesale

TSO x DSO x Aggregators x BRP x Other ☐

17.3 What are the procedures to sell flexibility?

17.3.1 Constraint Management

Open market x Tender process □ Bid □ Other □

17.3.2 Adequacy

Open market x Tender process □ Bid □ Other □

17.3.3 Balancing

Open Market x Tender process □ Bid □ Other □

17.3.4 Wholesale

Open Marketx□ Tender process □ Bid □ Other □

18 Can storage facilities (including Electric Vehicles) provide flexibility services in your country?

Yes □ No x

If yes, how?

19 Do the following flexibility services exist in your country?

19.1 Constraint Management

19.1.1 Voltage Control Yes x No ☐

19.1.2 Grid Capacity Management Yes x No ☐

19.1.3 Congestion Management Yes x No ☐

19.1.4 Controlled Islanding Yes x No ☐

19.1.5 Optional Downwards Flexibility Management Yes x No ☐

19.1.6 DSO Constraint Management (pre/post fault) Yes x No ☐

19.1.7 Other (please specify:) Yes ☐ No ☐

19.1.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.2 Adequacy

19.2.1 Capacity payment Yes x No ☐

19.2.2 Capacity Market Yes x No ☐

19.2.3 Strategic reserve Yes x No ☐

19.2.4 Hedging Yes x No ☐

19.2.5 Other (please specify) Yes ☐ No ☐

19.2.6 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.3 Balancing

19.3.1 Dynamic Containment Yes x No ☐

19.3.2 Frequency Containment Reserve (FCR) Yes x No ☐

19.3.3 Automatic Frequency Restoration Reserve (aFRR) Yes x No ☐

19.3.4 Manual Frequency Restoration Reserve (mFRR) Yes x No ☐

19.3.5 Replacement Reserve (RR) Yes x No ☐

19.3.6 other (please specify:) Yes ☐ No ☐

19.3.7 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.4 Wholesale

19.4.1 Day-ahead optimization Yes x No ☐

19.4.2 Intraday optimization Yes x No ☐

19.4.3 Self/passive balancing Yes x No ☐

19.4.4 Generation optimization Yes x No ☐

19.4.5 Exceeding Maximum Export/Import Capacity Yes x No ☐

19.4.6 Offsetting Yes x No ☐

19.4.7 Other (please specify:) Yes ☐ No ☐

19.4.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.5 Local Optimization

19.5.1 ToU Optimization Yes ☐ No x

19.5.2 kWmax control Yes x No ☐

19.5.3 Self-balancing Yes ☐ No x

19.5.4 Emergency power supply Yes x No ☐

19.5.5 Smart Contracts Yes x No ☐

19.5.6 Collective Self-consumption Yes ☐ No x

19.5.7 Transmission Charge Management Yes x No ☐

19.5.8 Distribution Charge Management Yes x No ☐

19.5.9 Other (please specify) Yes ☐ No ☐

19.5.10 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

20 Does the regulation in your country allow net-metering?

Yes ☐ No x

Explain.

21 Are there any legal incentives and benefits in your national/ regional/ local regulations that act as stimuli to the uptake of LFMs?

Yes ☐ No x

Explain.

4. Blockchain and Data Management in LFMs

1. Blockchain Technology & Smart Contract in Energy Services

Blockchain technology has the potential to transform the energy sector. Of the many use cases for blockchain, energy and sustainability are often less recognized. The energy industry has been consistently catalyzed by innovations including rooftop solar, electric vehicles, and smart metering.

The blockchain presents itself as the next emerging technology to spur growth in the energy sector through smart contracts and systems interoperability. A joint report issued in 2018 by the WEF, Stanford Woods Institute for the Environment, and PwC identified more than 65 existing and emerging blockchain use-cases for the environment. These use cases include new business models for energy markets, real-time data management, and moving carbon credits or renewable energy certificates onto the blockchain; the blockchain also offers unique solutions for renewable energy distribution. A range of blockchain products can be tailored to address various energy or sustainability applications, including the following: wholesale electricity distribution; peer-to-peer energy trading; electricity data management; commodity trading; utility providers; etc.

22 Does the regulation in your country allow the use of blockchain or other digital currencies in the energy sector?

Yes x No x

If yes, please, specify. At the moment in Bulgaria, there is no formal legislation on the use of decentralized ledger technology for the issuance, acquisition and settlement of crypto-assets that can be accepted for financial instruments" The latest technologies are coming to the Bulgarian government through the first amendments to the Law on the Protection of Financial Instruments (FIS), prepared by the Ministry of Finance still not approved by the Parliament. The law designates the Commission for Financial Supervision as the competent body to monitor the implementation of the market infrastructures, based on the decentralized ledger technology, which has the right to issue and take away their permits.

23 Do transactions concerning the flexibility services use Blockchain technology in your country?

Yes ☐ No x

If yes, please, specify.

24 Is there any provision or regulation that presents legal risk and behaves as a barrier to the use of Blockchain technology in flexibility services for LFMs?

Yes ☐ No x

If Yes, please, specify. Lack of internal capacity and regulatory issues are blocking future steps towards blockchain implementation

25 Does your country recognize smart contracts as legal contracts?

Yes x No ☐

If Yes, please, specify. ESCO contracts Other if not contradictory to the present legal regulation

2. Data Management & Protection

According to the General Data Protection Regulation 2016/679, data aggregation shouldn't violate the privacy and security of the customers. This regulation also removes obstacles to ensure a better mobility of personal data while protecting natural persons. LFMs process energy consumption data and shouldn't infer personal information especially when sharing data with third parties.

26 Does the regulation in your country guarantee the security of consumers' consumption data?

Yes x No ☐

If Yes, please, specify. The protection of personal data is based on the Law on Protection of Personal Data and all applicable by-laws that relate to Data Processing and Protection and the General Data Protection Regulation (EU) 2016/679.

27 In your country, how is the security of the grid? Are there any regulations about cybersecurity?

Explain. There is a Law on Cyber Security, SG. No. 94 of November 13, 2018

28 How is your country managing smart metering data?

Centralized data hub x Decentralized data infrastructure ☐

What are the risks and benefits of the system in place?

Risks:

The centralized model assumes the connection of all clients to the server where data is stored. Therefore, all information go through the host computer and in case the server resources are limited, it can only work effectively with a certain number of network members.

Illegal use of the large information arrays by persons with access to the information arrays.

Benefits:

Coverage of large data sets; Fast import of new data; Real-time processing of information in short deadlines; Analyzing different types of information; Revealing regularities between different sources and arrays of data; Real-time information analysis can be used to improve the systems.

5. Summary

29 Can you give recommendations and proposals for changes in the regulation in order to overcome the perceived legal risks and barriers in your country concerning

29.1 Creation of a LFM

29.2 Uptake of the flexibility services

Introduction of net and virtual energy metering

29.3 Use of blockchain technology for LFMs

29.4 Data Management

29.5 Other

30 Can you give recommendations and proposals for changes in the regulation in order to better foster Local Flexibility Markets uptake, flexibility services and blockchain technologies use for LFMs in your country; thus, creating incentives for their development?

ANNEX 1

Aggregation	***Distribution System Operator (DSO)***	***Transmission System Operator (TSO)***	***Balance Responsible Party (BRP)***
Art. 2. (18) of IEMD 2019/944	*Art. 2. (29) of IEMD 2019/944*	*Art. 2. (35) of IEMD 2019/944*	*Art.2. (14) of IEMD 2019/943*
‘aggregation’ means a function performed by a natural or legal person who combines multiple customer loads or generated electricity for sale, purchase or auction in any electricity market	‘DSO’ means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	‘TSO’ means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity	‘BRP’ means a market participant or its chosen representative responsible for its imbalances in the electricity market

Self-consumer	*Active customer*	*Renewable Energy Community(REC)*	*Citizens Energy Community (CEC)*
Art. 21. of REDII 2018/2001	Art.15 IEMD of 2019/944	Art. 22. of REDII 2018/2001	Art.16 of IEMD 2019/944
'Renewables self-consumer' means a final customer operating within its premises located within confined boundaries or, where permitted by a MS, within other premises, who generates RE electricity for its own consumption, and who may store or sell self-generated RE electricity, provided that, for a non-household REs self-consumer, those activities do not constitute its primary commercial or professional activity.	'Active customer' means a final customer, or a group of jointly acting final customers, who consumes or stores electricity generated within its premises located within confined boundaries or, where permitted by a MS, within other premises, or who sells self-generated electricity or participates in flexibility or EE schemes, provided that those activities do not constitute its primary commercial or professional activity;	'REC' means a legal entity: (a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the RE projects that are owned and developed by that legal entity; (b) the shareholders or members of which are natural persons, SMEs or local authorities, incl. municipalities; (c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits.	'CEC' means a legal entity that: (a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, incl. municipalities, or small enterprises; (b) has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; (c) may engage in generation, incl. from RES, distribution, supply, consumption, aggregation, energy storage, EE services or charging services for electric vehicles or provide other energy services to its members or shareholders.

ANNEX 2

Congestion	*Balancing*	*Demand Response*
Art. 2. (4) of IEMD 2019/943	*Art. 2. (10) of IEMD 2019/943*	*Art. 2. (20) of IEMD 2019/944*
‘congestion’ means a situation in which all requests from market participants to trade between network areas cannot be accommodated because they would significantly affect the physical flows on network elements which cannot accommodate those flows	‘balancing’ means all actions and processes, in all timelines, through which transmission system operators ensure, in an ongoing manner, maintenance of the system frequency within a predefined stability range and compliance with the amount of reserves needed with respect to the required quality	‘demand response’ means the change of electricity load by final customers from their normal or current consumption patterns in response to market signals, including in response to time-variable electricity prices or incentive payments, or in response to the acceptance of the final customer's bid to sell demand reduction or increase at a price in an organised market as defined in point (4) of Article 2 of Commission Implementing Regulation (EU) No 1348/2014 (17), whether alone or through aggregation

Ancillary service	***Non-frequency ancillary service***	***Energy storage***
Art. 2. (48) of IEMD 2019/944	*Art. 2. (49) of IEMD 2019/944*	*Art. 2. (59) of IEMD 2019/944*
‘Ancillary service’ means a service necessary for the operation of a transmission or distribution system, including balancing and non-frequency ancillary services, but not including congestion management	‘non-frequency ancillary service’ means a service used by a transmission system operator or distribution system operator for steady state voltage control, fast reactive current injections, inertia for local grid stability, short-circuit current, black start capability and island operation capability	‘Energy storage’ means, in the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical energy or use as another energy carrier

THANK YOU FOR ANSWERING THE QUESTIONS!

2. France

DEAR PARTICIPANT,

The following questionnaire is developed under the DE-RISK project in order for a thorough study to be performed to provide an overview of how the regulatory environment in ten European countries and at European Level evolved. The results of the survey will contribute to the Regulatory Impact Analysis (RIA) to deeply assess the current regulatory framework that is enabling or acting as a barrier for the large deployment of Local Flexibility Markets (LFM) and the potential flexibility services.

We invite you to complete this survey to collect your experience and views regarding:

- Awareness of European, national and local policies regarding the regulation on Local Flexibility Markets
- Perceived legal risks and benefits
- Impact of the regulation - barriers and incentives
- Legal background of innovative technologies - block chain transactions and flexibility services
- Perceived legal risks and benefits
- Recommendations about future legal development of the LFM in your country and at European Level.

ABOUT DE-RISK PROJECT

This survey is being conducted as part of the DE-RISK Project funded by the European Union (EU) under Horizon Europe program.. The DE-RISK project will support the market uptake of Renewable Energy Sources (RES) by de-risking the adoption of Local Flexibility Markets to increase the RES hosting capacity of the distribution network.

ABOUT YOUR PARTICIPATION

Your participation in this study is fully voluntary and all data collected will be treated confidentially. Participation is free and there are no mandatory requirements. The research outputs resulting from this work will only include collated data, without the possibility for anyone to identify your individual answers. Your contact details will be used on a need-to-know basis and will be strictly confidential until the end of the project’s lifetime. By submitting this form:

- you confirm that you have read and understood this information.
- you agree to participate in this research study and your answers to be included in our analysis and resulting from its research publications.
- you agree that we will process the data in line with DE-RISK project policy of confidentiality that is in accordance with GDPR 2016/679.

Country:	**FRANCE**
Organization:	**GRIDPOCKET**
Name of expert answering the survey:	**Filip Gluszak, Jean-Baptiste Bernard, Jean-Christophe Mouton, Guillaume Pilot**
Contact details: (mail, phone, other)	**filip.gluszak@gridpocket.com, jean-baptiste.bernard@gridpocket.com, jean-christophe.mouton@gridpocket.com, guillaume.pilot@gridpocket.com**
Date:	**01/03/2023**

1. LFM Regulation - Definitions of Market Actors and Market Characteristics

The European Commission promotes flexibility markets as they can contribute to the European Union in becoming a climate-neutral continent by 2050. The new market development is taking place in Europe with the transposition in the different Member States of the Clean Energy Package (specifically the Electricity directive EU 944/2019) with new roles for DSOs entering into new activity areas. DSO-TSO cooperation evolves in a beneficial way for energy markets and for consumers as well. Governance of how DSOs and TSOs interact and engage in network planning, as well as arrangements to facilitate effective coordination for system operation, especially for flexibility, have been the key regulatory concerns in this area for the last few years.

Local flexibility markets allow the use of flexibility at local level by distribution and transmission system operators. This means using flexibility from decentralized energy resources (DERs) to solve congestion management problems, minimize power outages and avoid grid expansions. Flexibility markets help energy networks to monitor energy flows and create market signals to motivate changes in energy supply and demand, integrating smart meters and appliances, renewable energy resources and energy efficient resources accordingly. The Clean Energy Package defines and offers an enabling legislative framework for Local Energy Markets participants. The analysis of the LFM regulation will be conducted including some of the following topics that characterize the market:

LFM topic	**Sub-topic**
Market actors	• Aggregator • Balance Responsible Party (BRP) • Citizen energy communities • Distribution System Operator (DSO) • Market operator
Market and product characteristics	• Market entry and exit and market platforms • Product characteristics (e.g., prequalification, standardization of FS)
Infrastructural issues	• Smart metering systems • Energy storage • Network expansion
Contract, bidding, and settlement	• Contract. Bidding, billing, and settlement
Data security issues	• Access to data, data security, privacy protection

The Clean Energy for all Europeans Package defines new ground for consumers by recognizing under EU law, the rights of citizens and communities to engage directly in the energy sector. It also sets out legal frameworks for LFMs. Participants of the whole DR value chain are defined in the laws of the Clean Energy Package. The revised Renewable Energy Directive (EU) 2018/2001 sets the framework for 'renewable energy communities' and the revised Internal Electricity Market Directives (EU) 2019/943 & 2019/944 introduce new roles and responsibilities for 'citizen energy communities', 'aggregation', 'distribution system operator', 'transmission system operator' and 'balance responsible party' in the energy system covering all types of electricity. (Look at Annex 1)

1. *Are the Directives on common rules for the internal market for electricity 2019/943 & 2019/944 already transposed into your national legislation?*

Yes X **No** ☐ **Partially** ☐

Is the revised Renewable Energy Directive (EU) 2018/2001 already transposed into your national legislation? **Yes**

X **No** ☐ **Partially** ☐

*1.1. If your answer is **Yes,** indicate the national / regional / local legislation that defines it and explain it:*

IEMD 2019/943: https://www.legifrance.gouv.fr/dossierlegislatif/JORFDOLE000043212853/ *Ordonnance n° 2021-237 du 3 mars 2021 portant transposition de la directive (UE) 2019/944 du Parlement européen et du Conseil du 5 juin 2019 concernant des règles communes pour le marché intérieur de l'électricité et modifiant la directive 2012/27/UE, et mesures d'adaptation au règlement (UE) 2019/943 du Parlement européen et du Conseil du 5 juin 2019 sur le marché intérieur de l'électricité*
IEMD 2019/944: https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000043213227/

Directive (UE) 2019/944 du Parlement européen et du Conseil du 5 juin 2019 concernant des règles communes pour le marché intérieur de l'électricité et modifiant la directive 2012/27/UE (refonte)
REDII 2018/2001: https://www.legifrance.gouv.fr/dossierlegislatif/JORFDOLE000043212476/   *Ordonnance n° 2021-235 du 3 mars 2021 portant transposition du volet durabilité des bioénergies de la directive (UE) 2018/2001 du Parlement européen et du Conseil du 11 décembre 2018 relative à la promotion de l'utilisation de l'énergie produite à partir de sources renouvelables*

1.2. *If your answer is **Partially,** and there is some regulation concerning the definitions below, please, specify:*

For example: Explain if regulation is available, or concepts are under development, or discussions are ongoing, etc.

Aggregation	Distribution System Operator (DSO)	Transmission System Operator (TSO)	Balance Responsible Party (BRP)

Self-consumers	Active consumers	Renewable energy communities (REC)	Citizen energy communities (CEC)

1.3. Are there other LFM participants in your country? How are they defined?

NRA ☐ Suppliers ☐ Traders ☐ Other ☐

2. How do DSOs and TSOs cooperate to organize the flexibility market?

ENEDIS (DSO) and RTE (TSO) work together to organize the flexibility market through call for tenders to recruit companies that could modulate their energy consumption or production. These types of calls of tenders started in 2020 and concerns several dizains of localizations per call. There is an economic contribution for companies that participate to these projects.

ENEDIS and RTE also propose the “Offre de Raccordement intelligente”: Electrcity producers can join the grid with a low cost if they guarantee that they can modulate the produced energy (in the limit of 5%) and can permanently guarantee the injection of at least 70% of the demanded power.

Collective autoconsumption is possible for groups of prosumers (grouping into a moral user) who would complete files to compete legally and technically with constraints asked by ENEDIS.

Finally, individual autoconsumption is possible for subscribed power < 36 kVA with a simplified procedure.

3. *How is the Local Flexibility Market organized in your country?*

Platform ☐ Aggregation X Other model ☐

ENEDIS/RTE are supervising all the Local Flexibility Market operations in France and needs outside services to assure local flexibility markets.

4. *Are there any legislative barriers which block the reinforcement of interactions between LFM's participants and slow down the development of LFMs? Please, indicate below:*

The procedure to integrate LFM is completely controlled by ENEDIS/RTE which ensure that LFM's participants can technically assume their roles to stabilize the grid.

5 Are there national regulations concerning the market products?

For example: Explain if regulations or guidelines are available, or discussions are ongoing, etc.

5.1. Market entry and exit: *Yes X* *No ☐*

Explain: LFM is linked to ENEDIS offers or needs ENEDIS validation.

5.2. Market Product characteristics (e.g, Are there guides and regulations on product prequalification, standardization and baseline):

Yes X No ☐

Explain: Requirements are indicated by ENEDIS based on the different possible markets.

6 Infrastructural issues concerning the LFMs.

6.1 Regulation on Smart Metering Systems. Are they adapted to the LFMs? Are they installed?

YesX No ☐

Smart meters are present in almost 80% of French electricity sites. They give more information to the DSO that can use them to limit congestion of the grid by controlling flexibility.

6.2 Regulation on Energy Storage: How is energy storage defined in your regulation? Is there any guideline, or discussions ongoing, etc.?

Yes X No ☐

Articles exist that explain energy storage regulation: https://www.legifrance.gouv.fr/codes/section_lc/LEGITEXT000023983208/LEGISCTA000043211888/

7 Contract, bidding, and settlement. Explain if any specific regulations or guidelines for LFM are established.

Yes X No ☐

Regulation and guidelines are proposed by ENEDIS. A contract with the flexibility role of the prosumer is provided after requirements are verified for the prosumer.

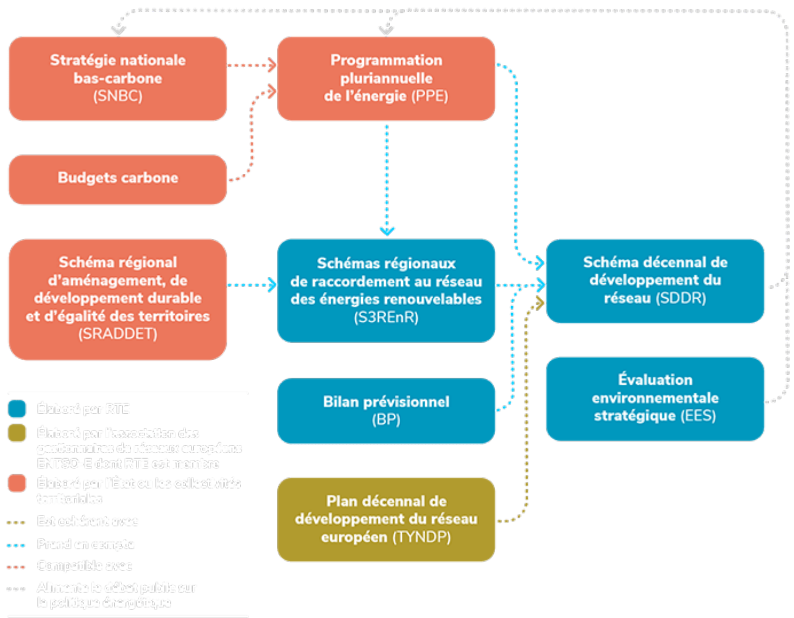
According to IEMD 2019/944 the network development plan published by the DSOs should provide transparency on the medium and long-term flexibility services and shall set out the planned investments for the next five-to-ten years, with particular emphasis on the main distribution infrastructure which is required in order to connect new generation capacity and new loads, including recharging points for electric vehicles. The network development plan shall also include the use of demand response, energy efficiency, energy storage facilities or other resources that the distribution system operator is to use as an alternative to system expansion.

8 Is there any legislation about development plans for the electricity network in your country?

Yes X **No** ☐

8.1 If your answer is Yes, indicate the legal regulation that defines it, its statement and how flexibility is included into it.

In 2019, a decennial development plan was defined and extended for the period 2021-2035. (SDDR 2019)



Source: https://www.rte-france.com/analyses-tendances-et-prospectives/le-schema-decennal-de-developpement-du-reseau

The law of the 10th of March 2023 has been done to accelerate the development of production plants of renewable energies in the next years. It was done in order to (1) Schedule renewable energy projects, (2) Simplify the procedures (3) Ease places for sun and wind power stations, (4) Increase the share of renewable energy values.

Source: https://www.vie-publique.fr/loi/286391-energies-renouvelables-loi-du-10-mars-2023

8.2 Are there any stimuli or incentives to create flexibility or/and to include flexibility in network development plans? Please, indicate below:

Local flexibility is explained with analyses on uncertainties, renewable energy localization or environmental issues. Points are made on adapting the grid to the new mix with renewable energies. Especially, flexibility and punctual balancing are described. 0.3% of volume reduction could be enough to improve considerably the quality of the grid.

Flexibility participants would be rewarded by RTE in exchange of cuts in their consumption.

8.3 Regulation on Network Expansion in compliance with the IEMD 2019/944?

2. *Yes X* *No ☐*

3.

Expansion should be limited and flexibility/energy storage should be encouraged:

https://aida.ineris.fr/reglementation/directive-ue-ndeg-2019944-050619-concernant-regles-communes-marche-interieur

4.

9 Can you note if there are any provisions or regional/local regulations that present legal risks and behave as barriers to the development of Local Energy markets:

The French electricity grid is (on average) 50 years old which is more than everywhere in Europe. This network needs to be modernized with the risks that congestion costs would increase. The SDDR 2019 estimates the investment costs to adapt the grid to the energy transition at 500 Millions of euros per year.

10 Can you describe any act provisions or regional / local regulations that bring benefits and behave as enablers to LFMs:

Not known at our knowledge (the grid being managed by RTE and ENEDIS)

11 Are there any administrative and bureaucratic procedures that hinder LFMs' development and play a restrictive role in their broader application? If yes, please, explain.

In general, every participant to LFM needs to validate administratively its participation with ENEDIS. This can be simple (client prosumers) or complex, following a centralized ENEDIS proposal to recruit participants for HT companies.

12 Would you suggest what kind of legal provisions in your country will contribute most to the activation of the interested parties (citizens, commercial and industrial players) to participate in LFMs?

Encouraging RES development would increase LFM interest in France.

13 Can you define any recommendations for improvement of the legislation concerning LFMs in your country or on EU level?

Increasing the number of recruitments of HT companies to local flexibility, increasing promotion of it and development of RES.

2. Policy and Regulatory Framework for LFMs Uptake

14 Does your National (Regional / Local) Energy Action Plans include targets for development and spread of LFMs?

Yes in the SDDR 2019 (https://assets.rte-france.com/prod/public/2020-07/Sch%C3%A9ma%20d%C3%A9cennal%20de%20d%C3%A9veloppement%20de%20r%C3%A9seau%202019%20-%20Synth%C3%A8se.pdf), it is explained the keys to spread LFMs (page 37):

- Use of smart grid solutions to quickly reduce energy peaks using LFMs
- Multiplying LFM initiatives to be able to stabilize grids in critical times even for a short period

15 What kind of bureaucratic and administrative barriers LFMs can experience

15.1 When flexibility producers connect to the grid?

15.1.1 Complicated application procedure: Yes X No ☐

Government is helping the development of renewable energies: https://www.ecologie.gouv.fr/dispositifs-soutien-aux-energies-renouvelables - Easy at an individual level (<36 kVA) - Based on call of tenders at a high production level

15.1.2 Uncertainty of approval: Yes X No ☐

For HT users

15.1.3 High costs: Yes ☐ No X

based on the amount of electricity possibly reinjected to the grid

15.1.4 Time consuming procedure: Yes X No ☐

Based on RTE work that could be necessary to re-dimension the grid

15.1.5 Other: Yes ☐ No ☐

Explain:

15.2 When operating the grid (allowance /licensing)?

15.2.1 for System Operators: *Yes ☐ No X*

Explain: operating the grid is centralized in France

15.2.2 for prosumers/aggregators: *Yes X No ☐*

Depends on the specific cases: Easy for residential prosumers to connect but complicated for high tension prosumers

15.2.3 for BRP *Yes X No ☐*

Explain: Flexibility can be taken as a constraint that can shift schedules and deliveries

15.2.4 other: *Yes ☐ No ☐*

Explain:

3. Flexibility Services in a Local Flexibility Market

Flexibility services are "the services provided by individual or aggregated (residential, commercial or industrial) prosumers to flexibility requesting parties (DSO, BRP, and TSO) or prosumers themselves, in reaction to external signals (price signal or activations), by modifying the consumption and/or production pattern, in order to facilitate the reliable and cost-effective management of variability and uncertainty in the electricity system"[1]. Flexibility services specifically focus on deliberate, time limited changes to the 'normal' energy profile[2].

LFM provides an opportunity for consumers to play a significant role in the operation of the electric grid by reducing or shifting their electricity usage in response to time-based rates or other forms of financial incentives. DR programs are currently being used by some electric system planners and operators, using mainly the flexibility provided by large industrial facilities connected to the high-voltage grid, as resource options for balancing supply and demand. Therefore, LFMs development will foster flexibility services at DSO level using residential and tertiary buildings flexibility (Look at Annex 2).

This questionnaire concerns the legal side of the applicability of the Flexibility Services in LFMs.

16 In your country, is there some regulation concerning the definitions below? If Yes, please, specify.

Congestion	Balancing	Demand Response
Abrogé par Ordonnance n°2011-504 du 9 mai 2011 - art. 4 : Public electricity	Balancing should be used to guarantee electricity on all the French territory.	Flexibility should be encouraged (directive 2019/944)

[1] Nixiang, A. Flexibility services in Citizen Energy Communities (Master's thesis), University of Technology Eindhoven, the Netherlands. (2020)

[2] USEF White Paper: Energy and Flexibility Services, 2019

service should guarantee electricity on all the French territory,		
Ancillary service	Non-frequency ancillary service	Energy storage
Public electricity service should guarantee electricity on all the French territory,	Public electricity service should guarantee electricity on all the French territory,	https://www.legifrance.gouv.fr/codes/section_lc/LEGITEXT000023983208/LEGISCTA000043211888/ Public electricity should not on, develop or exploit storage installations

17 What kinds of flexibility services are available in your country?

Constraint Management X Adequacy ☐ Balancing X Wholesale ☐

17.1 Which participants are flexibility providers?

17.1.1 Constraint Management

Prosumers X Aggregators X Large Generation X Other ☐

17.1.2 Adequacy

Prosumers ☐ Aggregators ☐ Large Generation ☐ Other ☐

17.1.3 Balancing

Prosumers X Aggregators X Large Generation X Other □

17.1.4 Wholesale

Prosumers □ Aggregators □ Large Generation □ Other □

17.2 Which participants are flexibility buyers?

17.2.1 Constraint Management

TSO X DSO X Aggregators □ BRP □ Other □

17.2.2 Adequacy

TSO □ DSO □ Aggregators □ BRP □ Other □

17.2.3 Balancing

TSO X DSO X Aggregators □ BRP □ Other □

17.2.4 Wholesale

TSO □ DSO □ Aggregators □ BRP □ Other □

17.3 What are the procedures to sell flexibility?

17.3.1 Constraint Management

Open market ☐ Tender process X Bid ☐ Other ☐

17.3.2 Adequacy

Open market ☐ Tender process ☐ Bid ☐ Other ☐

17.3.3 Balancing

Open Market ☐ Tender process X Bid ☐ Other ☐

17.3.4 Wholesale

Open Market ☐ Tender process ☐ Bid ☐ Other ☐

18 Can storage facilities (including Electric Vehicles) provide flexibility services in your country?

Yes X No ☐

Prosumers can be paid to reinject energy from storage to the grid

19 Do the following flexibility services exist in your country?

19.1 Constraint Management

19.1.1 Voltage Control Yes X No ☐

19.1.2 Grid Capacity Management Yes X No ☐

19.1.3 Congestion Management Yes X No ☐

19.1.4 Controlled Islanding Yes ☐ No ☐

19.1.5 Optional Downwards Flexibility Management Yes ☐ No ☐

19.1.6 DSO Constraint Management (pre/post fault) Yes ☐ No ☐

19.1.7 Other (please specify:) Yes ☐ No ☐

19.1.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes X No ☐

Explain: Only processed at a national level

19.2 Adequacy

19.2.1 Capacity payment Yes ☐ No ☐

19.2.2 Capacity Market Yes ☐ No ☐

19.2.3 Strategic reserve Yes ☐ No ☐

19.2.4 Hedging Yes ☐ No ☐

19.2.5 Other (please specify) Yes ☐ No ☐

19.2.6 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.3 Balancing

19.3.1 Dynamic Containment Yes ☐ No ☐

19.3.2 Frequency Containment Reserve (FCR) Yes ☐ No ☐

19.3.3 Automatic Frequency Restoration Reserve (aFRR) Yes ☐ No ☐

19.3.4 Manual Frequency Restoration Reserve (mFRR) Yes ☐ No ☐

19.3.5 Replacement Reserve (RR) Yes ☐ No ☐

19.3.6 other (please specify:) Yes ☐ No ☐

19.3.7 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.4 Wholesale

19.4.1 Day-ahead optimization Yes ☐ No ☐

19.4.2 Intraday optimization Yes ☐ No ☐

19.4.3 Self/passive balancing Yes ☐ No ☐

19.4.4 Generation optimization Yes ☐ No ☐

19.4.5 Exceeding Maximum Export/Import Capacity Yes ☐ No ☐

19.4.6 Offsetting Yes ☐ No ☐

19.4.7 Other (please specify:) Yes ☐ No ☐

19.4.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.5 Local Optimization

19.5.1 ToU Optimization Yes ☐ No ☐

19.5.2 kWmax control Yes ☐ No ☐

19.5.3 Self-balancing Yes ☐ No ☐

19.5.4 Emergency power supply Yes ☐ No ☐

19.5.5 Smart Contracts Yes ☐ No ☐

19.5.6 Collective Self-consumption Yes ☐ No ☐

19.5.7 Transmission Charge Management Yes ☐ No ☐

19.5.8 Distribution Charge Management Yes ☐ No ☐

19.5.9 Other (please specify) Yes ☐ No ☐

19.5.10 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

20 Does the regulation in your country allow net-metering?

Yes ☐ No ☐

Explain.

21 Are there any legal incentives and benefits in your national/ regional/ local regulations that act as stimuli to the uptake of LFMs?

Yes ☐ No ☐

Explain.

4. Blockchain and Data Management in LFMs

1. Blockchain Technology & Smart Contract in Energy Services

Blockchain technology has the potential to transform the energy sector. Of the many use cases for blockchain, energy and sustainability are often less recognized. The energy industry has been consistently catalyzed by innovations including rooftop solar, electric vehicles, and smart metering. The blockchain presents itself as the next emerging technology to spur growth in the energy sector through smart contracts and systems interoperability. A joint report issued in 2018 by the WEF, Stanford Woods Institute for the Environment, and PwC identified more than 65 existing and emerging blockchain use-cases for the environment. These use cases include new business models for energy markets, real-time data management, and moving carbon credits or renewable energy certificates onto the blockchain; the blockchain also offers unique solutions for renewable energy distribution. A range of blockchain products can be tailored to address various energy or sustainability applications, including the following: wholesale electricity distribution; peer-to-peer energy trading; electricity data management; commodity trading; utility providers; etc.

22 Does the regulation in your country allow the use of blockchain or other digital currencies in the energy sector?

Yes X No ☐

Do not see for which reason it would be forbidden

23 Do transactions concerning the flexibility services use Blockchain technology in your country?

Yes X No ☐

SolarCoin (https://solarcoin.org/) is a virtual money recognized by the Agence internationale de l'énergie renouvelable (IRENA).

24 Is there any provision or regulation that presents legal risk and behaves as a barrier to the use of Blockchain technology in flexibility services for LFMs?

Yes ☐ No X

If Yes, please, specify.

25 Does your country recognize smart contracts as legal contracts?

Yes X No ☐

Electronic contract is defined by the article 112-1 of the civil code.

2. Data Management & Protection

According to the General Data Protection Regulation 2016/679, data aggregation shouldn't violate the privacy and security of the customers. This regulation also removes obstacles to ensure a better mobility of personal data while protecting natural persons. LFMs process energy consumption data and shouldn't infer personal information especially when sharing data with third parties.

26 Does the regulation in your country guarantee the security of consumers' consumption data?

Yes X No □

Yes based on GDPR

27 In your country, how is the security of the grid? Are there any regulations about cybersecurity?

No specific regulation on energy but security should be optimal based on GDPR

28 How is your country managing smart metering data?

Centralized data hub X Decentralized data infrastructure □

What are the risks and benefits of the system in place?

Risks: Cybersecurity risks are higher Benefits: Better control of the grid, better information for the end-users

5. Summary

29 Can you give recommendations and proposals for changes in the regulation in order to overcome the perceived legal risks and barriers in your country concerning

29.1 Creation of a LFM

Should not be so centralized

29.2 Uptake of the flexibility services

Better information available / introduction of dynamic prices

29.3 Use of blockchain technology for LFMs

Could be encouraged but no information available

29.4 Data Management

Adequate legal framework with the GDPR

29.5 Other

30 *Can you give recommendations and proposals for changes in the regulation in order to better foster Local Flexibility Markets uptake, flexibility services and blockchain technologies use for LFMs in your country; thus, creating incentives for their development?*

Less centralization : allow municipalities /local authorities to manage LFM implementation *Better communication + citizen incentives* *Coercive regulation to implement PV on every new building* *relocate the production of solar panels in France and Europe*

ANNEX 1

Aggregation	***Distribution System Operator (DSO)***	***Transmission System Operator (TSO)***	***Balance Responsible Party (BRP)***
Art. 2. (18) of IEMD 2019/944	*Art. 2. (29) of IEMD 2019/944*	*Art. 2. (35) of IEMD 2019/944*	*Art.2. (14) of IEMD 2019/943*
'aggregation' means a function performed by a natural or legal person who combines multiple customer loads or generated electricity for sale, purchase or auction in any electricity market	'DSO' means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for	'TSO' means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for	'BRP' means a market participant or its chosen representative responsible for its imbalances in the electricity market

	ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity	

Self-consumer	***Active customer***	***Renewable Energy Community(REC)***	***Citizens Energy Community (CEC)***
Art. 21. of REDII 2018/2001	Art.15 IEMD of 2019/944	Art. 22. of REDII 2018/2001	Art.16 of IEMD 2019/944
‘Renewables self-consumer’ means a final customer operating within its premises located within confined boundaries or, where permitted by a MS, within other premises, who generates RE electricity for its own consumption, and who may store or sell self-generated RE electricity, provided that, for a non-household REs self-consumer, those activities	‘Active customer’ means a final customer, or a group of jointly acting final customers, who consumes or stores electricity generated within its premises located within confined boundaries or, where permitted by a MS, within other premises, or who sells self-generated electricity or participates in flexibility	‘REC’ means a legal entity: (a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the RE projects that are owned and developed by that legal entity; (b) the shareholders or members of which are natural persons, SMEs or local authorities, incl. municipalities;	‘CEC’ means a legal entity that: (a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, incl. municipalities, or small enterprises; (b) has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits;

do not constitute its primary commercial or professional activity.	or EE schemes, provided that those activities do not constitute its primary commercial or professional activity;	(c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits.	(c) may engage in generation, incl. from RES, distribution, supply, consumption, aggregation, energy storage, EE services or charging services for electric vehicles or provide other energy services to its members or shareholders.

ANNEX 2

Congestion	***Balancing***	***Demand Response***
Art. 2. (4) of IEMD 2019/943	*Art. 2. (10) of IEMD 2019/943*	*Art. 2. (20) of IEMD 2019/944*
‘congestion’ means a situation in which all requests from market participants to trade between network areas cannot be accommodated because they would significantly affect the physical flows on network elements which cannot accommodate those flows	‘balancing’ means all actions and processes, in all timelines, through which transmission system operators ensure, in an ongoing manner, maintenance of the system frequency within a predefined stability range and compliance with the amount of reserves needed with respect to the required quality	‘demand response’ means the change of electricity load by final customers from their normal or current consumption patterns in response to market signals, including in response to time-variable electricity prices or incentive payments, or in response to the acceptance of the final customer's bid to sell demand reduction or increase at a price in an organised market as defined in point (4) of Article 2 of Commission Implementing Regulation (EU)

		No 1348/2014 (17), whether alone or through aggregation

Ancillary service	***Non-frequency ancillary service***	***Energy storage***
Art. 2. (48) of IEMD 2019/944	*Art. 2. (49) of IEMD 2019/944*	*Art. 2. (59) of IEMD 2019/944*
'Ancillary service' means a service necessary for the operation of a transmission or distribution system, including balancing and non-frequency ancillary services, but not including congestion management	'non-frequency ancillary service' means a service used by a transmission system operator or distribution system operator for steady state voltage control, fast reactive current injections, inertia for local grid stability, short-circuit current, black start capability and island operation capability	'Energy storage' means, in the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical energy or use as another energy carrier

THANK YOU FOR ANSWERING THE QUESTIONS!

3. Greece

DEAR PARTICIPANT,

The following questionnaire is developed under the DE-RISK project in order for a thorough study to be performed to provide an overview of how the regulatory environment in ten European countries and at European Level evolved. The results of the survey will contribute to the Regulatory Impact Analysis (RIA) to deeply assess the current regulatory framework that is enabling or acting as a barrier for the large deployment of Local Flexibility Markets (LFM) and the potential flexibility services.

We invite you to complete this survey to collect your experience and views regarding:

- Awareness of European, national and local policies regarding the regulation on Local Flexibility Markets
- Perceived legal risks and benefits
- Impact of the regulation - barriers and incentives
- Legal background of innovative technologies - block chain transactions and flexibility services
- Perceived legal risks and benefits
- Recommendations about future legal development of the LFM in your country and at European Level.

ABOUT DE-RISK PROJECT

This survey is being conducted as part of the DE-RISK Project funded by the European Union (EU) under Horizon Europe program. The DE-RISK project will support the market uptake of Renewable Energy Sources (RES) by de-risking the adoption of Local Flexibility Markets to increase the RES hosting capacity of the distribution network.

ABOUT YOUR PARTICIPATION

Your participation in this study is fully voluntary and all data collected will be treated confidentially. Participation is free and there are no mandatory requirements. The research outputs resulting from this work will only include collated data, without the possibility for anyone to identify your individual answers. Your contact details will be used on a need-to-know basis and will be strictly confidential until the end of the project’s lifetime. By submitting this form:

- you confirm that you have read and understood this information.
- you agree to participate in this research study and your answers to be included in our analysis and resulting from its research publications.
- you agree that we will process the data in line with DE-RISK project policy of confidentiality that is in accordance with GDPR 2016/679.

Country:	**Greece**
Organization:	**QUE Technologies**
Name of expert answering the survey:	**Konstantinos Mamis, Thanos Kalamaris**
Contact details: (mail, phone, other)	**k.mamis@que-tech.com, t.kalamaris@que-tech.com**
Date:	**10/05/2023**

1. LFM Regulation - Definitions of Market Actors and Market Characteristics

The European Commission promotes flexibility markets as they can contribute to the European Union in becoming a climate-neutral continent by 2050. The new market development is taking place in Europe with the transposition in the different Member States of the Clean Energy Package (specifically the Electricity directive EU 944/2019) with new roles for DSOs entering into new activity areas. DSO-TSO cooperation evolves in a beneficial way for energy markets and for consumers as well. Governance of how DSOs and TSOs interact and engage in network planning, as well as arrangements to facilitate effective coordination for system operation, especially for flexibility, have been the key regulatory concerns in this area for the last few years.

Local flexibility markets allow the use of flexibility at local level by distribution and transmission system operators. This means using flexibility from decentralized energy resources (DERs) to solve congestion management problems, minimize power outages and avoid grid expansions. Flexibility markets help energy networks to monitor energy flows and create market signals to motivate changes in energy supply and demand, integrating smart meters and appliances, renewable energy resources and energy efficient resources accordingly. The Clean Energy Package defines and offers an enabling legislative framework for Local Energy Markets participants. The analysis of the LFM regulation will be conducted including some of the following topics that characterize the market:

LFM topic	**Sub-topic**
Market actors	• Aggregator • Balance Responsible Party (BRP) • Citizen energy communities • Distribution System Operator (DSO) • Market operator
Market and product characteristics	• Market entry and exit and market platforms • Product characteristics (e.g., prequalification, standardization of FS)
Infrastructural issues	• Smart metering systems • Energy storage • Network expansion
Contract, bidding, and settlement	• Contract. Bidding, billing, and settlement
Data security issues	• Access to data, data security, privacy protection

The Clean Energy for all Europeans Package defines new ground for consumers by recognizing under EU law, the rights of citizens and communities to engage directly in the energy sector. It also sets out legal frameworks for LFMs. Participants of the whole DR value chain are defined in the laws of the Clean Energy Package. The revised Renewable Energy Directive (EU) 2018/2001 sets the framework for 'renewable energy communities' and the revised Internal Electricity Market Directives (EU) 2019/943 & 2019/944 introduce new roles and responsibilities for 'citizen energy communities', 'aggregation', 'distribution system operator', 'transmission system operator' and 'balance responsible party' in the energy system covering all types of electricity. (Look at Annex 1)

1. *Are the Directives on common rules for the internal market for electricity 2019/943 & 2019/944 already transposed into your national legislation?*

Yes ☐ **No** ☐ **Partially** ☐

Is the revised Renewable Energy Directive (EU) 2018/2001 already transposed into your national legislation? **Yes**

☐ **No** ☐ **Partially** ☐

*1.1. If your answer is **Yes,** indicate the national / regional / local legislation that defines it and explain it:*

IEMD 2019/943: ***Greek Law*** **4986/2022 & Law 5037/2023**
IEMD 2019/944: ***Greek Law*** **4986/2022 & Law 5037/2023**

REDII 2018/2001: https://www.ey.com/en_gr/tax/tax-alerts/law-4951-2022-modernization-of-the-licensing-process-for-res-projects-and-licensing-of-energy-storage & **Law 5037/2023** Gradually integrated within the Greek legislation through a series of legislation in already existed legislations.

*1.2. If your answer is **Partially,** and there is some regulation concerning the definitions below, please, specify:*

For example: Explain if regulation is available, or concepts are under development, or discussions are ongoing, etc.

Aggregation	Distribution System Operator (DSO)	Transmission System Operator (TSO)	Balance Responsible Party (BRP)

Self-consumers	Active consumers	Renewable energy communities (REC)	Citizen energy communities (CEC)

1.3. Are there other LFM participants in your country? How are they defined?

NRA ☐ Suppliers ☐ Traders ☐ Other ☐

Greek laws 4986/2022 & 5037/2023 defines the general electricity market roles, in compliance with EU directives 2019/944 and 2019/943. As of now there is no local flexibility market.

2. How do DSOs and TSOs cooperate to organize the flexibility market?

Please, specify if there is any guidance or regulation defining it.

The differentiation between DSO-TSO is defined by the independent regulatory authority for energy (RAE). Their cooperation is regulated by RAE in compliance with EU directives 2019/944. Although, flexibility markets in Greece are not implemented yet.

3. How is the Local Flexibility Market organized in your country?

Platform ☐ Aggregation ☐ Other model ☐

Please, specify. Give the name, link, info about the applicable model in your country.

Greek laws 4986/2022 & 5037/2023 defines the general electricity market roles, in compliance with EU directives 2019/944. As of now there is no local flexibility market.

4. Are there any legislative barriers which block the reinforcement of interactions between LFM's participants and slow down the development of LFMs? Please, indicate below:

It is difficult to pinpoint a legislative barrier as of now. Although the transition in Greece may be challenging because there is only one DSO responsible for the distribution system in Greece.

5 Are there national regulations concerning the market products?

For example: Explain if regulations or guidelines are available, or discussions are ongoing, etc.

5.1. Market entry and exit: *Yes* ☐ *No* ☐

Explain:

- **TSO can't refuse the entry to any generating installation or energy storage that are eligible to do so (by satisfying the national regulations set by RAE).**
- **The wholesale market regulated also by RAE (Regulatory Authority for Energy) has strict regulation for market exit and entry. (https://www.enexgroup.gr/documents/20126/184422/20200306_Decision_01_EN.pdf)**

5.2. Market Product characteristics (e.g, Are there guides and regulations on product prequalification, standardization and baseline):

Yes ☐ *No* ☐

Explain:

For the effective implementation of the Balancing Market, the Balancing Market Rulebook is supplemented by methodologies decided by the Regulatory Authority for Energy (RAE), following a proposal by IPTO.

https://www.admie.gr/en/market/regulatory-framework/methodologia-kai-tehnikes-apofaseis

6 Infrastructural issues concerning the LFMs.

6.1 Regulation on Smart Metering Systems. Are they adapted to the LFMs? Are they installed?

Yes ☐ No ☐

Explain: Smart energy:

The transition from a non-smart to a smart energy metering equipment (early stage) is gradually materialized in compliance to EU directives 2019/944.

6.2 Regulation on Energy Storage: How is energy storage defined in your regulation? Is there any guideline, or discussions ongoing, etc.?

Yes ☐ No ☐

Explain:
According to the existing legislation Law 5037/2023 energy storage is being addressed as conventional energy sources. The reform of regulatory and licensing framework is under development by the Greek Government. As an exception, existing energy generation permission can be changed in energy storage permission, only until end of June 2023, with storage capacity in MW up to half the MW in existing generation permission.

7 Contract, bidding, and settlement. Explain if any specific regulations or guidelines for LFM are established.

Yes ☐ *No* ☐

Explain:
In compliance with **EU directives 2019/944 & 2019/943, no further guidelines have been given by any Greek Law.**

According to IEMD 2019/944 the network development plan published by the DSOs should provide transparency on the medium and long-term flexibility services and shall set out the planned investments for the next five-to-ten years, with particular emphasis on the main distribution infrastructure which is required in order to connect new generation capacity and new loads, including recharging points for electric vehicles. The network development plan shall also include the use of demand response, energy efficiency, energy storage facilities or other resources that the distribution system operator is to use as an alternative to system expansion.

8 Is there any legislation about development plans for the electricity network in your country?

Yes ☐ **No** ☐

8.1 If your answer is Yes, indicate the legal regulation that defines it, its statement and how flexibility is included into it.

The development of the System includes the planning and implementation of significant investments in order to ensure on the one hand the country's supply with electricity in an adequate, safe, efficient and reliable manner, and on the other hand, the long-term capability of the System to meet electricity transmission needs, on economically viable terms, to the benefit of society and the environment.
The main vehicle for the planning and scheduling of these investments is the Ten-year Network Development Plan (TYNDP).
According to the provisions of Law 4001/2011 and the Grid Code, IPTO prepares and issues the Ten-year Network Development Plan for Greece, which has a rolling nature and is issued on an annual basis.
The Ten-year Network Development Plan includes the System development projects for each reference period, including the necessary infrastructures for RES penetration, as well as the time frames and the estimated cash flows for their implementation.

8.2 Are there any stimuli or incentives to create flexibility or/and to include flexibility in network development plans? Please, indicate below:

IPTO, the Greek TSO, begun researching for a Transitory Flexibility Remuneration Mechanism and currently start an auction. Moreover, IPTO participates in EU Flexitranstore project. FLEXITRANSTORE project shall develop a next generation of Flexible Energy Grid (FEG), which provides the technical basis to support the valorization of flexibility services, enhancing the existing European Internal Energy Market (IEM). From a market perspective, state-of-theart ICT technologies / control improvements will be applied to develop an enhanced market model on an integrated platform, for flexibility services and to support cross border auctioning and trading of energy.

8.3 Regulation on Network Expansion in compliance with the IEMD 2019/944?

2. Yes ☐ No ☐

3.

Explain:

IPTO the Greek TSO has a plan developing European energy network for the transfer of RES-generated electricity from north African and southeastern Mediterranean countries to Europe via Greece and other southern European countries. This effort will take place between 2025 and 2030, a development that would boost the European grid's efficiency by 55 percent.

9 Can you note if there are any provisions or regional/local regulations that present legal risks and behave as barriers to the development of Local Energy markets:

Greece passed the legislation to comply with EU directives 2019/944 & 2019/943 in October 2022, it is difficult to pinpoint a regulation barrier as of now.

10 Can you describe any act provisions or regional / local regulations that bring benefits and behave as enablers to LFMs:

Based on their nature, some Greek islands (Rhodes, Antikithira, Agathonisi) are isolated form the national energy grid (still owned by the national DSO) own an autonomous energy generation that could facilitate the implementation of an LFM.

11 Are there any administrative and bureaucratic procedures that hinder LFMs' development and play a restrictive role in their broader application? If yes, please, explain.

Because Greek law that included EU's directive 2019/944 & 2019/943 is relatively new it is unclear, as of now.

12 Would you suggest what kind of legal provisions in your country will contribute most to the activation of the interested parties (citizens, commercial and industrial players) to participate in LFMs?

- **Transparency on how LFMs will be implemented and consumer protection against profiteering.**
- **Incentives regarding the pricing**

13 Can you define any recommendations for improvement of the legislation concerning LFMs in your country or on EU level?

2. Policy and Regulatory Framework for LFMs Uptake

14 Does your National (Regional / Local) Energy Action Plans include targets for development and spread of LFMs?

Please, explain: **Because Greek law that included EU's directive 2019/944 & 2019/943 is relatively new it is unclear, as of now.**

15 What kind of bureaucratic and administrative barriers LFMs can experience

15.1 When flexibility producers connect to the grid?

15.1.1 Complicated application procedure: *Yes* ☐ *No* ☐

Explain:

Greece has a history with complex bureaucratic administrative.

15.1.2 Uncertainty of approval: *Yes* ☐ *No* ☐

Explain:
As an incentive for the implementation of LFMs, bureaucratic procedures are simplified and accelerated.

15.1.3 High costs: *Yes* ☐ *No* ☐

Explain:
Greece has already funded a numerous of installations (PV's, batteries)

15.1.4 Time consuming procedure: *Yes* ☐ *No* ☐

Explain:

15.1.5 Other: *Yes* ☐ *No* ☐

Explain:

15.2 When operating the grid (allowance /licensing)?

15.2.1 for System Operators: *Yes ☐ No ☐*

Explain: **Because Greek law that included EU's directive 2019/944 & 2019/943 is relatively new it is unclear, as of now.**

15.2.2 for prosumers/aggregators: *Yes ☐ No ☐*

Explain: **Because Greek law that included EU's directive 2019/944 & 2019/943 is relatively new it is unclear, as of now.**

15.2.3 for BRP *Yes ☐ No ☐*

Explain: **Because Greek law that included EU's directive 2019/944 is relatively new it is unclear, as of now**

15.2.4 other: *Yes ☐ No ☐*

Explain:
Because Greek law that included EU's directive 2019/944 is relatively new it is unclear, as of now

3. Flexibility Services in a Local Flexibility Market

Flexibility services are "the services provided by individual or aggregated (residential, commercial or industrial) prosumers to flexibility requesting parties (DSO, BRP, and TSO) or prosumers themselves, in reaction to external signals (price signal or activations), by modifying the consumption and/or production pattern, in order to facilitate the reliable and cost-effective management of variability and uncertainty in the electricity system"[1]. Flexibility services specifically focus on deliberate, time limited changes to the 'normal' energy profile[2].

LFM provides an opportunity for consumers to play a significant role in the operation of the electric grid by reducing or shifting their electricity usage in response to time-based rates or other forms of financial incentives. DR programs are currently being used by some electric system planners and operators, using mainly the flexibility provided by large industrial facilities connected to the high-voltage grid, as resource options for balancing supply and demand. Therefore, LFMs development will foster flexibility services at DSO level using residential and tertiary buildings flexibility (Look at Annex 2).

This questionnaire concerns the legal side of the applicability of the Flexibility Services in LFMs.

16 In your country, is there some regulation concerning the definitions below? If Yes, please, specify.

Congestion	Balancing	Demand Response

[1] Nixiang, A. Flexibility services in Citizen Energy Communities (Master's thesis), University of Technology Eindhoven, the Netherlands. (2020)

[2] USEF White Paper: Energy and Flexibility Services, 2019

Ancillary service	Non-frequency ancillary service	Energy storage

17 What kinds of flexibility services are available in your country?

Constraint Management ☐ Adequacy ☐ Balancing ☐ Wholesale ☐

17.1 Which participants are flexibility providers?

17.1.1 Constraint Management

Prosumers ☐ Aggregators ☐ Large Generation ☐ Other ☐

17.1.2 Adequacy

Prosumers ☐ Aggregators ☐ Large Generation ☐ Other ☐

17.1.3 Balancing

Prosumers ☐ Aggregators ☐ Large Generation ☐ Other ☐

17.1.4 Wholesale

Prosumers ☐ Aggregators ☐ Large Generation ☐ Other ☐

17.2 Which participants are flexibility buyers?

17.2.1 Constraint Management

TSO ☐ DSO ☐ Aggregators ☐ BRP ☐ Other ☐

17.2.2 Adequacy

TSO ☐ DSO ☐ Aggregators ☐ BRP ☐ Other ☐

17.2.3 Balancing

TSO ☐ DSO ☐ Aggregators ☐ BRP ☐ Other ☐

17.2.4 Wholesale

TSO ☐ DSO ☐ Aggregators ☐ BRP ☐ Other ☐

17.3 What are the procedures to sell flexibility?

17.3.1 Constraint Management

Open market ☐ Tender process ☐ Bid ☐ Other ☐

17.3.2 Adequacy

Open market ☐ Tender process ☐ Bid ☐ Other ☐

17.3.3 Balancing

Open Market ☐ Tender process ☐ Bid ☐ Other ☐

17.3.4 Wholesale

Open Market ☐ Tender process ☐ Bid ☐ Other ☐

18 Can storage facilities (including Electric Vehicles) provide flexibility services in your country?

Yes ☐ No ☐

If yes, how? **They can participate in wholesale market, regulated as RES**

19 Do the following flexibility services exist in your country?

19.1 Constraint Management

19.1.1 Voltage Control Yes ☐ No ☐

19.1.2 Grid Capacity Management Yes ☐ No ☐

19.1.3 Congestion Management Yes ☐ No ☐

19.1.4 Controlled Islanding Yes ☐ No ☐

19.1.5 Optional Downwards Flexibility Management Yes ☐ No ☐

19.1.6 DSO Constraint Management (pre/post fault) Yes ☐ No ☐

19.1.7 Other (please specify:) Yes ☐ No ☐

19.1.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.2 Adequacy

19.2.1 Capacity payment Yes ☐ No ☐

19.2.2 Capacity Market Yes ☐ No ☐

19.2.3 Strategic reserve Yes ☐ No ☐

19.2.4 Hedging Yes ☐ No ☐

19.2.5 Other (please specify) Yes ☐ No ☐

19.2.6 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.3 Balancing

19.3.1 Dynamic Containment Yes ☐ No ☐

19.3.2 Frequency Containment Reserve (FCR) Yes ☐ No ☐

19.3.3 Automatic Frequency Restoration Reserve (aFRR) Yes ☐ No ☐

19.3.4 Manual Frequency Restoration Reserve (mFRR) Yes ☐ No ☐

19.3.5 Replacement Reserve (RR) Yes ☐ No ☐

19.3.6 other (please specify:) Yes ☐ No ☐

19.3.7 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain: **If there are they can't be pinpointed yet, due to the immature stages of local flexibility services.**

19.4 Wholesale

19.4.1 Day-ahead optimization Yes ☐ No ☐

19.4.2 Intraday optimization Yes ☐ No ☐

19.4.3 Self/passive balancing Yes ☐ No ☐

19.4.4 Generation optimization Yes ☐ No ☐

19.4.5 Exceeding Maximum Export/Import Capacity Yes ☐ No ☐

19.4.6 Offsetting Yes ☐ No ☐

19.4.7 Other (please specify:) Yes ☐ No ☐

19.4.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.5 Local Optimization

19.5.1 ToU Optimization Yes ☐ No ☐

19.5.2 kWmax control Yes ☐ No ☐

19.5.3 Self-balancing Yes ☐ No ☐

19.5.4 Emergency power supply Yes ☐ No ☐

19.5.5 Smart Contracts Yes ☐ No ☐

19.5.6 Collective Self-consumption Yes ☐ No ☐

19.5.7 Transmission Charge Management Yes ☐ No ☐

19.5.8 Distribution Charge Management Yes ☐ No ☐

19.5.9 Other (please specify) Yes ☐ No ☐

19.5.10 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

20 Does the regulation in your country allow net-metering?

Yes ☐ No ☐

Explain. **Net meters are allowed and regulated in Greek law, although only few have been installed as off now.**

21 Are there any legal incentives and benefits in your national/ regional/ local regulations that act as stimuli to the uptake of LFMs?

Yes ☐ No ☐

Explain. Not for the being time based on the immature state of implementation of the directive 2019/944

4. Blockchain and Data Management in LFMs

1. Blockchain Technology & Smart Contract in Energy Services

Blockchain technology has the potential to transform the energy sector. Of the many use cases for blockchain, energy and sustainability are often less recognized. The energy industry has been consistently catalyzed by innovations including rooftop solar, electric vehicles, and smart metering. The blockchain presents itself as the next emerging technology to spur growth in the energy sector through smart contracts and systems interoperability. A joint report issued in 2018 by the WEF, Stanford Woods Institute for the Environment, and PwC identified more than 65 existing and emerging blockchain use-cases for the environment. These use cases include new business models for energy markets, real-time data management, and moving carbon credits or renewable energy certificates onto the blockchain; the blockchain also offers unique solutions for renewable energy distribution. A range of blockchain products can be tailored to address various energy or sustainability applications, including the following: wholesale electricity distribution; peer-to-peer energy trading; electricity data management; commodity trading; utility providers; etc.

22 Does the regulation in your country allow the use of blockchain or other digital currencies in the energy sector?

Yes ☐ No ☐

If yes, please, specify. **In compliance with EU directive 2019/944. Published in Greek government gazette No 204, law No 4986, in 28 October 2022.**

23 Do transactions concerning the flexibility services use Blockchain technology in your country?

Yes ☐ No ☐

If yes, please, specify.

24 Is there any provision or regulation that presents legal risk and behaves as a barrier to the use of Blockchain technology in flexibility services for LFMs?

Yes ☐ No ☐

If Yes, please, specify.

25 Does your country recognize smart contracts as legal contracts?

Yes ☐ No ☐

If Yes, please, specify. **In Greek Law 4961/2022 on Emerging Technologies smart contracts are defined as a "set of coded computer functions concluded and executed through Distributed Ledger Technology in automated electronic format with the use of instructions on the performance of actions, omissions or tolerance, which are based on the existence or absence of specific conditions, according to terms directly recorded in computer code, programmed commands or a programming language".**

2. Data Management & Protection

According to the General Data Protection Regulation 2016/679, data aggregation shouldn't violate the privacy and security of the customers. This regulation also removes obstacles to ensure a better mobility of personal data while protecting natural persons. LFMs process energy consumption data and shouldn't infer personal information especially when sharing data with third parties.

26 Does the regulation in your country guarantee the security of consumers' consumption data?

Yes ☐ No ☐

If Yes, please, specify. **Consumers' data are safe according to Greek Law 4577/2018 and European Union's GDPR (EU) 2016/679.**

27 In your country, how is the security of the grid? Are there any regulations about cybersecurity?

Explain. **Greek Law 4577/2018 and European Union's GDPR (EU) 2016/679 ensures the security of the grid.**

28 How is your country managing smart metering data?

Centralized data hub ☐ Decentralized data infrastructure ☐

What are the risks and benefits of the system in place?

Risks:

Benefits:

5. Summary

29 Can you give recommendations and proposals for changes in the regulation in order to overcome the perceived legal risks and barriers in your country concerning

29.1 Creation of a LFM

29.2 Uptake of the flexibility services

29.3 Use of blockchain technology for LFMs

29.4 Data Management

29.5 Other

30 Can you give recommendations and proposals for changes in the regulation in order to better foster Local Flexibility Markets uptake, flexibility services and blockchain technologies use for LFMs in your country; thus, creating incentives for their development?

ANNEX 1

Aggregation	***Distribution System Operator (DSO)***	***Transmission System Operator (TSO)***	***Balance Responsible Party (BRP)***
Art. 2. (18) of IEMD 2019/944	*Art. 2. (29) of IEMD 2019/944*	*Art. 2. (35) of IEMD 2019/944*	*Art.2. (14) of IEMD 2019/943*

‘aggregation’ means a function performed by a natural or legal person who combines multiple customer loads or generated electricity for sale, purchase or auction in any electricity market	‘DSO’ means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	‘TSO’ means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity	‘BRP’ means a market participant or its chosen representative responsible for its imbalances in the electricity market

Self-consumer	***Active customer***	***Renewable Energy Community (REC)***	***Citizens Energy Community (CEC)***
Art. 21. of REDII 2018/2001	Art.15 IEMD of 2019/944	Art. 22. of REDII 2018/2001	Art.16 of IEMD 2019/944
‘Renewables self-consumer’ means a final customer operating within its premises located within confined boundaries or,	‘Active customer’ means a final customer, or a group of jointly acting final customers, who consumes or stores	‘REC’ means a legal entity: (a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively	‘CEC’ means a legal entity that: (a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons,

where permitted by a MS, within other premises, who generates RE electricity for its own consumption, and who may store or sell self-generated RE electricity, provided that, for a non-household REs self-consumer, those activities do not constitute its primary commercial or professional activity.	electricity generated within its premises located within confined boundaries or, where permitted by a MS, within other premises, or who sells self-generated electricity or participates in flexibility or EE schemes, provided that those activities do not constitute its primary commercial or professional activity;	controlled by shareholders or members that are located in the proximity of the RE projects that are owned and developed by that legal entity; (b) the shareholders or members of which are natural persons, SMEs or local authorities, incl. municipalities; (c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits.	local authorities, incl. municipalities, or small enterprises; (b) has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; (c) may engage in generation, incl. from RES, distribution, supply, consumption, aggregation, energy storage, EE services or charging services for electric vehicles or provide other energy services to its members or shareholders.

ANNEX 2

Congestion	***Balancing***	***Demand Response***
Art. 2. (4) of IEMD 2019/943	*Art. 2. (10) of IEMD 2019/943*	*Art. 2. (20) of IEMD 2019/944*
‘congestion’ means a situation in which all requests from market participants to trade between network areas cannot be	‘balancing’ means all actions and processes, in all timelines, through which transmission system operators ensure, in an ongoing manner,	‘demand response’ means the change of electricity load by final customers from their normal or current consumption patterns in response to market signals, including in response to time-variable electricity

accommodated because they would significantly affect the physical flows on network elements which cannot accommodate those flows	maintenance of the system frequency within a predefined stability range and compliance with the amount of reserves needed with respect to the required quality	prices or incentive payments, or in response to the acceptance of the final customer's bid to sell demand reduction or increase at a price in an organised market as defined in point (4) of Article 2 of Commission Implementing Regulation (EU) No 1348/2014 (17), whether alone or through aggregation

Ancillary service	***Non-frequency ancillary service***	***Energy storage***
Art. 2. (48) of IEMD 2019/944	*Art. 2. (49) of IEMD 2019/944*	*Art. 2. (59) of IEMD 2019/944*
'Ancillary service' means a service necessary for the operation of a transmission or distribution system, including balancing and non-frequency ancillary services,	'non-frequency ancillary service' means a service used by a transmission system operator or distribution system operator for steady state voltage control, fast reactive	'Energy storage' means, in the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the

but not including congestion management	current injections, inertia for local grid stability, short-circuit current, black start capability and island operation capability	subsequent reconversion of such energy into electrical energy or use as another energy carrier

THANK YOU FOR ANSWERING THE QUESTIONS!

4. Ireland

DEAR PARTICIPANT,

The following questionnaire is developed under the DE-RISK project in order for a thorough study to be performed to provide an overview of how the regulatory environment in ten European countries and at European Level evolved. The results of the survey will contribute to the Regulatory Impact Analysis (RIA) to deeply assess the current regulatory framework that is enabling or acting as a barrier for the large deployment of Local Flexibility Markets (LFM) and the potential flexibility services.

We invite you to complete this survey to collect your experience and views regarding:

- Awareness of European, national and local policies regarding the regulation on Local Flexibility Markets
- Perceived legal risks and benefits
- Impact of the regulation - barriers and incentives
- Legal background of innovative technologies - block chain transactions and flexibility services
- Perceived legal risks and benefits
- Recommendations about future legal development of the LFM in your country and at European Level.

ABOUT DE-RISK PROJECT

This survey is being conducted as part of the DE-RISK Project funded by the European Union (EU) under Horizon Europe program.. The DE-RISK project will support the market uptake of Renewable Energy Sources (RES) by de-risking the adoption of Local Flexibility Markets to increase the RES hosting capacity of the distribution network.

ABOUT YOUR PARTICIPATION

Your participation in this study is fully voluntary and all data collected will be treated confidentially. Participation is free and there are no mandatory requirements. The research outputs resulting from this work will only include collated data, without the possibility for anyone to identify your individual answers. Your contact details will be used on a need-to-know basis and will be strictly confidential until the end of the project's lifetime. By submitting this form:

- you confirm that you have read and understood this information.
- you agree to participate in this research study and your answers to be included in our analysis and resulting from its research publications.
- you agree that we will process the data in line with DE-RISK project policy of confidentiality that is in accordance with GDPR 2016/679.

Country:	**Ireland**
Organization:	**ESB Networks**
Name of expert answering the survey:	
Contact details: (mail, phone, other)	
Date:	**29/07/23**

1. LFM Regulation - Definitions of Market Actors and Market Characteristics

The European Commission promotes flexibility markets as they can contribute to the European Union in becoming a climate-neutral continent by 2050. The new market development is taking place in Europe with the transposition in the different Member States of the Clean Energy Package (specifically the Electricity directive EU 944/2019) with new roles for DSOs entering into new activity areas. DSO-TSO cooperation evolves in a beneficial way for energy markets and for consumers as well. Governance of how DSOs and TSOs interact and engage in network planning, as well as arrangements to facilitate effective coordination for system operation, especially for flexibility, have been the key regulatory concerns in this area for the last few years.

Local flexibility markets allow the use of flexibility at local level by distribution and transmission system operators. This means using flexibility from decentralized energy resources (DERs) to solve congestion management problems, minimize power outages and avoid grid expansions. Flexibility markets help energy networks to monitor energy flows and create market signals to motivate changes in energy supply and demand, integrating smart meters and appliances, renewable energy resources and energy efficient resources accordingly. The Clean Energy Package defines and offers an enabling legislative framework for Local Energy Markets participants. The analysis of the LFM regulation will be conducted including some of the following topics that characterize the market:

LFM topic	**Sub-topic**
Market actors	• Aggregator • Balance Responsible Party (BRP) • Citizen energy communities • Distribution System Operator (DSO) • Market operator
Market and product characteristics	• Market entry and exit and market platforms • Product characteristics (e.g., prequalification, standardization of FS)
Infrastructural issues	• Smart metering systems • Energy storage • Network expansion
Contract, bidding, and settlement	• Contract. Bidding, billing, and settlement
Data security issues	• Access to data, data security, privacy protection

The Clean Energy for all Europeans Package defines new ground for consumers by recognizing under EU law, the rights of citizens and communities to engage directly in the energy sector. It also sets out legal frameworks for LFMs. Participants of the whole DR value chain are defined in the laws of the Clean Energy Package. The revised Renewable Energy Directive (EU) 2018/2001 sets the framework for 'renewable energy communities' and the revised Internal Electricity Market Directives (EU) 2019/943 & 2019/944 introduce new roles and responsibilities for 'citizen energy communities', 'aggregation', 'distribution system operator', 'transmission system operator' and 'balance responsible party' in the energy system covering all types of electricity. (Look at Annex 1)

1. *Are the Directives on common rules for the internal market for electricity 2019/943 & 2019/944 already transposed into your national legislation?*

Yes ☐X **No** ☐ **Partially** ☐

Is the revised Renewable Energy Directive (EU) 2018/2001 already transposed into your national legislation? **Yes**

☐**X** **No** ☐ **Partially** ☐

*1.1. If your answer is **Yes**, indicate the national / regional / local legislation that defines it and explain it:*

IEMD 2019/943:
IEMD 2019/944: SI 704 2020 Article 40(1)(j) and (3) and Articles 57 to 64 of Directive (EU) 2019/944 SI 20 of 2022 Article 11, 14, 33, 36 and 54 of Directive (EU) 2019/944 SI 37 of 2022 Articles 19 to 24 of Directive (EU) 2019/944

SI 76 of 2022 Article 15 and 16 of Directive (EU) 2019/944 Article 21 and 22 of Directive (EU) 2018/2001 SI 227 of 2022 Articles 2, 14(2), 18(2), 33(2), 40, 41, 42, 51 and 59(8) Directive (EU) 2019/944 Circular Economy and Miscellaneous Act 2022 Article 15 and 16 of Directive (EU) 2019/944 Article 21 and 22 of Directive (EU) 2018/2001
REDII 2018/2001: SI 76 of 2022 Article 15 and 16 of Directive (EU) 2019/944 Article 21 and 22 of Directive (EU) 2018/2001 SI 350 2022 Articles 2, 3, 15(2), 16, 17, 18, 19, 23, 24, 25, 26, 27, 28, 29, 30 and 31 of Directive (EU) 2018/2001

*1.2. If your answer is **Partially,** and there is some regulation concerning the definitions below, please, specify:*

For example: Explain if regulation is available, or concepts are under development, or discussions are ongoing, etc.

Aggregation	Distribution System Operator (DSO)	Transmission System Operator (TSO)	Balance Responsible Party (BRP)
Aggregators are established in Ireland and have strong DSU portfolios. The regulator currently has a roadmap for review of licensing requirements for Aggregators due to the market changes envisaged	The DSO has a detailed roadmap to develop local flexibility markets in Ireland and pilots have begun and tenders issued for certain flexibility products aligned to the ENA flexibility products. In addition in light of the directive to reduce peak demand at critical times for domestic and commercial customers a bespoke pilot is active termed beat the peak with a target to have 200k customers signed up.	The TSO has a DS3 flexibility market in place since 2011 and established market is in place and operation under the SEMO in Ireland	The TSO is responsible for the intertrade balancing market in Ireland - SEMO.

	There is a DSO TSO interface in place and in operation.		

Self-consumers	Active consumers	Renewable energy communities (REC)	Citizen energy communities (CEC)
	DECC Micro-generation Support Scheme	Community Energy | Save Energy At Home & School | SEAI	

1.3. Are there other LFM participants in your country? How are they defined?

NRA ☐ Suppliers ☐ Traders ☐ Other ☐

2. *How do DSOs and TSOs cooperate to organize the flexibility market?*

Please, specify if there is any guidance or regulation defining it. The TSO has developed a flexibility market called DS3 in Ireland which has been operating active since 2011 and is a mature market for offering system services to the TSO The DSO is currently developing the local flexibility market in Ireland under a phased Pilot phase under the National Network, Local Connections Programme. There is a DSO and TSO in place and as the DSO flecibility market develops the market rules and coordination are being developed in coordination with the flexibility market.in line with the Phased pilot and is expected to be completed by 2025

3. *How is the Local Flexibility Market organized in your country?*

Platform ☐ Aggregation ☐x Other model ☐

Please, specify. Give the name, link, info about the applicable model in your country.

DSO Link: National Network, Local Connections Programme (esbnetworks.ie)

TSO Link: DS3 Consultations and Publications (eirgridgroup.com)

TSO Link: Delivering A Secure, Sustainable Electricity System (eirgridgroup.com)

4. *Are there any legislative barriers which block the reinforcement of interactions between LFM's participants and slow down the development of LFMs? Please, indicate below:*

NA

5 Are there national regulations concerning the market products?

For example: Explain if regulations or guidelines are available, or discussions are ongoing, etc.

5.1. Market entry and exit: *Yes ☐x* *No ☐*

Explain: There is standards and requirements to be an aggregator. This is being assessed at present by the Irish Regulator, commission for Regulation of utilities. The NNLC programme is developing and piloting local flexibility Markets on a phase plan under guidance from the CRU. Link: CRU202350_Roadmap_for_the_Clean_Energy_Packages_Electricity_and_Renewables_Directives_.pdf (divio-media.com)

5.2. Market Product characteristics (e.g, Are there guides and regulations on product prequalification, standardization and baseline):

Yes ☐ *No ☐x*

Explain: The TSO has guides and regulations for the DS3 flexibility market.

A programme is underway to develop the DSO LFM

CRU202350_Roadmap_for_the_Clean_Energy_Packages_Electricity_and_Renewables_Directives_.pdf (divio-media.com)

6 Infrastructural issues concerning the LFMs.

6.1 Regulation on Smart Metering Systems. Are they adapted to the LFMs? Are they installed?

Yes ☐x No ☐

Explain: Smart meters installation in Ireland started in 2021 and the roll our is expected to be completed in 2025. System services that support markets will be enabled as the markets develop under guidance from the Irish Regulator

6.2 Regulation on Energy Storage: How is energy storage defined in your regulation? Is there any guideline, or discussions ongoing, etc.?

Yes ☐ No ☐x

Explain:

7 Contract, bidding, and settlement. Explain if any specific regulations or guidelines for LFM are established.

Yes ☐ *No* ☐*x*

Explain:

According to IEMD 2019/944 the network development plan published by the DSOs should provide transparency on the medium and long-term flexibility services and shall set out the planned investments for the next five-to-ten years, with particular emphasis on the main distribution infrastructure which is required in order to connect new generation capacity and new loads, including recharging points for electric vehicles. The network development plan shall also include the use of demand response, energy efficiency, energy storage facilities or other resources that the distribution system operator is to use as an alternative to system expansion.

8 Is there any legislation about development plans for the electricity network in your country?

Yes ☐**X** **No** ☐

8.1 If your answer is Yes, indicate the legal regulation that defines it, its statement and how flexibility is included into it.

The DSO have development plans for the electricity network setout in our Price Review 5 programme approved by the Commission for Energy Regulation. Section 12 of The Climate Action Plan 2023 includes flexibility targets from electricity.

8.2 Are there any stimuli or incentives to create flexibility or/and to include flexibility in network development plans? Please, indicate below:

Yes the network development plans include the development of a flexibility market: esb-networks-national-network-local-connections-programme-phased-flexibiltiy-market-development-plan.pdf (esbnetworks.ie)

8.3 Regulation on Network Expansion in compliance with the IEMD 2019/944?

2. *Yes ☐X No ☐*

3.

Explain: *[CRU202350_Roadmap_for_the_Clean_Energy_Packages_Electricity_and_Renewables_Directives_.pdf (divio-media.com)]*

4.

9 Can you note if there are any provisions or regional/local regulations that present legal risks and behave as barriers to the development of Local Energy markets:

10 Can you describe any act provisions or regional / local regulations that bring benefits and behave as enablers to LFMs:

11 Are there any administrative and bureaucratic procedures that hinder LFMs' development and play a restrictive role in their broader application? If yes, please, explain.

CRU202350_Roadmap_for_the_Clean_Energy_Packages_Electricity_and_Renewables_Directives_.pdf (divio-media.com)

12 Would you suggest what kind of legal provisions in your country will contribute most to the activation of the interested parties (citizens, commercial and industrial players) to participate in LFMs?

CRU202350_Roadmap_for_the_Clean_Energy_Packages_Electricity_and_Renewables_Directives_.pdf (divio-media.com)

13 Can you define any recommendations for improvement of the legislation concerning LFMs in your country or on EU level?

2. Policy and Regulatory Framework for LFMs Uptake

14 Does your National (Regional / Local) Energy Action Plans include targets for development and spread of LFMs?

Please, explain: The Government has included LFM within the Climate Action Plan 2023.

256997_b5da0446-8d81-4fb5-991e-65dd807bb257.pdf

15 What kind of bureaucratic and administrative barriers LFMs can experience

15.1 When flexibility producers connect to the grid?

15.1.1 Complicated application procedure: *Yes ☐* *No ☐*

Explain: These are yet to be defined for LFMs.

15.1.2 Uncertainty of approval: *Yes ☐* *No ☐*

Explain:

15.1.3 High costs: *Yes* ☐ *No* ☐

Explain:

15.1.4 Time consuming procedure: *Yes* ☐ *No* ☐

Explain:

15.1.5 Other: *Yes* ☐ *No* ☐

Explain:

15.2 When operating the grid (allowance /licensing)?

15.2.1 for System Operators: *Yes* ☐ *No* ☐

Explain:
There are standard grid Connection policy's in place in the Irish Market to enable Micro generation, Mini

generation and small scale generation to facility local generation. There is a micro generation support scheme in place for customers to be paid for exporting onto the grid.

15.2.2 for prosumers/aggregators: *Yes* ☐ *No* ☐

Explain:
There is legal and regulatory requirements currently to be an aggregator. The Regulator is assessing this as part of its regulatory roadmap for flexibility services.

CRU202350_Roadmap_for_the_Clean_Energy_Packages_Electricity_and_Renewables_Directives_.pdf (divio-media.com)

15.2.3 for BRP *Yes* ☐ *No* ☐

Explain:

15.2.4 other: *Yes* ☐ *No* ☐

Explain:

3. Flexibility Services in a Local Flexibility Market

Flexibility services are "the services provided by individual or aggregated (residential, commercial or industrial) prosumers to flexibility requesting parties (DSO, BRP, and TSO) or prosumers themselves, in reaction to external signals (price signal or activations), by modifying the consumption and/or production pattern, in order to facilitate the reliable and cost-effective management of variability and uncertainty in the electricity system"[1]. Flexibility services specifically focus on deliberate, time limited changes to the 'normal' energy profile[2].

LFM provides an opportunity for consumers to play a significant role in the operation of the electric grid by reducing or shifting their electricity usage in response to time-based rates or other forms of financial incentives. DR programs are currently being used by some electric system planners and operators, using mainly the flexibility provided by large industrial facilities connected to the high-voltage grid, as resource options for balancing supply and demand. Therefore, LFMs development will foster flexibility services at DSO level using residential and tertiary buildings flexibility (Look at Annex 2).

This questionnaire concerns the legal side of the applicability of the Flexibility Services in LFMs.

16 In your country, is there some regulation concerning the definitions below? If Yes, please, specify.

Congestion	Balancing	Demand Response
	DS3 Market TSO	DS3 Market TSO
Ancillary service	Non-frequency ancillary service	Energy storage
DS3 Market TSO		

[1] Nixiang, A. Flexibility services in Citizen Energy Communities (Master's thesis), University of Technology Eindhoven, the Netherlands. (2020)
[2] USEF White Paper: Energy and Flexibility Services, 2019

17 What kinds of flexibility services are available in your country?

Constraint Management ☐ Adequacy ☐ Balancing ☐ Wholesale ☐

17.1 Which participants are flexibility providers?

17.1.1 Constraint Management

Prosumers ☐ Aggregators ☐ Large Generation ☐ x Other ☐

17.1.2 Adequacy

Prosumers ☐ Aggregators ☐ Large Generation ☐ x Other ☐

17.1.3 Balancing

Prosumers ☐ Aggregators ☐ Large Generation ☐x Other ☐

17.1.4 Wholesale

Prosumers ☐ Aggregators ☐ Large Generation ☐ Other ☐

17.2 Which participants are flexibility buyers?

17.2.1 Constraint Management

TSO ☐x DSO ☐ Aggregators ☐ BRP ☐ Other ☐

17.2.2 Adequacy

TSO ☐ DSO ☐ Aggregators ☐ BRP ☐ Other ☐

17.2.3 Balancing

TSO ☐x DSO ☐ Aggregators ☐ BRP ☐ Other ☐

17.2.4 Wholesale

TSO ☐ DSO ☐ Aggregators ☐ BRP ☐ Other ☐

17.3 What are the procedures to sell flexibility?

17.3.1 Constraint Management

Open market ☐ Tender process ☐ Bid ☐ Other ☐

17.3.2 Adequacy

Open market Tender process ☐ Bid ☐ Other ☐

17.3.3 Balancing

Open Market ☐ Tender process ☐ Bid ☐ Other ☐

17.3.4 Wholesale

Open Market ☐ Tender process ☐ Bid ☐ Other ☐

18 Can storage facilities (including Electric Vehicles) provide flexibility services in your country?

Yes ☐ No ☐

If yes, how? Grid Scale battery services

19 Do the following flexibility services exist in your country?

19.1 Constraint Management

19.1.1 Voltage Control Yes ☐ No ☐

19.1.2 Grid Capacity Management Yes ☐ No ☐

19.1.3 Congestion Management Yes ☐ No ☐

19.1.4 Controlled Islanding Yes ☐ No ☐

19.1.5 Optional Downwards Flexibility Management Yes ☐ No ☐

19.1.6 DSO Constraint Management (pre/post fault) Yes ☐ No ☐

19.1.7 Other (please specify:) Yes ☐ No ☐

19.1.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.2 Adequacy

19.2.1 Capacity payment Yes ☐ No ☐

19.2.2 Capacity Market Yes ☐ No ☐

19.2.3 Strategic reserve Yes ☐ No ☐

19.2.4 Hedging Yes ☐ No ☐

19.2.5 Other (please specify) Yes ☐ No ☐

19.2.6 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.3 Balancing

19.3.1 Dynamic Containment Yes ☐ No ☐

19.3.2 Frequency Containment Reserve (FCR) Yes ☐ No ☐

19.3.3 Automatic Frequency Restoration Reserve (aFRR) Yes ☐ No ☐

19.3.4 Manual Frequency Restoration Reserve (mFRR) Yes ☐ No ☐

19.3.5 Replacement Reserve (RR) Yes ☐ No ☐

19.3.6 other (please specify:) Yes ☐ No ☐

19.3.7 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.4 Wholesale

19.4.1 Day-ahead optimization Yes ☐ No ☐

19.4.2 Intraday optimization Yes ☐ No ☐

19.4.3 Self/passive balancing Yes ☐ No ☐

19.4.4 Generation optimization Yes ☐ No ☐

19.4.5 Exceeding Maximum Export/Import Capacity Yes ☐ No ☐

19.4.6 Offsetting Yes ☐ No ☐

19.4.7 Other (please specify:) Yes ☐ No ☐

19.4.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.5 Local Optimization

19.5.1 ToU Optimization Yes ☐ No ☐

19.5.2 kWmax control Yes ☐ No ☐

19.5.3 Self-balancing Yes ☐ No ☐

19.5.4 Emergency power supply Yes ☐ No ☐

19.5.5 Smart Contracts Yes ☐ No ☐

19.5.6 Collective Self-consumption Yes ☐ No ☐

19.5.7 Transmission Charge Management Yes ☐ No ☐

19.5.8 Distribution Charge Management Yes ☐ No ☐

19.5.9 Other (please specify) Yes ☐ No ☐

19.5.10 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

20 Does the regulation in your country allow net-metering?

Yes ☐ No ☐

Explain.

21 Are there any legal incentives and benefits in your national/ regional/ local regulations that act as stimuli to the uptake of LFMs?

Yes ☐ No ☐

Explain.

4. Blockchain and Data Management in LFMs

1. Blockchain Technology & Smart Contract in Energy Services

Blockchain technology has the potential to transform the energy sector. Of the many use cases for blockchain, energy and sustainability are often less recognized. The energy industry has been consistently catalyzed by innovations including rooftop solar, electric vehicles, and smart metering. The blockchain presents itself as the next emerging technology to spur growth in the energy sector through smart contracts and systems interoperability. A joint report issued in 2018 by the WEF, Stanford Woods Institute for the Environment, and PwC identified more than 65 existing and emerging blockchain use-cases for the environment. These use cases include new business models for energy markets, real-time data management, and moving carbon credits or renewable energy certificates onto the blockchain; the blockchain also offers unique solutions for renewable energy distribution. A range of blockchain products can be tailored to address various energy or sustainability applications, including the following: wholesale electricity distribution; peer-to-peer energy trading; electricity data management; commodity trading; utility providers; etc.

22 Does the regulation in your country allow the use of blockchain or other digital currencies in the energy sector?

Yes □ No □

If yes, please, specify.

23 Do transactions concerning the flexibility services use Blockchain technology in your country?

Yes □ No □

If yes, please, specify.

24 Is there any provision or regulation that presents legal risk and behaves as a barrier to the use of Blockchain technology in flexibility services for LFMs?

Yes □ No □

If Yes, please, specify.

25 Does your country recognize smart contracts as legal contracts?

Yes ☐ No ☐

If Yes, please, specify.

2. Data Management & Protection

According to the General Data Protection Regulation 2016/679, data aggregation shouldn't violate the privacy and security of the customers. This regulation also removes obstacles to ensure a better mobility of personal data while protecting natural persons. LFMs process energy consumption data and shouldn't infer personal information especially when sharing data with third parties.

26 Does the regulation in your country guarantee the security of consumers' consumption data?

Yes ☐ No ☐

If Yes, please, specify.

27 In your country, how is the security of the grid? Are there any regulations about cybersecurity?

Explain.

28 How is your country managing smart metering data?

Centralized data hub ☐ Decentralized data infrastructure ☐

What are the risks and benefits of the system in place?

Risks: Benefits:

5. Summary

29 Can you give recommendations and proposals for changes in the regulation in order to overcome the perceived legal risks and barriers in your country concerning

29.1 Creation of a LFM

29.2 Uptake of the flexibility services

29.3 Use of blockchain technology for LFMs

29.4 Data Management

29.5 Other

30 Can you give recommendations and proposals for changes in the regulation in order to better foster Local Flexibility Markets uptake, flexibility services and blockchain technologies use for LFMs in your country; thus, creating incentives for their development?

ANNEX 1

Aggregation	***Distribution System Operator (DSO)***	***Transmission System Operator (TSO)***	***Balance Responsible Party (BRP)***
Art. 2. (18) of IEMD 2019/944	*Art. 2. (29) of IEMD 2019/944*	*Art. 2. (35) of IEMD 2019/944*	*Art.2. (14) of IEMD 2019/943*
‘aggregation’ means a function performed by a natural or legal person who combines multiple customer loads or generated electricity for sale, purchase or auction in any electricity market	‘DSO’ means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	‘TSO’ means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity	‘BRP’ means a market participant or its chosen representative responsible for its imbalances in the electricity market

Self-consumer	*Active customer*	*Renewable Energy Community(REC)*	*Citizens Energy Community (CEC)*
Art. 21. of REDII 2018/2001	Art.15 IEMD of 2019/944	Art. 22. of REDII 2018/2001	Art.16 of IEMD 2019/944
‘Renewables self-consumer’ means a final customer operating within its premises located within confined boundaries or, where permitted by a MS, within other premises, who generates RE electricity for its own consumption, and who may store or sell self-generated RE electricity, provided that, for a non-household REs self-consumer, those activities do not constitute its primary commercial or professional activity.	‘Active customer’ means a final customer, or a group of jointly acting final customers, who consumes or stores electricity generated within its premises located within confined boundaries or, where permitted by a MS, within other premises, or who sells self-generated electricity or participates in flexibility or EE schemes, provided that those activities do not constitute its primary commercial or professional activity;	‘REC’ means a legal entity: (a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the RE projects that are owned and developed by that legal entity; (b) the shareholders or members of which are natural persons, SMEs or local authorities, incl. municipalities; (c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits.	‘CEC’ means a legal entity that: (a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, incl. municipalities, or small enterprises; (b) has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; (c) may engage in generation, incl. from RES, distribution, supply, consumption, aggregation, energy storage, EE services or charging services for electric vehicles or provide other energy services to its members or shareholders.

ANNEX 2

Congestion	***Balancing***	***Demand Response***
Art. 2. (4) of IEMD 2019/943	*Art. 2. (10) of IEMD 2019/943*	*Art. 2. (20) of IEMD 2019/944*
‘congestion’ means a situation in which all requests from market participants to trade between network areas cannot be accommodated because they would significantly affect the physical flows on network elements which cannot accommodate those flows	‘balancing’ means all actions and processes, in all timelines, through which transmission system operators ensure, in an ongoing manner, maintenance of the system frequency within a predefined stability range and compliance with the amount of reserves needed with respect to the required quality	‘demand response’ means the change of electricity load by final customers from their normal or current consumption patterns in response to market signals, including in response to time-variable electricity prices or incentive payments, or in response to the acceptance of the final customer's bid to sell demand reduction or increase at a price in an organised market as defined in point (4) of Article 2 of Commission Implementing Regulation (EU) No 1348/2014 (17), whether alone or through aggregation

Ancillary service	***Non-frequency ancillary service***	***Energy storage***
Art. 2. (48) of IEMD 2019/944	*Art. 2. (49) of IEMD 2019/944*	*Art. 2. (59) of IEMD 2019/944*
‘Ancillary service’ means a service necessary for the operation of a transmission or distribution system, including balancing and non-frequency ancillary services, but not including congestion management	‘non-frequency ancillary service’ means a service used by a transmission system operator or distribution system operator for steady state voltage control, fast reactive current injections, inertia for local grid stability, short-circuit current, black start capability and island operation capability	‘Energy storage’ means, in the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical energy or use as another energy carrier

THANK YOU FOR ANSWERING THE QUESTIONS!

5. Italy

DEAR PARTICIPANT,

The following questionnaire is developed under the DE-RISK project in order for a thorough study to be performed to provide an overview of how the regulatory environment in ten European countries and at European Level evolved. The results of the survey will contribute to the Regulatory Impact Analysis (RIA) to deeply assess the current regulatory framework that is enabling or acting as a barrier for the large deployment of Local Flexibility Markets (LFM) and the potential flexibility services.

We invite you to complete this survey to collect your experience and views regarding:

- Awareness of European, national and local policies regarding the regulation on Local Flexibility Markets
- Perceived legal risks and benefits
- Impact of the regulation - barriers and incentives
- Legal background of innovative technologies - block chain transactions and flexibility services
- Perceived legal risks and benefits
- Recommendations about future legal development of the LFM in your country and at European Level.

ABOUT DE-RISK PROJECT

This survey is being conducted as part of the DE-RISK Project funded by the European Union (EU) under Horizon Europe program.. The DE-RISK project will support the market uptake of Renewable Energy Sources (RES) by de-risking the adoption of Local Flexibility Markets to increase the RES hosting capacity of the distribution network.

ABOUT YOUR PARTICIPATION

Your participation in this study is fully voluntary and all data collected will be treated confidentially. Participation is free and there are no mandatory requirements. The research outputs resulting from this work will only include collated data, without the possibility for anyone to identify your individual answers. Your contact details will be used on a need-to-know basis and will be strictly confidential until the end of the project’s lifetime. By submitting this form:

- you confirm that you have read and understood this information.
- you agree to participate in this research study and your answers to be included in our analysis and resulting from its research publications.
- you agree that we will process the data in line with DE-RISK project policy of confidentiality that is in accordance with GDPR 2016/679.

Country:	**Italy**
Organization:	**SOFENA**
Name of expert answering the survey:	**Marc-Antoine Andrieux**
Contact details: (mail, phone, other)	
Date:	**03/04/2023**

1. LFM Regulation - Definitions of Market Actors and Market Characteristics

The European Commission promotes flexibility markets as they can contribute to the European Union in becoming a climate-neutral continent by 2050. The new market development is taking place in Europe with the transposition in the different Member States of the Clean Energy Package (specifically the Electricity directive EU 944/2019) with new roles for DSOs entering into new activity areas. DSO-TSO cooperation evolves in a beneficial way for energy markets and for consumers as well. Governance of how DSOs and TSOs interact and engage in network planning, as well as arrangements to facilitate effective coordination for system operation, especially for flexibility, have been the key regulatory concerns in this area for the last few years.

Local flexibility markets allow the use of flexibility at local level by distribution and transmission system operators. This means using flexibility from decentralized energy resources (DERs) to solve congestion management problems, minimize power outages and avoid grid expansions. Flexibility markets help energy networks to monitor energy flows and create market signals to motivate changes in energy supply and demand, integrating smart meters and appliances, renewable energy resources and energy efficient resources accordingly. The Clean Energy Package defines and offers an enabling legislative framework for Local Energy Markets participants. The analysis of the LFM regulation will be conducted including some of the following topics that characterize the market:

LFM topic	**Sub-topic**
Market actors	• Aggregator • Balance Responsible Party (BRP) • Citizen energy communities • Distribution System Operator (DSO) • Market operator
Market and product characteristics	• Market entry and exit and market platforms • Product characteristics (e.g., prequalification, standardization of FS)
Infrastructural issues	• Smart metering systems • Energy storage • Network expansion
Contract, bidding, and settlement	• Contract. Bidding, billing, and settlement
Data security issues	• Access to data, data security, privacy protection

The Clean Energy for all Europeans Package defines new ground for consumers by recognizing under EU law, the rights of citizens and communities to engage directly in the energy sector. It also sets out legal frameworks for LFMs. Participants of the whole DR value chain are defined in the laws of the Clean Energy Package. The revised Renewable Energy Directive (EU) 2018/2001 sets the framework for 'renewable energy communities' and the revised Internal Electricity Market Directives (EU) 2019/943 & 2019/944 introduce new roles and responsibilities for 'citizen energy communities', 'aggregation', 'distribution system operator', 'transmission system operator' and 'balance responsible party' in the energy system covering all types of electricity. (Look at Annex 1)

1. *Are the Directives on common rules for the internal market for electricity 2019/943 & 2019/944 already transposed into your national legislation?*

Yes ■ **No** □ **Partially** □

Is the revised Renewable Energy Directive (EU) 2018/2001 already transposed into your national legislation? **Yes** ■ **No** □ **Partially** □

1.1. *If your answer is **Yes,** indicate the national / regional / local legislation that defines it and explain it:*

IEMD 2019/943: Legislative Decree n°210, 8 nov. 2021 which transpose the EU Directive
IEMD 2019/944: Legislative Decree n°210, 8 nov. 2021 which transpose the EU Directive
REDII 2018/2001: Legislative Decree n°199, 8 nov. 2021 which transpose the EU Directive

1.2. If your answer is ***Partially,*** *and there is some regulation concerning the definitions below, please, specify:*

For example: Explain if regulation is available, or concepts are under development, or discussions are ongoing, etc.

Aggregation	Distribution System Operator (DSO)	Transmission System Operator (TSO)	Balance Responsible Party (BRP)
Legislative Decree 210/2021, Art.3 (9)(10) *Aggregation is the function exercised by a natural person or legal entity that combines multiple customer or power loads generated for sale, purchase or auction in any electricity market.* *Independent aggregator is the market player that carries out the aggregation and is not related to the supplier of concerned customers.*	Legislative Decree 79/1999 Art.2 (25) & Art.9 & Legislative Decree 210/2021, Art.23 *Any natural or legal person in charge of the management, maintenance and development of the distribution system in a given area and the related interconnections with other systems, and to ensure the long-term ability of the system to meet demands of reasonable electricity distribution tariffs.*	Legislative Decree 79/1999 Art.2 (25) & Art.3 & Legislative Decree 210/2021, Art.22 *Any natural or legal person in charge of the management, maintenance and development of the transport network in a given area and the related interconnections with other systems, and to ensure the long-term ability of the system to meet demands of reasonable electricity transmission tariffs.*	Legislative Decree 210/2021, Art.3 (13) *The BRP is the market's participant or its designated representative, in charge of the imbalances it causes on the electricity market.*

Self-consumers	Active consumers	Renewable energy communities (REC)	Citizen energy communities (CEC)
Legislative Decree 210/2021, Art.2 (2) *Self-consumer is the natural or*	Legislative Decree 210/2021, Art.3 (2) *An active customer is an end customer or a group of*	Legislative Decree 199/2021, Art. 31 *Final clients have a right to organize themselves as REC if the following conditions are met:*	Legislative Decree 210/2021, Art.3 (3) & Art.14 *CEC is a subject of law with or without moral authority:*

legal person who produces electricity and uses it (to an extent not less than 70% per year) for its own use or for the use of subsidiaries.	*end customers located in a building or condominium acting collectively, who, on their own premises, carry out at least one of the following functions: production of electricity for self-consumption, storage or sale of self-produced electricity, participation in energy efficiency or flexibility mechanisms, possibly through an aggregator. These activities cannot under any circumstances constitute the main commercial or professional activity of these customers.*	*(a) the main objective is to offer its members or associates or to the territory in which it operates: environmental, economic or social benefits rather than financial profits (b) the REC belongs to the natural persons, SME, local authorities (incl. municipalities, R&D organisms, third-party organization in the environment field) (c) concerning compagnies, their participation to a REC can't be their principal commercial or industrial activity (d) Participation to an REC is open to all consumers, incl. consumers in an energy poverty situation.*	*(a) based on voluntary and open participation (b) controlled by partners or associates who are natural persons, small businesses, local authorities (incl. municipalities, R&D organisms, third-party organization in the environment field (c)whose main object is to offer its members or associates or to the territory in which it operates: environmental, economic or social benefits rather than financial profits (d) who may participate in the generation, distribution, supply, consumption, aggregation, storage energy, energy efficiency services or EV charging & other services to its members or associates.*

1.3. Are there other LFM participants in your country? How are they defined?

NRA ■ Suppliers ☐ Traders ☐ Other ☐

1. ARERA (Italian NRA) is defined by the article 42 of the legislative decree 93/2011 and amended by the article 24 of the legislative decree 210/2021 and has the main following missions:
   - Developing competitive regional markets & Facilitate electricity circulation within EU

- Supervising the proper functioning of the electricity market

2. *How do DSOs and TSOs cooperate to organize the flexibility market?*

Cooperation between TSO-DSO in a pilot project (SmartNet project) which aims to aggregate data on the electricity produced in real time in order to facilitate the use of ancillary services. The DSO, Edyna, is monitoring the grid in real time and is passing the information to the TSO, Terna, which centralizes the data and analyzes them to take action if need be.[1]

3. *How is the Local Flexibility Market organized in your country?*

Platform ■ Aggregation ☐ Other model ☐

The implementation of a LFM (in Rome) through the Platone project[2] aims at implementing a real integrated market with innovative technologies (Use of blockchain, Smart metering system and new grid equipment). Retail and prosumers interact with aggregators and DSOs to access new flexibility services.

4. *Are there any legislative barriers which block the reinforcement of interactions between LFM's participants and slow down the development of LFMs? Please, indicate below:*

Lack of legislation concerning Blockchain

5 Are there national regulations concerning the market products?

For example: Explain if regulations or guidelines are available, or discussions are ongoing, etc.

[1] https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Jul/IRENA_TSO-DSO_co-operation_2020.pdf?la=en&hash=5D78444F4339DC130204A0F9A99A30753368AABC

[2] https://platone-h2020.eu/Trials/Italian_Demo

5.1. Market entry and exit: *Yes* [redacted] *No ☐*

Explain: The access to the Italian Power Exchange (IPEX) is regulated by the GME (Gestore dei Mercati Energetici SpA). Participants have to submit a Market Participation Application and a Market Participation Agreement to be approved by the GME and then can enter into the Register of Market Participants.[3] All the requirements are defined in the "Integrated Text of the Electricity Market Rules" (Art. 11)[4]

5.2. Market Product characteristics (e.g, Are there guides and regulations on product prequalification, standardization and baseline):

Yes X *No ☐*

In the Italian Grid Code[5] (made by Terna, supervised by ARERA), Chapter 4 defines Flexibility Products, their characteristics and the requirements for enabling resources.

[3] https://www.mercatoelettrico.org/en/mercati/mercatoelettrico/ComePartecipare.aspx
[4] https://www.mercatoelettrico.org/en/MenuBiblioteca/Documenti/20220321_Testo_Integrato_ME_En.pdf
[5] https://www.terna.it/en/electric-system/grid-codes/italian-grid-code

6 Infrastructural issues concerning the LFMs.

6.1 Regulation on Smart Metering Systems. Are they adapted to the LFMs? Are they installed?

Yes [redacted] *No ☐*

Explain: The Article 9, legislative decree 210/2021 defines the objectives in terms of smart-metering. The technical details are defined in the Grid Code, Chapter 5. On the field, 80% of households were equipped with smart meters in 2020. A second generation of SMS is currently deployed.

6.2 Regulation on Energy Storage: How is energy storage defined in your regulation? Is there any guideline, or discussions ongoing, etc.?

Yes X No ☐

Energy storage planification is defined in the legislative decree 210/2021, article 18. Article 19 states that TSO and DSO can own and manage energy storage facilities if they are integrated in the network. The National Energy and Climate Plan also encourages the development of storage facilities to improve the flexibility of the system and to keep over-generation to a minimum. The goal is to have an increased capacity of 6000 MW split between pumping and electrochemical production (between 2019 and 2030) and an additional 4000 MW of distributed storage facilities. Hydrogen synthesis from excess renewable electricity is also a possibility to explore to have more flexibility.

7 Contract, bidding, and settlement. Explain if any specific regulations or guidelines for LFM are established.

Yes ☐ *No* ☐

No specific regulation for LFM, regulation for the flexibility market, in general, can be found in the Electricity Market Rules.

According to IEMD 2019/944 the network development plan published by the DSOs should provide transparency on the medium and long-term flexibility services and shall set out the planned investments for the next five-to-ten years, with particular emphasis on the main distribution infrastructure which is required in order to connect new generation capacity and new loads, including recharging points for electric vehicles. The network development plan shall also include the use of demand response, energy efficiency, energy storage facilities or other resources that the distribution system operator is to use as an alternative to system expansion.

8 Is there any legislation about development plans for the electricity network in your country?

Yes ■ **No** ☐

8.1 If your answer is Yes, indicate the legal regulation that defines it, its statement and how flexibility is included into it.

10-year development plan defined in Legislative Decree 93/2011 and Legislative decree 199/2021 defines the methods for electricity network planning. The only mention of flexibility is that the plan should include planification for electric vehicles.

8.2 Are there any stimuli or incentives to create flexibility or/and to include flexibility in network development plans? Please, indicate below:

Electricity generated from RES is encouraged by VAT and other taxes reduction/deduction, especially for prosumers so they can inject their excess electricity in the grid and provide FS.

8.3 Regulation on Network Expansion in compliance with the IEMD 2019/944?

2. Yes ■ No ☐

2.

3. Grid development is defined in the Italian Grid Code, Chapter 2 and it details the development planning process, the data needed for the planning and the development plan.

7.

9 Can you note if there are any provisions or regional/local regulations that present legal risks and behave as barriers to the development of Local Energy markets:

10 Can you describe any act provisions or regional / local regulations that bring benefits and behave as enablers to LFMs:

11 Are there any administrative and bureaucratic procedures that hinder LFMs' development and play a restrictive role in their broader application? If yes, please, explain.

The National Energy and Climate Plan (2019) suggests the need to simplify the authorization procedures (especially for Energy Storage – Pumping Systems).

12 Would you suggest what kind of legal provisions in your country will contribute most to the activation of the interested parties (citizens, commercial and industrial players) to participate in LFMs?

13 Can you define any recommendations for improvement of the legislation concerning LFMs in your country or on EU level?

2. Policy and Regulatory Framework for LFMs Uptake

14 Does your National (Regional / Local) Energy Action Plans include targets for development and spread of LFMs?

The National Energy and Climate Plan includes national objectives for the flexibility services expansion but there are no specific targets for the development of LFMs. It promotes the development of Energy communities, self-consumers and technologies 'such as smart meters, storage systems). Without being specific, the NECL states that: "in the long-term, the dispatching model itself will be aligned with market developments, tending towards models that are better tailored to a distributed resource system". This document announces the possibility of decentralized electricity markets to be able to provide preventive measures to the grid.

15 What kind of bureaucratic and administrative barriers LFMs can experience

15.1 When flexibility producers connect to the grid?

15.1.1 Complicated application procedure: Yes ☐ No X

Explain: No, the Grid Code provides the necessary information to connect to the grid.

15.1.2 Uncertainty of approval: *Yes X* *No ☐*

Explain: There are requirements to connect to the grid and provide Flexibility Services, so they're always a risk of been rejected by a network operator or the market's authority.

15.1.3 High costs: *Yes X* *No ☐*

Depending on the location of the project and the technical requirements for the grid connection, the connection can be a barrier. FiT and other incentives moderate this financial risk.

15.1.4 Time consuming procedure: *Yes X* *No ☐*

Despite a change in legislation to simplify procedures, connecting to the grid can be time consuming depending on the complexity of the projects and the variety of stakeholders.

15.1.5 Other: *Yes ☐* *No ☐*

Explain:

15.2 When operating the grid (allowance /licensing)?

15.2.1 for System Operators: *Yes X* *No ☐*

Explain: Licensing process can involve significant bureaucratic and administrative procedures.

15.2.2 for prosumers/aggregators: *Yes X* *No ☐*

Aggregators must register with GSE (Energy Services Manager) and comply with technical requirement

15.2.3 for BRP *Yes X* *No ☐*

BRPs need authorization from ARERA to operate, and have technical and operational requirements (incl. submitting reports on their activity)

15.2.4 other: *Yes ☐* *No ☐*

Explain:

3. Flexibility Services in a Local Flexibility Market

Flexibility services are "the services provided by individual or aggregated (residential, commercial or industrial) prosumers to flexibility requesting parties (DSO, BRP, and TSO) or prosumers themselves, in reaction to external signals (price signal or activations), by modifying the consumption and/or production pattern, in order to facilitate the reliable and cost-effective management of variability and uncertainty in the electricity system"[6]. Flexibility services specifically focus on deliberate, time limited changes to the 'normal' energy profile[7].

LFM provides an opportunity for consumers to play a significant role in the operation of the electric grid by reducing or shifting their electricity usage in response to time-based rates or other forms of financial incentives. DR programs are currently being used by some electric system planners and operators, using mainly the flexibility provided by large industrial facilities connected to the high-voltage grid, as resource options for balancing supply and demand. Therefore, LFMs development will foster flexibility services at DSO level using residential and tertiary buildings flexibility (Look at Annex 2).

This questionnaire concerns the legal side of the applicability of the Flexibility Services in LFMs.

16 In your country, is there some regulation concerning the definitions below? If Yes, please, specify.

Congestion	Balancing	Demand Response

[6] Nixiang, A. Flexibility services in Citizen Energy Communities (Master's thesis), University of Technology Eindhoven, the Netherlands. (2020)

[7] USEF White Paper: Energy and Flexibility Services, 2019

Congestion is regulated by ARERA through the Resolution ARG/elt162/11 and by Terna with its Italian Congestion Management Rules	Terna is responsible for the grid balance. Flexibility services (Grid Code) and imbalance fees are available to ensure the network safety (ARERA Resolution ARG/elt107/09, section 3)	Implicit and Explicit DR are both regulated and promoted in the Italian Regulation and Planification. Art.8 of Legislative Decree 210/2021 regulates contracts with dynamic electricity tariffs to provide new flexibility in the grid.
Ancillary service	Non-frequency ancillary service	Energy storage
Ancillary services are defined by the Grid Code (Resources for dispatching)	Non-frequency ancillary services are defined by the Grid Code (Resources for dispatching)	Legislative Decree 210/2021, Art.3 (6) *Energy storage is the deferral of end use electricity after production or its storage (through a stored energy) for its own later conversion to electricity.* Energy Storage Planification is scheduled in Article 18.

17 What kinds of flexibility services are available in your country?

Constraint Management X Adequacy ☐ Balancing X Wholesale X

17.1 Which participants are flexibility providers?

17.1.1 Constraint Management

Prosumers ☐ Aggregators ☐ Large Generation X Other ☐

17.1.2 Adequacy

Prosumers ☐ Aggregators ☐ Large Generation ☐ Other ☐

17.1.3 Balancing

Prosumers ☐ Aggregators ☐ Large Generation X Other ☐

17.1.4 Wholesale

Prosumers X Aggregators X Large Generation X Other ☐

17.2 Which participants are flexibility buyers?

17.2.1 Constraint Management

TSO X DSO X Aggregators ☐ BRP ☐ Other ☐

17.2.2 Adequacy

TSO ☐ DSO ☐ Aggregators ☐ BRP ☐ Other ☐

17.2.3 Balancing

TSO X DSO X Aggregators ☐ BRP ☐ Other ☐

17.2.4 Wholesale

TSO X DSO X Aggregators X BRP X Other ☐

17.3 What are the procedures to sell flexibility?

17.3.1 Constraint Management

Open market X Tender process X Bid □ Other □

17.3.2 Adequacy

Open market □ Tender process □ Bid □ Other □

17.3.3 Balancing

Open Market □ Tender process X Bid □ Other □

17.3.4 Wholesale

Open Market X Tender process □ Bid X Other □

18 Can storage facilities (including Electric Vehicles) provide flexibility services in your country?

Yes □ No □

If yes, how?

19 Do the following flexibility services exist in your country?

19.1 Constraint Management

19.1.1 Voltage Control Yes X No ☐

19.1.2 Grid Capacity Management Yes X No ☐

19.1.3 Congestion Management Yes X No ☐

19.1.4 Controlled Islanding Yes ☐ No ☐

19.1.5 Optional Downwards Flexibility Management Yes ☐ No ☐

19.1.6 DSO Constraint Management (pre/post fault) Yes X No ☐

19.1.7 Other (please specify: Interruptible Load Service) Yes X No ☐

19.1.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No X

Explain:

19.2 Adequacy

19.2.1 Capacity payment Yes ☐ No ☐

19.2.2 Capacity Market Yes ☐ No ☐

19.2.3 Strategic reserve Yes ☐ No ☐

19.2.4 Hedging Yes ☐ No ☐

19.2.5 Other (please specify) Yes ☐ No ☐

19.2.6 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.3 Balancing

19.3.1 Dynamic Containment Yes ☐ No ☐

19.3.2 Frequency Containment Reserve (FCR) Yes X No ☐

19.3.3 Automatic Frequency Restoration Reserve (aFRR) Yes X No ☐

19.3.4 Manual Frequency Restoration Reserve (mFRR) Yes X No ☐

19.3.5 Replacement Reserve (RR) Yes ☐ No ☐

19.3.6 other (please specify:) Yes ☐ No ☐

19.3.7 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No X

Explain:

19.4 Wholesale

19.4.1 Day-ahead optimization Yes X No ☐

19.4.2 Intraday optimization Yes X No ☐

19.4.3 Self/passive balancing Yes ☐ No ☐

19.4.4 Generation optimization Yes ☐ No ☐

19.4.5 Exceeding Maximum Export/Import Capacity Yes ☐ No ☐

19.4.6 Offsetting Yes ☐ No ☐

19.4.7 Other (please specify:) Yes ☐ No X

19.4.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No X

Explain:

19.5 Local Optimization

19.5.1 ToU Optimization Yes X No ☐

19.5.2 kWmax control Yes X No ☐

19.5.3 Self-balancing Yes X No ☐

19.5.4 Emergency power supply Yes ☐ No ☐

19.5.5 Smart Contracts Yes X No ☐

19.5.6 Collective Self-consumption Yes ☐ No ☐

19.5.7 Transmission Charge Management Yes ☐ No ☐

19.5.8 Distribution Charge Management Yes ☐ No ☐

19.5.9 Other (please specify) Yes ☐ No ☐

19.5.10 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

20 Does the regulation in your country allow net-metering?

Yes X No ☐

The "Scambio sul Posto" scheme allows prosumers to consume the electricity they produce or to fed produced electricity into the grid. This system can be used by prosumers with a plant's capacity lower than 500 kW (Art 2bis,2 E612/2014/R/eel) and is based on the balance between self-consumption and electricity fed into the network (Art. 1, 2 570/2012/R/efr). The prosumer pays the supplier for the import electricity and GSE gives credit for the electricity fed in. If more electricity is fed in than consumed, prosumers will receive an economic compensation (Art. 6 570/2012/R/efr). Otherwise, the difference has to be paid by the prosumer to the supplier.[8]

21 Are there any legal incentives and benefits in your national/ regional/ local regulations that act as stimuli to the uptake of LFMs?

Yes X No ☐

[8] http://www.res-legal.eu/search-by-country/italy/single/s/res-e/t/promotion/aid/net-metering-scambio-sul-posto/lastp/151/

“Scambio sul posto” scheme for metering promotes the role of prosumer as well as the “Ritiro Dedicato” scheme. RES producers can sell their electricity production to GSE, who will sell it on the electricity markets on their behalf with a guaranteed minimum price. If the electricity price is higher, prosumers will receive an annual adjustment.

A tax reduction mechanism is also in place for RES producers. Electricity generation from solar and wind energy has a reduction of 10% on the VAT for investments on their plants.

4. Blockchain and Data Management in LFMs

1. Blockchain Technology & Smart Contract in Energy Services

Blockchain technology has the potential to transform the energy sector. Of the many use cases for blockchain, energy and sustainability are often less recognized. The energy industry has been consistently catalyzed by innovations including rooftop solar, electric vehicles, and smart metering. The blockchain presents itself as the next emerging technology to spur growth in the energy sector through smart contracts and systems interoperability. A joint report issued in 2018 by the WEF, Stanford Woods Institute for the Environment, and PwC identified more than 65 existing and emerging blockchain use-cases for the environment. These use cases include new business models for energy markets, real-time data management, and moving carbon credits or renewable energy certificates onto the blockchain; the blockchain also offers unique solutions for renewable energy distribution. A range of blockchain products can be tailored to address various energy or sustainability applications, including the following: wholesale electricity distribution; peer-to-peer energy trading; electricity data management; commodity trading; utility providers; etc.

22 Does the regulation in your country allow the use of blockchain or other digital currencies in the energy sector?

Yes X No ☐

Blockchain is defined in the Italian law (Law Decree 135/2019) but there is no regulation about it. Therefore, the use of blockchain in the energy sector isn’t forbidden.

23 Do transactions concerning the flexibility services use Blockchain technology in your country?

Yes ☐ No X

Some experiments are taking place in Italy such as the pilot of the Platone project which aims to create a LFM and uses a local blockchain based flexibility market.[9]

24 Is there any provision or regulation that presents legal risk and behaves as a barrier to the use of Blockchain technology in flexibility services for LFMs?

Yes X No ☐

Lack of regulation and therefore a lack of standardization

25 Does your country recognize smart contracts as legal contracts?

Yes X No ☐

Smart contracts are defined as a software program that operates on Distributed Ledger Technologies and whose execution automatically binds two or more parties.

[9] https://www.smart-energy.com/regional-news/europe-uk/italys-areti-launches-flexibility-pilot-in-rome/

2. Data Management & Protection

According to the General Data Protection Regulation 2016/679, data aggregation shouldn't violate the privacy and security of the customers. This regulation also removes obstacles to ensure a better mobility of personal data while protecting natural persons. LFMs process energy consumption data and shouldn't infer personal information especially when sharing data with third parties.

26 Does the regulation in your country guarantee the security of consumers' consumption data?

Yes X No ☐

The Italian regulation on data management follows the European regulation GDPR.

27 In your country, how is the security of the grid? Are there any regulations about cybersecurity?

Law Decree 82/2021 on defining the national cybersecurity architecture and on the establishment of the National Cybersecurity Agency

28 How is your country managing smart metering data?

Centralized data hub X Decentralized data infrastructure □

What are the risks and benefits of the system in place?

Risks: Benefits:

5. Summary

29 Can you give recommendations and proposals for changes in the regulation in order to overcome the perceived legal risks and barriers in your country concerning

29.1 Creation of a LFM

29.2 Uptake of the flexibility services

29.3 Use of blockchain technology for LFMs

29.4 Data Management

29.5 Other

30 Can you give recommendations and proposals for changes in the regulation in order to better foster Local Flexibility Markets uptake, flexibility services and blockchain technologies use for LFMs in your country; thus, creating incentives for their development?

ANNEX 1

Aggregation	***Distribution System Operator (DSO)***	***Transmission System Operator (TSO)***	***Balance Responsible Party (BRP)***

Art. 2. (18) of IEMD 2019/944	*Art. 2. (29) of IEMD 2019/944*	*Art. 2. (35) of IEMD 2019/944*	*Art.2. (14) of IEMD 2019/943*
'aggregation' means a function performed by a natural or legal person who combines multiple customer loads or generated electricity for sale, purchase or auction in any electricity market	'DSO' means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	'TSO' means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity	'BRP' means a market participant or its chosen representative responsible for its imbalances in the electricity market

---

Self-consumer	***Active customer***	***Renewable Energy Community(REC)***	***Citizens Energy Community (CEC)***
Art. 21. of REDII 2018/2001	Art.15 IEMD of 2019/944	Art. 22. of REDII 2018/2001	Art.16 of IEMD 2019/944

'Renewables self-consumer' means a final customer operating within its premises located within confined boundaries or, where permitted by a MS, within other premises, who generates RE electricity for its own consumption, and who may store or sell self-generated RE electricity, provided that, for a non-household REs self-consumer, those activities do not constitute its primary commercial or professional activity.	'Active customer' means a final customer, or a group of jointly acting final customers, who consumes or stores electricity generated within its premises located within confined boundaries or, where permitted by a MS, within other premises, or who sells self-generated electricity or participates in flexibility or EE schemes, provided that those activities do not constitute its primary commercial or professional activity;	'REC' means a legal entity: (a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the RE projects that are owned and developed by that legal entity; (b) the shareholders or members of which are natural persons, SMEs or local authorities, incl. municipalities; (c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits.	'CEC' means a legal entity that: (a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, incl. municipalities, or small enterprises; (b) has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; (c) may engage in generation, incl. from RES, distribution, supply, consumption, aggregation, energy storage, EE services or charging services for electric vehicles or provide other energy services to its members or shareholders.

ANNEX 2

Congestion	***Balancing***	***Demand Response***
Art. 2. (4) of IEMD 2019/943	*Art. 2. (10) of IEMD 2019/943*	*Art. 2. (20) of IEMD 2019/944*

‘congestion’ means a situation in which all requests from market participants to trade between network areas cannot be accommodated because they would significantly affect the physical flows on network elements which cannot accommodate those flows	‘balancing’ means all actions and processes, in all timelines, through which transmission system operators ensure, in an ongoing manner, maintenance of the system frequency within a predefined stability range and compliance with the amount of reserves needed with respect to the required quality	‘demand response’ means the change of electricity load by final customers from their normal or current consumption patterns in response to market signals, including in response to time-variable electricity prices or incentive payments, or in response to the acceptance of the final customer's bid to sell demand reduction or increase at a price in an organised market as defined in point (4) of Article 2 of Commission Implementing Regulation (EU) No 1348/2014 (17), whether alone or through aggregation

Ancillary service	***Non-frequency ancillary service***	***Energy storage***
Art. 2. (48) of IEMD 2019/944	*Art. 2. (49) of IEMD 2019/944*	*Art. 2. (59) of IEMD 2019/944*

‘Ancillary service’ means a service necessary for the operation of a transmission or distribution system, including balancing and non-frequency ancillary services, but not including congestion management	‘non-frequency ancillary service’ means a service used by a transmission system operator or distribution system operator for steady state voltage control, fast reactive current injections, inertia for local grid stability, short-circuit current, black start capability and island operation capability	‘Energy storage’ means, in the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical energy or use as another energy carrier

THANK YOU FOR ANSWERING THE QUESTIONS!

6. Netherlands

DEAR PARTICIPANT,

The following questionnaire is developed under the DE-RISK project in order for a thorough study to be performed to provide an overview of how the regulatory environment in ten European countries and at European Level evolved. The results of the survey will contribute to the Regulatory Impact Analysis (RIA) to deeply assess the current regulatory framework that is enabling or acting as a barrier for the large deployment of Local Flexibility Markets (LFM) and the potential flexibility services.

We invite you to complete this survey to collect your experience and views regarding:

- Awareness of European, national and local policies regarding the regulation on Local Flexibility Markets
- Perceived legal risks and benefits
- Impact of the regulation - barriers and incentives
- Legal background of innovative technologies - block chain transactions and flexibility services
- Perceived legal risks and benefits
- Recommendations about future legal development of the LFM in your country and at European Level.

ABOUT DE-RISK PROJECT

This survey is being conducted as part of the DE-RISK Project funded by the European Union (EU) under Horizon Europe program.. The DE-RISK project will support the market uptake of Renewable Energy Sources (RES) by de-risking the adoption of Local Flexibility Markets to increase the RES hosting capacity of the distribution network.

ABOUT YOUR PARTICIPATION

Your participation in this study is fully voluntary and all data collected will be treated confidentially. Participation is free and there are no mandatory requirements. The research outputs resulting from this work will only include collated data, without the possibility for anyone to identify your individual answers. Your contact details will be used on a need-to-know basis and will be strictly confidential until the end of the project's lifetime. By submitting this form:

- you confirm that you have read and understood this information.
- you agree to participate in this research study and your answers to be included in our analysis and resulting from its research publications.
- you agree that we will process the data in line with DE-RISK project policy of confidentiality that is in accordance with GDPR 2016/679.

Country:	**The Netherlands**
Organization:	**SOFENA**
Name of expert answering the survey:	**Juliette GRIMAUD**
Contact details: (mail, phone, other)	
Date:	**March 2023**

1. LFM Regulation - Definitions of Market Actors and Market Characteristics

The European Commission promotes flexibility markets as they can contribute to the European Union in becoming a climate-neutral continent by 2050. The new market development is taking place in Europe with the transposition in the different Member States of the Clean Energy Package (specifically the Electricity directive EU 944/2019) with new roles for DSOs entering into new activity areas. DSO-TSO cooperation evolves in a beneficial way for energy markets and for consumers as well. Governance of how DSOs and TSOs interact and engage in network planning, as well as arrangements to facilitate effective coordination for system operation, especially for flexibility, have been the key regulatory concerns in this area for the last few years.

Local flexibility markets allow the use of flexibility at local level by distribution and transmission system operators. This means using flexibility from decentralized energy resources (DERs) to solve congestion management problems, minimize power outages and avoid grid expansions. Flexibility markets help energy networks to monitor energy flows and create market signals to motivate changes in energy supply and demand, integrating smart meters and appliances, renewable energy resources and energy efficient resources accordingly. The Clean Energy Package defines and offers an enabling legislative framework for Local Energy Markets participants. The analysis of the LFM regulation will be conducted including some of the following topics that characterize the market:

LFM topic	**Sub-topic**
Market actors	• Aggregator • Balance Responsible Party (BRP) • Citizen energy communities • Distribution System Operator (DSO) • Market operator
Market and product characteristics	• Market entry and exit and market platforms • Product characteristics (e.g., prequalification, standardization of FS)
Infrastructural issues	• Smart metering systems • Energy storage • Network expansion
Contract, bidding, and settlement	• Contract. Bidding, billing, and settlement
Data security issues	• Access to data, data security, privacy protection

The Clean Energy for all Europeans Package defines new ground for consumers by recognizing under EU law, the rights of citizens and communities to engage directly in the energy sector. It also sets out legal frameworks for LFMs. Participants of the whole DR value chain are defined in the laws of the Clean Energy Package. The revised Renewable Energy Directive (EU) 2018/2001 sets the framework for 'renewable energy communities' and the revised Internal Electricity Market Directives (EU) 2019/943 & 2019/944 introduce new roles and responsibilities for 'citizen energy communities', 'aggregation', 'distribution system operator', 'transmission system operator' and 'balance responsible party' in the energy system covering all types of electricity. (Look at Annex 1)

1. *Are the Directives on common rules for the internal market for electricity 2019/943 & 2019/944 already transposed into your national legislation?*

Yes ☐ **No** ☐ **Partially** ■

Is the revised Renewable Energy Directive (EU) 2018/2001 already transposed into your national legislation? **Yes**

☐ **No** ☐ **Partially** ■

*1.1. If your answer is **Yes,** indicate the national / regional / local legislation that defines it and explain it:*

IEMD 2019/943: 1998 Electricity Act and several amendments (including the 2012 E-Act)
IEMD 2019/944: 1998 Electricity Act and several amendments. The Electricity Law and the Gas Law are currently under review in order to made a combine law which will transpose the directive and improve it. In the beginning of April 2023, the new law has not been implemented yet (has been submitted to the House of Representatives for parliamentary consideration at the end of 2022)

REDII 2018/2001: Act of June 2021, which is an amendment of the Environmental Management Act Energy Transport Decree and its amendments

*1.2. If your answer is **Partially,** and there is some regulation concerning the definitions below, please, specify:*

For example: Explain if regulation is available, or concepts are under development, or discussions are ongoing, etc.

Aggregation	Distribution System Operator (DSO)	Transmission System Operator (TSO)	Balance Responsible Party (BRP)
Not defined	1998 Electricity Law: tasks and obligation of the DSO	1998 Electricity Law: tasks and obligations of the TSO	Not defined

Self-consumers	Active consumers	Renewable energy communities (REC)	Citizen energy communities (CEC)
Not defined	Not defined	Not defined.	Not defined.

1.3. Are there other LFM participants in your country? How are they defined?

NRA ■ Suppliers ■ Traders ■ Other ☐

2. How do DSOs and TSOs cooperate to organize the flexibility market?

Please, specify if there is any guidance or regulation defining it. TSO and DSO have obligations about the technical aspects of the grid. Their collaboration is in the form of project such as the GOPACS project.

3. How is the Local Flexibility Market organized in your country?

Platform ■ Aggregation ☐ Other model ☐

Please, specify. Give the name, link, info about the applicable model in your country. Blockchain platform : Crowd Balancing Platform Equigy [Crowd Balancing Platform - Blockchain Technology (tennet.eu)]

[Flexcity helps to build up the secondary reserve of the network managed by TenneT and offers new services to its partners - Equigy]

GOPACS project: the GOPACS platform is a coordination platform for Dutch operator that allows them to reduce congestion in the electricity grid.

The aim is to go-live this platform in June 2023.

4. *Are there any legislative barriers which block the reinforcement of interactions between LFM's participants and slow down the development of LFMs? Please, indicate below:*

Legislative frameworks that make setting up LFM ventures difficult; lack of policy framework for LFM investments; complex and changeable policies regarding LFM development; difficulty in accessing loans, contracts or funding for LFM projects, because of a lot of rules at the national level.

5 Are there national regulations concerning the market products?

For example: Explain if regulations or guidelines are available, or discussions are ongoing, etc.

5.1. Market entry and exit: *Yes* [redacted] *No* ☐

Explain:

Art 95a of 1998 Electricity Act:
It is forbidden to supply electricity without a permit to

customers who have on a connection to a network with a total maximum permeability of not more than 3*80 A.

5.2. Market Product characteristics (e.g, Are there guides and regulations on product prequalification, standardization and baseline):

Yes ☐ *No* [redacted]

Explain:

6 Infrastructural issues concerning the LFMs.

6.1 Regulation on Smart Metering Systems. Are they adapted to the LFMs? Are they installed?

Yes [redacted] *No* [redacted]

Explain:

Smart meters are rather widespread in the Netherlands, in 2022 about 85% of customers with a small connection are equipped, and it is 90 % for customers with a large connection.

PowerMatching City → project to test the use of smart grids and home energy management systems to enable household to participate in local flexibility market

6.2 Regulation on Energy Storage: How is energy storage defined in your regulation? Is there any guideline, or discussions ongoing, etc.?

Yes ☐ *No* ☒

Explain:
The Energy transition Fund provides financial support for project related to energy storage (among others projects)
Roadmap for Integration of Energy Storage in Dutch Power Mix → conference in 2022

7 Contract, bidding, and settlement. Explain if any specific regulations or guidelines for LFM are established.

Yes ☐ *No* ■

Explain: Difficulty in accessing loans/contracts/funding for LFM projects because of the many national rules

According to IEMD 2019/944 the network development plan published by the DSOs should provide transparency on the medium and long-term flexibility services and shall set out the planned investments for the next five-to-ten years, with particular emphasis on the main distribution infrastructure which is required in order to connect new generation capacity and new loads, including recharging points for electric vehicles. The network development plan shall also include the use of demand response, energy efficiency, energy storage facilities or other resources that the distribution system operator is to use as an alternative to system expansion.

8 Is there any legislation about development plans for the electricity network in your country?

Yes ■ **No** ☐

8.1 If your answer is Yes, indicate the legal regulation that defines it, its statement and how flexibility is included into it.

1998 Electricity Law: obligation of the DSO and TSO, about the network but also about the transparency of the grid

8.2 Are there any stimuli or incentives to create flexibility or/and to include flexibility in network development plans? Please, indicate below:

The flexibility market program, launched in 2019 → incentive households and business to shift their energy consumption and generation, encourages also the development of local flexibility market Not really incentive for the flexibility of the grid, but rather tools (like the ValueFlex) which encourages the companies to use energy in a more flexible way by highlighting the possible saving.

8.3 Regulation on Network Expansion in compliance with the IEMD 2019/944?

2. Yes ☐ No ■

3.

Explain:

9 Can you note if there are any provisions or regional/local regulations that present legal risks and behave as barriers to the development of Local Energy markets:

/

10 Can you describe any act provisions or regional / local regulations that bring benefits and behave as enablers to LFMs:

/

11 Are there any administrative and bureaucratic procedures that hinder LFMs' development and play a restrictive role in their broader application? If yes, please, explain.

A lot of rules at the national level, rigid legal, bureaucratic and administrative procedures

12 Would you suggest what kind of legal provisions in your country will contribute most to the activation of the interested parties (citizens, commercial and industrial players) to participate in LFMs?

/

13 Can you define any recommendations for improvement of the legislation concerning LFMs in your country or on EU level?

/

2. Policy and Regulatory Framework for LFMs Uptake

14 Does your National (Regional / Local) Energy Action Plans include targets for development and spread of LFMs?

Please, explain: The Flexibility Market plan → the aim is to create a more flexible energy system, and encourages the development of local flexibility markets PowerMatching City → to enable households to participate in local flexibility market

15 What kind of bureaucratic and administrative barriers LFMs can experience

15.1 When flexibility producers connect to the grid?

15.1.1 Complicated application procedure: *Yes* [redacted] *No ☐*

Complex and rigid rules

15.1.2 Uncertainty of approval: *Yes* [redacted] *No ☐*

Explain: Lack of experience with LFM; Difficulty in accessing loans/contracts/funding for LFM projects

15.1.3 High costs: *Yes* [redacted] *No ☐*

Explain: A high return on investment may be contradictory to the nature of a LFM and their long-term outlook

15.1.4 Time consuming procedure: *Yes ☐* *No ☐*

Explain:

15.1.5 Other: *Yes ☐* *No ☐*

Explain:

15.2 When operating the grid (allowance /licensing)?

15.2.1 for System Operators: *Yes ☐* *No ☐*

Explain:

15.2.2 for prosumers/aggregators: *Yes ☐* *No ☐*

Explain:

15.2.3 for BRP *Yes ☐* *No ☐*

Explain:

15.2.4 other: *Yes ☐* *No ☐*

Explain:

3. Flexibility Services in a Local Flexibility Market

Flexibility services are "the services provided by individual or aggregated (residential, commercial or industrial) prosumers to flexibility requesting parties (DSO, BRP, and TSO) or prosumers themselves, in reaction to external signals (price signal or activations), by modifying the consumption and/or production pattern, in order to facilitate the reliable and cost-effective management of variability and uncertainty in the electricity system"[1]. Flexibility services specifically focus on deliberate, time limited changes to the 'normal' energy profile[2].

LFM provides an opportunity for consumers to play a significant role in the operation of the electric grid by reducing or shifting their electricity usage in response to time-based rates or other forms of financial incentives. DR programs are currently being used by some electric system planners and operators, using mainly the flexibility provided by large industrial facilities connected to the high-voltage grid, as resource options for balancing supply and demand. Therefore, LFMs development will foster flexibility services at DSO level using residential and tertiary buildings flexibility (Look at Annex 2).

This questionnaire concerns the legal side of the applicability of the Flexibility Services in LFMs.

16 In your country, is there some regulation concerning the definitions below? If Yes, please, specify.

[1] Nixiang, A. Flexibility services in Citizen Energy Communities (Master's thesis), University of Technology Eindhoven, the Netherlands. (2020)

[2] USEF White Paper: Energy and Flexibility Services, 2019

Congestion	Balancing	Demand Response
	FCR, aFRR, mFRRda and mFRRsa	
Ancillary service	**Non-frequency ancillary service**	**Energy storage**
balancing reserves, reactive power, redispatch, balck start facility, compensation of losses (source: INTERRFACE: TSO-DSO-Consumer INTERFACE aRchitecture to provide innovative Grid)	/	Subsidy program (and energy transition fund) about the energy storage; Energy storage roadmap

17 What kinds of flexibility services are available in your country?

Constraint Management ■ Adequacy ☐ Balancing ■ Wholesale ■

17.1 Which participants are flexibility providers?

17.1.1 Constraint Management

Prosumers ☐ Aggregators ■ Large Generation ■ Other ☐

17.1.2 Adequacy

Prosumers ☐ Aggregators ☐ Large Generation ☐ Other ☐

17.1.3 Balancing

Prosumers ☐ Aggregators ☐ Large Generation ☐ Other ☐

17.1.4 Wholesale

Prosumers ■ Aggregators ■ Large Generation ■ Other ☐

17.2 Which participants are flexibility buyers?

17.2.1 Constraint Management

TSO ■ DSO ■ Aggregators ☐ BRP ☐ Other ☐

17.2.2 Adequacy

TSO ☐ DSO ☐ Aggregators ☐ BRP ☐ Other ☐

17.2.3 Balancing

TSO ■ DSO ■ Aggregators ☐ BRP ☐ Other ☐

17.2.4 Wholesale

TSO ■ DSO ■ Aggregators ☐ BRP ☐ Other ☐

17.3 What are the procedures to sell flexibility?

17.3.1 Constraint Management

Open market ☐ Tender process ☐ Bid ☐ Other ☐

17.3.2 Adequacy

Open market ☐ Tender process ☐ Bid ☐ Other ☐

17.3.3 Balancing

Open Market ☐ Tender process ☐ Bid ■ Other ☐

17.3.4 Wholesale

Open Market ☐ Tender process ☐ Bid ☐ Other ☐

18 Can storage facilities (including Electric Vehicles) provide flexibility services in your country?

Yes ■ No ☐

If yes, how?
Project such as “Vehicle2grid” used electric vehicle, and more particularly the batteries as temporary storage that can relieve the grid, and supply local electricity networks.

19 Do the following flexibility services exist in your country?

19.1 Constraint Management

19.1.1 Voltage Control Yes ☐ No ☐

19.1.2 Grid Capacity Management Yes ■ No ☐

19.1.3 Congestion Management Yes ■ No ☐

19.1.4 Controlled Islanding Yes ☐ No ☐

19.1.5 Optional Downwards Flexibility Management Yes ■ No ☐

19.1.6 DSO Constraint Management (pre/post fault) Yes ☐ No ☐

19.1.7 Other (please specify:) Yes ☐ No ☐

19.1.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.2 Adequacy

19.2.1 Capacity payment Yes ☐ No ☐

19.2.2 Capacity Market Yes ☐ No ☐

19.2.3 Strategic reserve Yes ■ No ☐

19.2.4 Hedging Yes ☐ No ☐

19.2.5 Other (please specify) Yes ☐ No ☐

19.2.6 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:
/

19.3 Balancing

19.3.1 Dynamic Containment Yes ☐ No ☐

19.3.2 Frequency Containment Reserve (FCR) Yes ■ No ☐

19.3.3 Automatic Frequency Restoration Reserve (aFRR) Yes ■ No ☐

19.3.4 Manual Frequency Restoration Reserve (mFRR) Yes ■ No ☐

19.3.5 Replacement Reserve (RR) Yes ☐ No ☐

19.3.6 other (please specify:) Yes ☐ No ☐

19.3.7 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain: /

19.4 Wholesale

19.4.1 Day-ahead optimization Yes ■ No ☐

19.4.2 Intraday optimization Yes ■ No ☐

19.4.3 Self/passive balancing Yes ■ No ☐

19.4.4 Generation optimization Yes ☐ No ☐

19.4.5 Exceeding Maximum Export/Import Capacity Yes ☐ No ☐

19.4.6 Offsetting Yes ☐ No ☐

19.4.7 Other (please specify:) Yes ☐ No ☐

19.4.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:
/

19.5 Local Optimization

19.5.1 ToU Optimization Yes ☐ No ☐

19.5.2 kWmax control Yes ☐ No ☐

19.5.3 Self-balancing Yes ☐ No ☐

19.5.4 Emergency power supply Yes ☐ No ☐

19.5.5 Smart Contracts Yes ☐ No ☐

19.5.6 Collective Self-consumption Yes ☐ No ☐

19.5.7 Transmission Charge Management Yes ☐ No ☐

19.5.8 Distribution Charge Management Yes ☐ No ☐

19.5.9 Other (please specify) Yes ☐ No ☐

19.5.10 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:
/

20 Does the regulation in your country allow net-metering?

Yes [redacted] No [redacted]

Explain.
Not yet but the Dutch parliament has approved a proposal to phase out the net metering
https://www.pv-magazine.com/2023/02/09/dutch-parliament-approves-roposal-to-phase-out-net-metering/

21 Are there any legal incentives and benefits in your national/ regional/ local regulations that act as stimuli to the uptake of LFMs?

Yes [redacted] No [redacted]

Explain. Not in the regulation yet, but there are projects in order to improve that.

4. Blockchain and Data Management in LFMs

1. Blockchain Technology & Smart Contract in Energy Services

Blockchain technology has the potential to transform the energy sector. Of the many use cases for blockchain, energy and sustainability are often less recognized. The energy industry has been consistently catalyzed by innovations including rooftop solar, electric vehicles, and smart metering. The blockchain presents itself as the next emerging technology to spur growth in the energy sector through smart contracts and systems interoperability. A joint report issued in 2018 by the WEF, Stanford Woods Institute for the Environment, and PwC identified more than 65 existing and emerging blockchain use-cases for the environment. These use cases include new business models for energy markets, real-time data management, and moving carbon credits or renewable energy certificates onto the blockchain; the blockchain also offers unique solutions for renewable energy distribution. A range of blockchain products can be tailored to address various energy or sustainability applications, including the following: wholesale electricity distribution; peer-to-peer energy trading; electricity data management; commodity trading; utility providers; etc.

22 Does the regulation in your country allow the use of blockchain or other digital currencies in the energy sector?

Yes ■ No ■

If yes, please, specify.

There isn't specific regulation about the blockchain technology in the 1998 Electricity Law, but some projects are under development, for example the TenneT's project about the Equigy Crowd Balancing platform, which is a blockchain-based cross-border data platform.

23 Do transactions concerning the flexibility services use Blockchain technology in your country?

Yes ■ No ■

If yes, please, specify.

Equigy Crowd Balancing platform → blockchain-based crossed-border data platform

24 Is there any provision or regulation that presents legal risk and behaves as a barrier to the use of Blockchain technology in flexibility services for LFMs?

Yes ■ No ■

If Yes, please, specify.

Lack of information and regulation about the blockchain technology

25 Does your country recognize smart contracts as legal contracts?

Yes ■ No ■

If Yes, please, specify. Smart contracts can exist under the Dutch law, so they are regulated, but there isn't specific regulation. The Dutch Civil Code contains several articles with regard to automated and electronical contracting, but there is no specification of the applicable conditions of this legal framework for smart contracts. (source: Smart contracts in the Netherlands; A legal research regarding the use of smart contracts within Dutch contract law and legal framework, by Ruben Schulpen, 2018)

2. Data Management & Protection

According to the General Data Protection Regulation 2016/679, data aggregation shouldn't violate the privacy and security of the customers. This regulation also removes obstacles to ensure a better mobility of personal data while protecting natural persons. LFMs process energy consumption data and shouldn't infer personal information especially when sharing data with third parties.

26 Does the regulation in your country guarantee the security of consumers' consumption data?

Yes ■ No □

If Yes, please, specify.

The 1998 Electricity Act guarantees the use of the data within the framework imposed by the GPRD, that the data used are only those related to the electric consumptions, and that only authorized stakeholders (subject to the GPDR) have access to these data.

27 In your country, how is the security of the grid? Are there any regulations about cybersecurity?

Explain.

Not regulation about cybersecurity in the 1998 Electricity Law

28 How is your country managing smart metering data?

Centralized data hub ☐ Decentralized data infrastructure ☐

What are the risks and benefits of the system in place?

Insufficient regulation about the smart metering

5. Summary

29 Can you give recommendations and proposals for changes in the regulation in order to overcome the perceived legal risks and barriers in your country concerning

29.1 Creation of a LFM

/

29.2 Uptake of the flexibility services

/

29.3 Use of blockchain technology for LFMs

/

29.4 Data Management

/

29.5 Other

/

30 Can you give recommendations and proposals for changes in the regulation in order to better foster Local Flexibility Markets uptake, flexibility services and blockchain technologies use for LFMs in your country; thus, creating incentives for their development?

/

ANNEX 1

Aggregation	***Distribution System Operator (DSO)***	***Transmission System Operator (TSO)***	***Balance Responsible Party (BRP)***
Art. 2. (18) of IEMD 2019/944	*Art. 2. (29) of IEMD 2019/944*	*Art. 2. (35) of IEMD 2019/944*	*Art.2. (14) of IEMD 2019/943*
‘aggregation’ means a function performed by a natural or legal person who combines multiple customer loads or generated electricity for sale, purchase or auction in any electricity market	‘DSO’ means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	‘TSO’ means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity	‘BRP’ means a market participant or its chosen representative responsible for its imbalances in the electricity market

Self-consumer	***Active customer***	***Renewable Energy Community (REC)***	***Citizens Energy Community (CEC)***
Art. 21. of REDII 2018/2001	Art.15 IEMD of 2019/944	Art. 22. of REDII 2018/2001	Art.16 of IEMD 2019/944
'Renewables self-consumer' means a final customer operating within its premises located within confined boundaries or, where permitted by a MS, within other premises, who generates RE electricity for its own consumption, and who may store or sell self-generated RE electricity, provided that, for a non-household REs self-consumer, those activities do not constitute its primary commercial or professional activity.	'Active customer' means a final customer, or a group of jointly acting final customers, who consumes or stores electricity generated within its premises located within confined boundaries or, where permitted by a MS, within other premises, or who sells self-generated electricity or participates in flexibility or EE schemes, provided that those activities do not constitute its primary commercial or professional activity;	'REC' means a legal entity: (a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the RE projects that are owned and developed by that legal entity; (b) the shareholders or members of which are natural persons, SMEs or local authorities, incl. municipalities; (c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits.	'CEC' means a legal entity that: (a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, incl. municipalities, or small enterprises; (b) has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; (c) may engage in generation, incl. from RES, distribution, supply, consumption, aggregation, energy storage, EE services or charging services for electric vehicles or provide other energy services to its members or shareholders.

ANNEX 2

Congestion	***Balancing***	***Demand Response***
Art. 2. (4) of IEMD 2019/943	*Art. 2. (10) of IEMD 2019/943*	*Art. 2. (20) of IEMD 2019/944*
‘congestion’ means a situation in which all requests from market participants to trade between network areas cannot be accommodated because they would significantly affect the physical flows on network elements which cannot accommodate those flows	‘balancing’ means all actions and processes, in all timelines, through which transmission system operators ensure, in an ongoing manner, maintenance of the system frequency within a predefined stability range and compliance with the amount of reserves needed with respect to the required quality	‘demand response’ means the change of electricity load by final customers from their normal or current consumption patterns in response to market signals, including in response to time-variable electricity prices or incentive payments, or in response to the acceptance of the final customer's bid to sell demand reduction or increase at a price in an organised market as defined in point (4) of Article 2 of Commission Implementing Regulation (EU) No 1348/2014 (17), whether alone or through aggregation

Ancillary service	***Non-frequency ancillary service***	***Energy storage***
Art. 2. (48) of IEMD 2019/944	*Art. 2. (49) of IEMD 2019/944*	*Art. 2. (59) of IEMD 2019/944*
‘Ancillary service’ means a service necessary for the operation of a transmission or distribution system, including balancing and non-frequency ancillary services, but not including congestion management	‘non-frequency ancillary service’ means a service used by a transmission system operator or distribution system operator for steady state voltage control, fast reactive current injections, inertia for local grid stability, short-circuit current, black start capability and island operation capability	‘Energy storage’ means, in the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical energy or use as another energy carrier

THANK YOU FOR ANSWERING THE QUESTIONS!

7. Portugal

DEAR PARTICIPANT,

The following questionnaire is developed under the DE-RISK project in order for a thorough study to be performed to provide an overview of how the regulatory environment in ten European countries and at European Level evolved. The results of the survey will contribute to the Regulatory Impact Analysis (RIA) to deeply assess the current regulatory framework that is enabling or acting as a barrier for the large deployment of Local Flexibility Markets (LFM) and the potential flexibility services.

We invite you to complete this survey to collect your experience and views regarding:

- Awareness of European, national and local policies regarding the regulation on Local Flexibility Markets
- Perceived legal risks and benefits
- Impact of the regulation - barriers and incentives
- Legal background of innovative technologies - block chain transactions and flexibility services
- Perceived legal risks and benefits
- Recommendations about future legal development of the LFM in your country and at European Level.

ABOUT DE-RISK PROJECT

This survey is being conducted as part of the DE-RISK Project funded by the European Union (EU) under Horizon Europe program.. The DE-RISK project will support the market uptake of Renewable Energy Sources (RES) by de-risking the adoption of Local Flexibility Markets to increase the RES hosting capacity of the distribution network.

ABOUT YOUR PARTICIPATION

Your participation in this study is fully voluntary and all data collected will be treated confidentially. Participation is free and there are no mandatory requirements. The research outputs resulting from this work will only include collated data, without the possibility for anyone to identify your individual answers. Your contact details will be used on a need-to-know basis and will be strictly confidential until the end of the project's lifetime. By submitting this form:

- you confirm that you have read and understood this information.
- you agree to participate in this research study and your answers to be included in our analysis and resulting from its research publications.
- you agree that we will process the data in line with DE-RISK project policy of confidentiality that is in accordance with GDPR 2016/679.

Country:	Portugal
Organization:	NOVA Information Management School
Name of expert answering the survey:	Yasser Alhelaly
Contact details: (mail, phone, other)	yalhelaly@novaims.unl.pt
Date:	13/4/2023

1. LFM Regulation - Definitions of Market Actors and Market Characteristics

The European Commission promotes flexibility markets as they can contribute to the European Union in becoming a climate-neutral continent by 2050. The new market development is taking place in Europe with the transposition in the different Member States of the Clean Energy Package (specifically the Electricity directive EU 944/2019) with new roles for DSOs entering into new activity areas. DSO-TSO cooperation evolves in a beneficial way for energy markets and for consumers as well. Governance of how DSOs and TSOs interact and engage in network planning, as well as arrangements to facilitate effective coordination for system operation, especially for flexibility, have been the key regulatory concerns in this area for the last few years.

Local flexibility markets allow the use of flexibility at local level by distribution and transmission system operators. This means using flexibility from decentralized energy resources (DERs) to solve congestion management problems, minimize power outages and avoid grid expansions. Flexibility markets help energy networks to monitor energy flows and create market signals to motivate changes in energy supply and demand, integrating smart meters and appliances, renewable energy resources and energy efficient resources accordingly. The Clean Energy Package defines and offers an enabling legislative framework for Local Energy Markets participants. The analysis of the LFM regulation will be conducted including some of the following topics that characterize the market:

LFM topic	**Sub-topic**
Market actors	• Aggregator • Balance Responsible Party (BRP) • Citizen energy communities • Distribution System Operator (DSO) • Market operator
Market and product characteristics	• Market entry and exit and market platforms • Product characteristics (e.g., prequalification, standardization of FS)
Infrastructural issues	• Smart metering systems • Energy storage • Network expansion
Contract, bidding, and settlement	• Contract. Bidding, billing, and settlement
Data security issues	• Access to data, data security, privacy protection

The Clean Energy for all Europeans Package defines new ground for consumers by recognizing under EU law, the rights of citizens and communities to engage directly in the energy sector. It also sets out legal frameworks for LFMs. Participants of the whole DR value chain are defined in the laws of the Clean Energy Package. The revised Renewable Energy Directive (EU) 2018/2001 sets the framework for 'renewable energy communities' and the revised Internal Electricity Market Directives (EU) 2019/943 & 2019/944 introduce new roles and responsibilities for 'citizen energy communities', 'aggregation', 'distribution system operator', 'transmission system operator' and 'balance responsible party' in the energy system covering all types of electricity. (Look at Annex 1)

1. *Are the Directives on common rules for the internal market for electricity 2019/943 & 2019/944 already transposed into your national legislation?*

Yes ☐ **No** ☐ **Partially** ☐

Is the revised Renewable Energy Directive (EU) 2018/2001 already transposed into your national legislation? **Yes**

☐ **No** ☐ **Partially** ☐

1.1. *If your answer is* ***Yes,*** *indicate the national / regional / local legislation that defines it and explain it:*

IEMD 2019/943:
Yes, the European internal market for electricity Directive has been transposed into Portuguese national legislation. The transposition was completed in 2019 through the approval of Decree-Law No. 172/2019, which establishes the legal framework for the organization of the Portuguese electricity market. This law transposes several provisions of the EU internal market for electricity directive, including rules on third-party access to the transmission and distribution networks, the establishment of an independent system operator, and the promotion of cross-border trade of electricity. The law also establishes rules for the organization of the wholesale electricity market, the operation of the balancing and settlement system, and the functioning of the retail market for electricity.

IEMD 2019/944: *Yes, the European Electricity Directive 2019 has been transposed into Portuguese national legislation. The transposition was completed in 2021 through the approval of Decree-Law No. 75/2021, which amends and updates the legal framework for the organization of the Portuguese electricity sector. This law transposes several provisions of the EU Electricity Directive, including rules on the organization and functioning of the electricity market, the promotion of demand response and energy storage, and the integration of renewable energy sources into the grid. The law also establishes rules for the operation of the distribution and transmission networks, the coordination of system operators, and the promotion of cross-border trade of electricity.*
REDII 2018/2001: *Yes, the European Renewable Energy Directive (RED II) has been transposed into Portuguese national legislation. The transposition was completed in 2020 through the approval of Law No. 32/2020, which establishes the legal framework for the promotion of renewable energy sources in Portugal. This law sets targets for the share of renewable energy in final energy consumption, establishes support mechanisms for renewable energy production and consumption, and defines rules for the certification and verification of renewable energy sources.*

1.2. *If your answer is **Partially,** and there is some regulation concerning the definitions below, please, specify:*

For example: Explain if regulation is available, or concepts are under development, or discussions are ongoing, etc.

Aggregation	Distribution System Operator (DSO)	Transmission System Operator (TSO)	Balance Responsible Party (BRP)

Self-consumers	Active consumers	Renewable energy communities (REC)	Citizen energy communities (CEC)

1.3. Are there other LFM participants in your country? How are they defined? Yes. E-REDES and Piclo are example for Portugal's first local flexibility market service providers

NRA ☐ Suppliers ☐ Traders ☐ Other ☐

2. How do DSOs and TSOs cooperate to organize the flexibility market?

In Portugal, the cooperation between Distribution System Operators (DSOs) and Transmission System Operators (TSOs) is critical for the effective organization of the flexibility market. DSOs are responsible for the local distribution networks, while TSOs manage the transmission network and ensure the balance between supply and demand at the national level. For example, E-REDES' responsibility as a DSO to connect consumption sites to the distribution grid, ensure the safety and reliability of the grid to supply energy, and provide aggregate consumption data of delivery points where EV charging stations are connected to the Electric Mobility Network Management Entity (Mobi.E). On the other hand, Piclo Flex, an independent marketplace in Portugal, collaborates with system operators to procure local flexibility services to maintain a delicate balance of supply and demand in the grids. Piclo has secured its first international collaboration with the Slovenian electricity transmission system operator (TSO), ELES, on behalf of the Green Transformation Consortium, a group of Slovenian energy companies with a shared goal for accelerating Slovenian decarbonisation.

3. How is the Local Flexibility Market organized in your country?

Platform ☐ Aggregation ☐ Other model ☐

In Portugal, the Local Flexibility Market (LFM) is organized through a platform called the "Flexibility Management Platform" (FMP), which is managed by the country's transmission system operator, Redes Energéticas Nacionais (REN). The FMP serves as a marketplace for the trading of flexible energy products, including demand response, energy storage, and distributed generation. The platform allows market participants, such as aggregators and consumers, to offer their flexibility services to the system operator, which can then use these services to balance the electricity grid in real-time. To participate in the LFM, market participants must register with the FMP and meet certain technical and operational requirements, such as the ability to provide reliable and accurate information on their flexibility capabilities and availability. The LFM in Portugal is also subject to various regulatory frameworks and policies, including the Regulamento de Relações Comerciais do Setor Elétrico (RRCE) and the Plano Nacional de Energia e Clima 2021-2030 (PNEC), which set out the rules and procedures for the commercial relations between market agents and the country's targets and policies for the energy transition, respectively. Foe example, E-REDES and Piclo lead the way towards Portugal's first local flexibility market that will enable DSOs to unlock value from decentralized energy resources, secure flexibility at scale, and decarbonize the grid. In January 2023, Piclo, the leading independent marketplace provider for flexibility services, has launched Portugal's first project to build a local flexibility market with E-REDES, Portugal's largest distribution system operator (DSO). The collaboration will use the Piclo Flex marketplace to streamline the procurement and participation in E-REDES' DSO flexibility market. The project is an aggregation between Piclo and E-REDES. First, Piclo enables the interested Flexibility Service Providers to contribute to E-REDES goal to decarbonize the electricity grids, giving a major contribution to the Portugal National Energy and Climate Plan 2030. The project aims to digitally transform the Portuguese national electrical system, enhancing the distribution grid capability, and address the current and emerging energy challenges. The project will effectively manage the electricity grids, and motivate engagement of grid users, national businesses and communities who will have the key role in this future evolution.

E-REDES and Piclo lead the way towards Portugal's first local flexibility market

4. *Are there any legislative barriers which block the reinforcement of interactions between LFM's participants and slow down the development of LFMs? Please, indicate below:*

Yes. Local Flexible Markets (LFMs) in Europe are emerging markets that enable demand-side resources such as renewable energy, energy storage systems, and electric vehicles to provide flexibility services to the grid. Despite the numerous benefits of LFMs, there are still several challenges that need to be addressed to maximize their potential.

Some of the main challenges of Local Flexible Markets in Portugal/Europe include:

1. Lack of standardized rules and regulations: There is a lack of standardized rules and regulations across different countries and regions in Europe, which makes it difficult for LFMs to operate efficiently.
2. Market fragmentation: The market for LFM services is highly fragmented, with many small-scale providers offering different services, making it difficult for buyers to find and purchase the services they need.
3. Integration with existing markets: LFMs need to be integrated with existing energy markets to ensure efficient and effective operation. However, this integration can be challenging due to the differences in market structures and regulatory frameworks.
4. Data management: Effective data management is essential for the efficient operation of LFMs. However, there are concerns about data privacy and security, which need to be addressed to ensure customer trust.
5. To overcome these challenges, the following legislative measures can be taken:
6. Standardization of rules and regulations: Standardized rules and regulations can help ensure a level playing field for all market participants, reduce regulatory barriers, and promote the efficient operation of LFMs.
7. Harmonization of markets: The harmonization of markets can promote the integration of LFMs with existing energy markets, facilitate cross-border trade, and create new business opportunities.
8. Data protection regulations: The development of clear data protection regulations can help address concerns about data privacy and security, promote customer trust, and enable effective data management.
9. Financial support: Providing financial support to market participants can help address market fragmentation by promoting the consolidation of smaller providers and creating economies of scale.
10. Increased investment in Renewable Generation (RG) is required, but RG's uncertainty necessitates stable generation support, leading to increased reserves and ramping needs from conventional generation.
11. Low variable costs of RG are reducing electricity prices in valley hours, discouraging conventional generation from running.
12. Current markets are often price-cap energy markets where RG is not fully integrated, requiring additional remuneration mechanisms to incentivize flexible generation.
13. Increasing Distributed Generation (DG) is posing new challenges to grid operation at both the transmission and distribution levels.
14. Electric Vehicles (EV) are expected to develop, increasing electricity load.
15. Unaware consumers may be a barrier to LFM participation, requiring legislation to promote renewable energy education.
16. Renewable Energy Sources (RES) will challenge the need for real-time balancing and increase the need for flexibility.

17. The shift to decentralized energy sources will pose new challenges in balancing demand and supply.

To overcome these challenges, the following legislative measures can be taken:

1. Standardization of rules and regulations: Standardized rules and regulations can help ensure a level playing field for all market participants, reduce regulatory barriers, and promote the efficient operation of LFMs.
2. Harmonization of markets: The harmonization of markets can promote the integration of LFMs with existing energy markets, facilitate cross-border trade, and create new business opportunities.
3. Data protection regulations: The development of clear data protection regulations can help address concerns about data privacy and security, promote customer trust, and enable effective data management.
4. Financial support: Providing financial support to market participants can help address market fragmentation by promoting the consolidation of smaller providers and creating economies of scale.
5. Provide financial incentives to support investment in Renewable Generation (RG) while also ensuring adequate support for conventional generation to meet ramping and reserve needs.
6. Implement policies that promote a balanced energy mix, including setting minimum requirements for conventional generation to support grid stability.
7. Implement a new regulatory framework that integrates Renewable Generation (RG) into the energy market, such as introducing feed-in tariffs.
8. Develop new standards and regulations to address the challenges posed by Distributed Generation (DG) to ensure grid stability and reliability.
9. Implement policies to encourage the adoption of Electric Vehicles (EVs), such as providing financial incentives or mandating the installation of EV charging infrastructure.
10. Mandate renewable energy education in schools and develop public awareness campaigns to promote the benefits of Local Flexible Markets (LFM).
11. Implement policies that incentivize flexible generation and provide market-based solutions to address the challenge of real-time balancing.
12. Develop policies and regulations to support the transition to decentralized energy sources, including promoting grid flexibility and investing in new grid infrastructure.

1. Are there national regulations concerning the market products?

For example: Explain if regulations or guidelines are available, or discussions are ongoing, etc.

5.1. Market entry and exit: *Yes* ☑ *No* ☐

In Portugal, the Local Flexible Markets (LFM) are subject to several national regulations that aim to promote their development, integration, and operation within the country's electricity market.

- *One of the main regulatory frameworks governing LFM in Portugal is the "Regulamento de Relações Comerciais do Setor Elétrico" (RRCE), which sets out the rules and procedures for the commercial relations between market agents in the electricity sector, including generators, traders, and consumers. The RRCE defines the terms and conditions for the participation of market agents in the LFM, including the requirements for product prequalification, standardization, and baseline.*
- *The "Plano Nacional de Energia e Clima 2021-2030" (PNEC) is Portugal's national energy and climate plan, which sets out the country's targets and policies for the energy transition. The PNEC includes measures to promote the development of LFM, such as the establishment of a pilot*

project for the implementation of demand response in the residential sector.

- *The "Plano de Desenvolvimento e Investimento na Rede de Transporte de Eletricidade 2019-2028" (PDIRT) is Portugal's plan for the development and investment in the electricity transmission network. The PDIRT includes measures to enhance the flexibility and resilience of the grid, including the development of new technologies and solutions for the integration of renewable energy sources and the promotion of demand response.*
- *The "Regulamento da Gestão do Sistema Elétrico de Distribuição" (RGSE) is the regulation that governs the management of the electricity distribution system in Portugal. The RGSE includes provisions for the integration and operation of LFM at the distribution level, including the coordination of distribution network operators and the establishment of technical requirements for the connection of distributed generation and demand response.*

5.2. Market Product characteristics (e.g, Are there guides and regulations on product prequalification, standardization and baseline):

Yes ☑ *No* ☐

Yes, there are guides and regulations in Portugal that govern the prequalification, standardization, and baseline for products and services in Local Flexible Markets (LFM). One of the main regulatory frameworks governing LFM in Portugal is the "Regulamento de Relações Comerciais do Setor Elétrico" (RRCE), which sets out the rules and procedures for the commercial relations between market agents in the electricity sector, including generators, traders, and consumers. In addition, the "Plano Nacional de Energia e Clima 2021-2030" (PNEC) is Portugal's national energy and climate plan, which sets out the country's targets and policies for the energy transition. The PNEC includes measures to promote the development of Local Flexible Markets (LFM) and the prequalification of products and services in this area. There are also several industry associations and organizations in Portugal that provide guidance and support for companies operating in LFM, including the Portuguese Association for the Promotion of the Smart Grid (GridPT), the Portuguese Renewable Energy Association (APREN), and the Portuguese Energy Storage Association (APESB).

2. Infrastructural issues concerning the LFMs.

2.1 Regulation on Smart Metering Systems. Are they adapted to the LFMs? Are they installed?

Yes ☑ *No* ☐

Yes, Portugal has implemented a Smart Metering System as part of its efforts to support Local Flexible Markets (LFM). The system, known as the "Digital Metering System" or "Sistema de Medição Eletrónica" (SME), enables real-time metering data collection and communication between customers, energy suppliers, and distribution network operators. The SME provides a foundation for the development of new energy services and business models, including time-of-use pricing, demand response, and peer-to-peer energy trading. The implementation of smart metering systems is a key component of Portugal's energy transition strategy, which aims to increase the share of renewable energy in the country's energy mix and promote greater energy efficiency.

2.2 *Regulation on Energy Storage: How is energy storage defined in your regulation? Is there any guideline, or discussions ongoing, etc.?*

Yes ☐ ✓ *No* ☐

In Portugal, energy storage is defined as a system or device that is capable of storing electrical energy and releasing it when required. Energy storage systems are considered an essential component for the integration of renewable energy sources and the management of electricity grids.

There are several regulations and guidelines in Portugal related to energy storage, including:

- *The Energy Storage Regulation (Regulamento de Armazenamento de Energia): This regulation establishes the technical requirements and procedures for the connection and operation of energy storage systems to the electricity grid. It also defines the rights and obligations of the grid operator and energy storage system owners.*
- *National Energy and Climate Plan (Plano Nacional Energia e Clima - PNEC): The PNEC is a long-term strategic plan that defines the objectives and measures for the transition to a low-carbon economy. It includes specific targets for the deployment of energy storage systems to support the integration of renewable energy sources and the decarbonization of the electricity sector.*
- *National Strategy for Energy Storage (Estratégia Nacional para o Armazenamento de Energia): This strategy aims to promote the development of energy storage technologies and their integration into the Portuguese electricity system. It includes measures to incentivize research and development, support the deployment of energy storage systems, and promote the creation of a competitive market for energy storage services.*
- *Portuguese Electricity Tariff Regulation (Regulamento Tarifário): The Tariff Regulation includes provisions related to the pricing of energy storage services, such as grid services and*

energy trading. It establishes the rules for the remuneration of energy storage systems and the payment of fees and charges related to their connection and use.

Regarding ongoing discussions, there are several initiatives and projects in Portugal related to energy storage, such as the promotion of pilot projects and demonstrations, the development of new technologies, and the revision of regulations and standards. These initiatives aim to foster innovation, increase the competitiveness of the energy sector, and support the achievement of national and European energy and climate objectives.

3. Contract, bidding, and settlement. Explain if any specific regulations or guidelines for LFM are established.

Yes ☑ *No* ☐

Yes, there are established contract, bidding, and settlement regulations and guidelines for Local Flexible Markets (LFM) in Portugal. The main regulatory framework for LFM in Portugal is established by the Portuguese Regulatory Authority for Energy (ERSE), which is responsible for defining the technical and economic conditions for the operation of the LFM.

The ERSE has established a set of rules for the contracting and settlement of LFM services, which *includes guidelines on the type of services that can be provided, the bidding process, and the settlement mechanisms. These rules aim to ensure that the LFM is transparent, competitive, and efficient, and that it provides fair compensation for the flexibility services provided by the market participants.*

The contracting process for LFM services is based on a bidding mechanism, where market participants submit offers to provide flexibility services to the system operator. The offers are evaluated based on their technical and economic characteristics, and the best offers are selected to provide the required services. The settlement of the services provided is based on a pay-as-bid mechanism, where market participants are paid according to the price they offered for the services provided.

In addition to these rules, the ERSE has also established guidelines for the certification of LFM operators and for the technical and economic requirements for the provision of flexibility services. These guidelines aim to ensure that the LFM operators and market participants meet the necessary technical and economic requirements to provide reliable and efficient flexibility services to the system operator.

According to IEMD 2019/944 the network development plan published by the DSOs should provide transparency on the medium and long-term flexibility services and shall set out the planned investments for the next five-to-ten years, with particular emphasis on the main distribution infrastructure which is required in order to connect new generation capacity and new loads, including recharging points for electric vehicles. The network development plan shall also include the use of demand response, energy efficiency, energy storage facilities or other resources that the distribution system operator is to use as an alternative to system expansion.

4. Is there any legislation about development plans for the electricity network in your country?

Yes ☑ **No** ☐

4.1 If your answer is Yes, indicate the legal regulation that defines it, its statement and how flexibility is included into it.

Yes, Portugal has legislation regarding the development of the electricity network. The Development and Investment Plan for the Electricity Sector (PDIRT) is the main instrument for defining the long-term development and investment plan for the Portuguese electricity sector, including the expansion and reinforcement of the electricity network. The PDIRT is developed by the Portuguese energy regulator (ERSE) in coordination with the Transmission System Operator (TSO) and Distribution System Operators (DSOs), and it is subject to public consultation before being approved by the government. *Additionally, there are also specific regulations and guidelines for the development and operation of the electricity network, including technical codes and standards, safety regulations, and environmental impact assessments. These regulations aim to ensure the efficient, reliable, and sustainable operation of the electricity network while protecting the interests of consumers and the environment.*

4.2 Are there any stimuli or incentives to create flexibility or/and to include flexibility in network development plans? Please, indicate below:

Yes, there are incentives and stimuli in Portugal to promote the creation and inclusion of flexibility in network development plans.

One such incentive is the "Capacity Market", which is a market-based mechanism that aims to ensure the availability of sufficient generation and demand-side resources to meet peak electricity demand. This mechanism provides financial incentives to flexible resources, including demand response, energy storage, and flexible generation, to participate in the market and provide capacity when needed.

In addition, there are also funding programs and subsidies available to support the development and deployment of flexible technologies, such as energy storage systems and demand response solutions, particularly in the context of renewable energy integration and grid stability. For example, the Portuguese government has launched a program called "PPEC" (Programa para a Eficiência nos Consumos de Energia Elétrica), which provides funding for energy efficiency and demand-side management projects, including the implementation of flexible technologies. Moreover, the development and operation of the electricity network in Portugal are subject to regulatory targets and performance standards, including those related to the integration of renewable energy, grid reliability, and system efficiency. The system operators are required to meet these targets and standards, which may incentivize the inclusion of flexibility solutions in their network development plans.

4.3 Regulation on Network Expansion in compliance with the IEMD 2019/944?

2. Yes ☑ No ☐

Yes, there are regulations in Portugal regarding network expansion. The main regulation is the Regulation of the Electricity Networks and Public Service of Electricity (RNSESP), which establishes the rules for the expansion, operation, and maintenance of the electricity networks in Portugal. The RNSESP also includes provisions for the integration of renewable energy sources, the development of smart grids, and the promotion of energy efficiency. Additionally, the national transmission system operator (TSO), Redes

Energéticas Nacionais (REN), is responsible for proposing and implementing network expansion plans in accordance with the guidelines and objectives set by the Portuguese government.

5. Can you note if there are any provisions or regional/local regulations that present legal risks and behave as barriers to the development of Local Energy markets:

According to the "National Progress Report on Renewable Energy and Energy Efficiency in Portugal", submitted to the European Commission in 2022. The report notes that Portugal faces some challenges in achieving its renewable energy and energy efficiency targets, including the need for further investment in renewable energy sources and energy efficiency measures, as well as the need to address legal and regulatory barriers to the development of local energy markets. Hereafter a summary of the challenges mentioned in the link:

- *Decarbonization of the electricity sector*
- *Increasing penetration of renewable energy sources*
- *Integration of distributed energy resources*
- *Development of flexible and smart grids*
- *Implementation of demand response mechanisms*
- *Efficient use of energy storage systems*
- *Improvement of energy efficiency*
- *Balancing supply and demand*
- *Ensuring security of supply*
- *Addressing the issue of energy poverty*
- *Integration of Portugal's electricity market with the EU's internal electricity market*
- *Ensuring cost-effective investment in the electricity sector*

- *Ensuring fair competition and market access for all stakeholders*

The link of the report: PT_RPP_electricity.pdf (europa.eu)

6. Can you describe any act provisions or regional / local regulations that bring benefits and behave as enablers to LFMs:

There are several provisions and regulations that benefit and enable LFMs in Portugal, including:

1. *The creation of the National Network of Intelligent Grids (REN4.0), which aims to promote the development of smart grids and the integration of renewable energy sources.*
2. *The implementation of the National Plan for Energy and Climate, which sets targets for renewable energy production and energy efficiency improvements.*
3. *The promotion of energy communities through the Energy Communities Regulation, which allows individuals and organizations to collectively own and manage renewable energy systems.*
4. *The implementation of net-metering, which allows energy consumers with on-site renewable energy systems to sell excess energy back to the grid.*
5. *The development of the Market Agents Regulation, which facilitates the participation of new actors, such as aggregators and energy service companies, in the energy market.*
6. *The implementation of the Storage Regulation, which enables the deployment of energy storage systems to support the integration of renewable energy sources.*
7. *The establishment of the Portuguese Energy Efficiency Fund, which provides financial support for energy efficiency projects.*

7. Are there any administrative and bureaucratic procedures that hinder LFMs' development and play a restrictive role in their broader application? If yes, please, explain.

Yes. There are some administrative and bureaucratic procedures that could hinder the development of Local Flexible Markets (LFMs) in Portugal. For example, the process of obtaining licenses and permits for new renewable energy projects can be time-consuming and may involve multiple government agencies. This can lead to delays and additional costs for project developers.

Additionally, the current tariff system for accessing the electricity grid may not adequately incentivize flexibility, as it is mainly based on the amount of electricity consumed rather than the time of consumption. This could discourage the development of flexible technologies and discourage participation in LFMs. Finally, the lack of standardization and harmonization among local energy markets and the absence of a clear regulatory framework for LFMs could also hinder their development in Portugal.

8. Would you suggest what kind of legal provisions in your country will contribute most to the activation of the interested parties (citizens, commercial and industrial players) to participate in LFMs?

Based on the challenges and enablers identified in Portugal's electricity sector, some legal provisions that could contribute to activating interested parties to participate in LFMs are:

- *Establishing clear and transparent rules and regulations for the participation of all actors in the LFMs, including citizens, commercial, and industrial players.*
- *Creating a level playing field that ensures fair competition among all market participants.*
- *Providing financial incentives and support mechanisms for the deployment of flexibility solutions, including energy storage and demand response.*
- *Encouraging the development of new business models that allow for the aggregation and trading of flexible resources.*
- *Streamlining administrative and bureaucratic procedures to facilitate the participation of all actors in the LFMs.*
- *Ensuring the protection of consumers' rights and privacy in the LFMs through adequate data protection and cybersecurity measures.*
- *Promoting the use of renewable energy sources and energy efficiency measures to increase the availability of flexible resources in the LFMs.*

9. Can you define any recommendations for improvement of the legislation concerning LFMs in your country or on EU level?

Based on the challenges and opportunities presented in the current state of Local Flexible Markets (LFMs) in Portugal, some potential recommendations for improvement could include:

- *Clear and harmonized regulations: A clear and harmonized legal framework that sets out the rules and procedures for participation in LFMs can encourage the participation of interested parties and help reduce administrative barriers.*
- *Simplification of administrative procedures: Simplifying administrative procedures for participation in LFMs can reduce transaction costs, improve market participation, and promote market efficiency.*
- *Standardization and interoperability: Developing standards for interoperability between different technologies, market platforms, and stakeholders can enable more efficient and effective participation in LFMs.*
- *Transparency and information sharing: Facilitating information sharing between market actors and providing transparent information on market rules and outcomes can increase market efficiency and foster trust among market actors.*
- *Incentivizing participation: Providing financial incentives, such as subsidies or tax breaks, for LFMs' development and participation can encourage the involvement of different market actors, including citizens, commercial and industrial players.*

- *Active involvement of stakeholders: Encouraging active involvement of stakeholders, including citizens, commercial and industrial players, in the design and implementation of LFMs can ensure that the market meets their needs and aligns with their interests.*
- *Integration with network planning: Integrating LFMs into network planning can ensure that network investments are made efficiently and cost-effectively, and that LFMs contribute to network stability and security.*

2. Policy and Regulatory Framework for LFMs Uptake

10. Does your National (Regional / Local) Energy Action Plans include targets for development and spread of LFMs?

Yes. The Portuguese National Energy and Climate Plan (NECP) includes targets for renewable energy deployment, energy efficiency, and greenhouse gas emissions reduction, but it does not specifically mention Local Flexible Markets (LFMs). However, the NECP does mention the promotion of demand-side flexibility, which could indirectly support the development and spread of LFMs. As for *regional and local energy action plans in Portugal, it is possible that some include specific targets for the development and spread of LFMs, but this would depend on the individual plan.*

11. What kind of bureaucratic and administrative barriers LFMs can experience

Some potential bureaucratic and administrative barriers that LFMs may face in Portugal include: (1) Licensing and permitting: Setting up and operating flexible energy resources such as renewable energy sources, energy storage, and demand response may require various licenses and permits from different authorities, which can be time-consuming and costly. (2) Grid connection and access: Connecting to the grid and securing access to the market can be a complex process that involves negotiating with network operators and complying with technical and regulatory requirements. (3) Data management: The operation of LFMs requires the collection and sharing of data between multiple stakeholders. Ensuring the quality, privacy, and security of this data can be challenging, particularly in the absence of clear standards and protocols. (4) Contractual arrangements: Negotiating and implementing contractual arrangements between market participants, including the allocation of risks and benefits, can be complex and time-consuming. (5) Market design and regulation: The design of the energy market and the regulatory framework may not always be conducive to the development of LFMs. For example, the lack of price signals or the existence of price caps may discourage investment in flexible resources. (6) Awareness and education: Raising awareness and educating stakeholders about the benefits and opportunities of LFMs can be challenging, particularly among smaller players who may lack the necessary resources and expertise.

11.1 When do flexibility producers connect to the grid?

Flexibility producers can connect to the grid when they have obtained the necessary permits and agreements from the relevant authorities, including the distribution system operator (DSO) and transmission system operator (TSO). This may include obtaining a connection agreement, complying with technical requirements and standards, and meeting any necessary grid codes and regulations. Once the connection is established, flexibility producers can participate in the local or national flexibility market and offer their services to grid operators and energy consumers.

11.1.1 Complicated application procedure: *Yes* ☑ *No* ☐

The application procedure for connecting to the grid may be complicated and time-consuming, as it involves various technical, administrative, and legal requirements. In some cases, the process may also be *affected by bureaucratic and administrative barriers, such as delays in obtaining permits or conflicting regulations. It is important for flexibility producers to carefully follow the relevant procedures and regulations to ensure a smooth and efficient connection to the grid.*

11.1.2 Uncertainty of approval: *Yes ☐* *No ☐*

Yes, it is possible that uncertainty of approval may happen when flexibility producers connect to the grid. This is because the approval process may involve multiple entities such as the distribution system operator (DSO) and the transmission system operator (TSO), and the requirements and procedures for approval may not be clearly defined or may be subject to interpretation. Additionally, there may be limited capacity or technical constraints on the grid that could limit the number of flexibility producers that can be connected, which may lead to a competitive process for grid access. These factors can lead to uncertainty for flexibility producers seeking to connect to the grid.

11.1.3 High costs: *Yes ☐* *No ☐*

Connecting to the grid as a flexibility producer may involve some costs, such as fees for grid connection, system operation, and metering. However, these costs *can vary depending on the specific situation, such as the size and type of the flexibility project, and the location of the grid connection. In some cases, subsidies or support schemes may be available to help cover the costs. Additionally, if the project is designed and operated efficiently, it may generate revenue from participation in the flexibility market, which could offset the costs.*

11.1.4 Time consuming procedure: *Yes ☐* *No ☐*

Yes, it is possible for the connection process for flexibility producers to be time-consuming, especially if there are complicated application procedures or if there is uncertainty regarding approval. This can result in delays and additional costs for the flexibility producer. However, some countries have implemented streamlined procedures to reduce the time and cost associated with connecting to the grid.

11.1.5 Other: *Yes ☑* *No ☐*

Yes, there are other possible implications when flexibility producers connect to the grid. For example:

- ***Technical** issues: Flexibility producers may face technical issues related to grid connection, such as grid stability, power quality, and system protection.*

- ***Contractual*** *issues: Flexibility producers may face issues related to contracts and agreements with grid operators, such as pricing, payment terms, and service levels.*
- ***Market*** *issues: Flexibility producers may face issues related to market access and participation, such as market design, rules, and regulations, as well as competition from other market players.*
- ***Environmental*** *issues: Flexibility producers may face environmental issues related to their operations, such as emissions, waste, and resource consumption.*
- ***Social*** *issues: Flexibility producers may face social issues related to their interactions with local communities, such as noise, land use, and visual impacts.:*

11.2 When operating the grid (allowance /licensing)?

11.2.1 for System Operators: *Yes* ☐ *No* ☑

In Portugal, the operation of the transmission and distribution grid is carried out by Transmission System Operator (TSO) and Distribution System Operator (DSO), respectively. They are authorized and regulated by the Portuguese Energy Services Regulatory Authority (ERSE) under the terms of their concession contracts.

The concession contracts define the roles, responsibilities, and obligations of the TSO and DSO and set out the conditions under which they can operate the grid. These contracts also include the terms for the provision of network services, the connection of generators and consumers, and the tariff structures for network use. *Therefore, **there is no need for additional licensing** or allowances for the system operators to operate the grid beyond the concession contracts.*

11.2.2 for prosumers/aggregators: *Yes ☑ No ☐*

In Portugal, prosumers and aggregators who wish to participate in the electricity market and offer flexibility services are required to obtain a license from the Energy Services Regulatory Authority (ERSE). The license is necessary for the participation of prosumers and aggregators in the energy market and ensures that they comply with the applicable regulatory requirements.

11.2.3 for BRP *Yes ☑ No ☐*

Yes, there are specific allowances and licensing requirements for Balance Responsible Parties (BRP) in the operation of the grid. In Portugal, the Portuguese Energy Services Regulatory Authority (ERSE) is responsible for the regulation and licensing of BRPs. Companies that want to act as BRPs must apply for a license and meet certain requirements, including financial and technical capabilities, to ensure they can fulfill their responsibilities in managing imbalances between production and consumption within their portfolio of clients. The licensing process includes a detailed evaluation of the company's ability to manage imbalances and comply with market rules and regulations.

11.2.4 other: Yes ☐ No ☐

Yes, there may be other parties or actors who require allowances or licenses to operate on the grid. For example, energy traders who participate in electricity markets may require a license from the national regulatory authority. Also, energy storage system operators may need to obtain permits or licenses from relevant authorities to install and operate their systems. Additionally, companies involved in the production and distribution of renewable energy, such as wind or solar farms, may need to obtain permits or licenses for their activities.

3. Flexibility Services in a Local Flexibility Market

Flexibility services are “the services provided by individual or aggregated (residential, commercial or industrial) prosumers to flexibility requesting parties (DSO, BRP, and TSO) or prosumers themselves, in reaction to external signals (price signal or activations), by modifying the consumption and/or production pattern, in order to facilitate the reliable and cost-effective management of variability and uncertainty in the electricity system”[1]. Flexibility services specifically focus on deliberate, time limited changes to the ‘normal’ energy profile[2].

LFM provides an opportunity for consumers to play a significant role in the operation of the electric grid by reducing or shifting their electricity usage in response to time-based rates or other forms of financial incentives. DR programs are currently being used by some electric system planners and operators, using mainly the flexibility provided by large industrial facilities connected to the high-voltage grid, as resource options for balancing supply and demand. Therefore, LFMs development will foster flexibility services at DSO level using residential and tertiary buildings flexibility (Look at Annex 2).

This questionnaire concerns the legal side of the applicability of the Flexibility Services in LFMs.

12. In your country, is there some regulation concerning the definitions below? If Yes, please, specify.

Congestion	Balancing	Demand Response
Yes, in Portugal there are regulations concerning congestion in the electricity grid. These regulations aim to prevent and manage congestion to ensure the security and stability of the grid. Congestion management is handled by the System Operator (REN) and involves	*Yes, there is regulation concerning balancing in Portugal. The transmission system operator (TSO), REN, is responsible for ensuring the balance between electricity production and consumption in real-time. REN manages the balancing market, where market participants can offer balancing*	*Yes, there is regulation concerning demand response in Portugal. The Portuguese Regulatory Authority for Energy (ERSE) has established a framework for demand response that includes rules for its implementation, operation, and management. The framework aims to encourage the participation of end-users,*

[1] Nixiang, A. Flexibility services in Citizen Energy Communities (Master’s thesis), University of Technology Eindhoven, the Netherlands. (2020)

[2] USEF White Paper: Energy and Flexibility Services, 2019

measures such as curtailment of renewable energy production, activation of demand response programs, and activation of flexible assets. The rules and procedures for congestion management are defined by the Portuguese Regulatory Authority for Energy (ERSE) in coordination with REN.	*services, such as the provision of reserves or the activation of demand response. The balancing market is operated in compliance with the European balancing guidelines and the principles of non-discrimination, transparency, and cost-effectiveness. The Portuguese regulatory authority, ERSE, oversees REN's balancing activities and ensures that they are carried out in a fair and efficient manner.*	*aggregators, and other stakeholders in demand response programs to help ensure a reliable and efficient electricity system. The framework also sets out guidelines for the remuneration of demand response providers and the calculation of their compensation. Additionally, there are pilot projects and initiatives being developed to promote the use of demand response in Portugal, such as the use of smart meters and the development of virtual power plants.*
Ancillary service	Non-frequency ancillary service	Energy storage
Yes, there is regulation concerning ancillary services in Portugal, which is primarily governed by the Portuguese Electricity Services Regulation Authority (ERSE). The regulation requires that the system operator procure various ancillary services, including frequency control, voltage control, and system restoration, in order to ensure the safe and efficient operation of the grid. ERSE sets the technical and economic rules for the procurement of these services, and the system operator is responsible for contracting with providers.	*Yes, there is regulation concerning non-frequency ancillary services in Portugal. The transmission system operator, REN, is responsible for procuring non-frequency ancillary services from market participants through a competitive tender process. These services include voltage control, black start capability, and reactive power support, among others. The regulatory framework for ancillary services in Portugal is established by the Portuguese Energy Services Regulatory Authority (ERSE) in accordance with EU regulations.*	*Yes, there is regulation concerning energy storage in Portugal. In 2019, Portugal approved a regulatory framework for energy storage systems, which includes rules for their connection to the grid and participation in the energy market. The framework also sets technical standards for energy storage systems to ensure their safety and performance.*

13. What kinds of flexibility services are available in your country?

Constraint Management ☐ Adequacy ☐ Balancing ☐ Wholesale ☐

13.1 Which participants are flexibility providers?

13.1.1 Constraint Management

Prosumers ☐ Aggregators ☐ Large Generation ☐ Other ☐

13.1.2 Adequacy

Prosumers ☐ Aggregators ☐ Large Generation ☐ Other ☐

13.1.3 Balancing

Prosumers ☐ Aggregators ☐ Large Generation ☐ Other ☐

13.1.4 Wholesale

Prosumers ☐ Aggregators ☐ Large Generation ☐ Other ☐

13.2 Which participants are flexibility buyers?

13.2.1 Constraint Management

TSO ☐ DSO ☐ Aggregators ☐ BRP ☐ Other ☐

13.2.2 Adequacy

TSO ☐ DSO ☐ Aggregators ☐ BRP ☐ Other ☐

13.2.3 Balancing

TSO ☐ DSO ☐ Aggregators ☐ BRP ☐ Other ☐

13.2.4 Wholesale

TSO ☐ DSO ☐ Aggregators ☐ BRP ☐ Other ☐

13.3 What are the procedures to sell flexibility?

13.3.1 Constraint Management

Open market ☐ Tender process ☐ Bid ☐ Other ☐

13.3.2 Adequacy

Open market ☐ Tender process ☐ Bid ☐ Other ☐

13.3.3 Balancing

Open Market ☐ Tender process ☐ Bid ☐ Other ☐

13.3.4 Wholesale

Open Market ☐ Tender process ☐ Bid ☐ Other ☐

14. Can storage facilities (including Electric Vehicles) provide flexibility services in your country?

Yes ☐ No ☐

Yes, storage facilities, including electric vehicles, can provide flexibility services in Portugal. In fact, energy storage is an important source of flexibility in the energy system, as it can help to balance the variability of renewable energy sources, manage peak demand, and support grid stability. In Portugal, there are various types of energy storage facilities that can provide flexibility services, including:

- *Battery storage systems: Battery storage systems can store electricity and release it when needed, providing flexibility to the grid. These systems can be installed at different points in the electricity network, including at the transmission or distribution level, or on a customer's premises.*
- *Pumped hydro storage: Pumped hydro storage is a type of energy storage that uses the potential energy of water to store electricity. In Portugal, there are several pumped hydro storage facilities, including the Alto Lindoso and Frades II plants.*
- *Electric vehicles: Electric vehicles can also provide flexibility services by adjusting their charging patterns to support the grid's needs. For example, they can charge during periods of low demand and discharge electricity back to the grid during peak periods.*

15. Do the following flexibility services exist in your country?

15.1 Constraint Management

15.1.1 Voltage Control Yes ☐ No ☐

15.1.2 Grid Capacity Management Yes ☑ No ☐

15.1.3 Congestion Management Yes ☑ No ☐

15.1.4 Controlled Islanding Yes ☑ No ☐

15.1.5 Optional Downwards Flexibility Management Yes ☑ No ☐

15.1.6 DSO Constraint Management (pre/post fault) Yes ☑ No ☐

15.1.7 Other (please specify:) Yes ☑ No ☐

15.1.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☑ No ☐

There may be legal constraints in Portugal's national, regional, or local regulations that act as barriers to flexibility services, depending on the specific service and the regulatory framework. For example, there may be rules related to grid connection, technical requirements, or market participation that could limit the deployment of certain types of flexibility services. Additionally, the regulatory framework for flexibility services is constantly evolving, and new regulations could be introduced that affect the development of flexibility services. However, the regulatory framework in Portugal is designed to encourage the development of flexibility services and to ensure that they can be integrated into the energy system effectively.

15.2 Adequacy

15.2.1 Capacity payment Yes ☐ No ☐

15.2.2 Capacity Market Yes ☐ No ☐

15.2.3 Strategic reserve Yes ☐ No ☐

15.2.4 Hedging Yes ☐ No ☐

15.2.5 Other (please specify: *Market participation, eligibility criteria, or technical requirements*)

Yes ☐ No ☐

15.2.6 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Yes. There may be a legal constraint that may act as barriers to these flexibility services. To explain, there may be specific regulations and guidelines in place that could affect their deployment or operation. For example, there may be rules related to technical requirements, market participation, eligibility criteria, or other factors that could limit their effectiveness or economic viability.

15.3 Balancing

15.3.1 Dynamic Containment Yes ☐ No ☐

15.3.2 Frequency Containment Reserve (FCR) Yes ☐ No ☐

15.3.3 Automatic Frequency Restoration Reserve (aFRR) Yes ☐ No ☐

15.3.4 Manual Frequency Restoration Reserve (mFRR) Yes ☑ No ☐

15.3.5 Replacement Reserve (RR) Yes ☑ No ☐

15.3.6 other (please specify:) Yes ☐ No ☑

15.3.7 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☑ No ☐

Yes. There may be rules related to technical requirements, market participation, eligibility criteria, or other factors that could *act as barriers to those flexibility services*

15.4 Wholesale

15.4.1 Day-ahead optimization Yes ☑ No ☐

15.4.2 Intraday optimization Yes ☑ No ☐

15.4.3 Self/passive balancing Yes ☑ No ☐

15.4.4 Generation optimization Yes ☑ No ☐

15.4.5 Exceeding Maximum Export/Import Capacity Yes ☑ No ☐

15.4.6 Offsetting Yes ☐ No ☐

15.4.7 Other (please specify:) Yes ☐ No ☐

15.4.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Yes. There may be rules related to technical requirements, market participation, eligibility criteria, or other factors that could *act as barriers to those flexibility services*

15.5 Local Optimization

15.5.1 ToU Optimization Yes ☐ No ☐

15.5.2 kWmax control Yes ☐ No ☐

15.5.3 Self-balancing Yes ☐ No ☐

15.5.4 Emergency power supply Yes ☐ No ☐

15.5.5 Smart Contracts Yes ☐ No ☐

15.5.6 Collective Self-consumption Yes ☐ No ☐

15.5.7 Transmission Charge Management Yes ☐ No ☐

15.5.8 Distribution Charge Management ***(I don't Know)*** Yes ☐ No ☐

15.5.9 Other (please specify) Yes ☐ No ☐

15.5.10 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Yes. There may be rules related to technical requirements, market participation, eligibility criteria, or other factors that could act as barriers to those flexibility services

16. Does the regulation in your country allow net-metering?

Yes ☐ No ☐

Yes, net-metering is allowed in Portugal for renewable energy systems up to 200 kW. The excess energy generated by the system is injected into the grid, and the consumer is credited for that amount. This credit can be used to offset the electricity consumption from the grid when the renewable energy system is not generating enough energy.

17. Are there any legal incentives and benefits in your national/ regional/ local regulations that act as stimuli to the uptake of LFMs?

Yes ☐ No ☐

Yes, there are legal incentives and benefits in Portugal's national, regional, and local regulations that act as stimuli to the uptake of LFMs. One such incentive is the feed-in tariff (FiT) system, which provides a guaranteed price for renewable energy producers for a fixed period. This system has been available for a wide range of renewable energy sources, including wind, solar, biomass, and hydropower. Additionally, the government has implemented various tax incentives, grants, and subsidies to promote the uptake of LFMs, such as reduced VAT rates for energy-efficient equipment, tax deductions for investments in energy efficiency, and grants for energy audits. Furthermore, the Portuguese government has set ambitious renewable energy targets and has established policies and strategies to promote renewable energy development and energy efficiency. For instance, the National Energy and Climate Plan (NECP) aims to reach a 47% renewable energy share in the final energy consumption by 2030 and to increase energy efficiency by 35%.

4. Blockchain and Data Management in LFMs

1. Blockchain Technology & Smart Contract in Energy Services

Blockchain technology has the potential to transform the energy sector. Of the many use cases for blockchain, energy and sustainability are often less recognized. The energy industry has been consistently catalyzed by innovations including rooftop solar, electric vehicles, and smart metering. The blockchain presents itself as the next emerging technology to spur growth in the energy sector through smart contracts and systems interoperability. A joint report issued in 2018 by the WEF, Stanford Woods Institute for the Environment, and PwC identified more than 65 existing and emerging blockchain use-cases for the environment. These use cases include new business models for energy markets, real-time data management, and moving carbon credits or renewable energy certificates onto the blockchain; the blockchain also offers unique solutions for renewable energy distribution. A range of blockchain products can be tailored to address various energy or sustainability applications, including the following: wholesale electricity distribution; peer-to-peer energy trading; electricity data management; commodity trading; utility providers; etc.

18. Does the regulation in your country allow the use of blockchain or other digital currencies in the energy sector?

Yes ☐ No ☐

Yes, Portugal has been actively exploring the use of blockchain and other digital technologies in the energy sector. In fact, the Portuguese government has launched several initiatives aimed at promoting the development and use of blockchain-based solutions for the energy market, such as the "BlockStart" program, which supports startups in the development of blockchain-based projects, and the "Energy Web Foundation", which is an international non-profit organization that is developing an open-source blockchain platform for the energy sector. Additionally, Portugal has also been exploring the use of digital currencies, such as the adoption of cryptocurrency payments for energy bills by some energy suppliers.

19. *Do transactions concerning the flexibility services use Blockchain technology in your country?*

Yes ☑ No ☐

Yes. There are P2P energy trading applications available in Portugal. P2P (peer-to-peer) energy trading programs can be considered a form of LFM services as they enable the trading of locally generated energy between individuals or entities within a local community. This can provide a more flexible and sustainable way of managing energy supply and demand, as well as promote the development of renewable energy resources at the local level. For example, there is a company called Power Ledger that has partnered with EDP Distribuição, the largest distribution system operator in Portugal, to launch a P2P energy trading platform. The platform allows consumers to trade excess energy generated by their solar panels with other consumers in their community. Additionally, there are other P2P energy trading platforms such as the one developed by WePower and EDP, which enables consumers to buy and sell green energy directly from each other. Both P2P platforms are designed over Digital Ledgers Technology (DLT).

20. *Is there any provision or regulation that presents legal risk and behaves as a barrier to the use of Blockchain technology in flexibility services for LFMs?*

Yes ☐ No ☐

I don't Know!

21. Does your country recognize smart contracts as legal contracts?

Yes ☑ No ☐

Yes, Portugal recognizes smart contracts as legal contracts. In 2019, the Portuguese Parliament approved a law that explicitly recognizes and regulates electronic registered letters, electronic time stamps, and smart contracts. The law grants legal validity to smart contracts and sets out the legal requirements for their use in different areas, including the energy sector.

2. Data Management & Protection

According to the General Data Protection Regulation 2016/679, data aggregation shouldn't violate the privacy and security of the customers. This regulation also removes obstacles to ensure a better mobility of personal data while protecting natural persons. LFMs process energy consumption data and shouldn't infer personal information especially when sharing data with third parties.

22. Does the regulation in your country guarantee the security of consumers' consumption data?

Yes ☑ No ☐

Yes, Portugal has implemented the General Data Protection Regulation (GDPR), which is a legal framework that provides the security and protection of consumers' personal data, including consumption data. This regulation is applicable to all entities that collect and process personal data, including energy companies. Additionally, there are specific regulations in the energy sector, such as the Portuguese Electricity Law and the Regulation of the Energy Services Regulatory Authority, that establish requirements for the processing and management of consumption data, including security measures to protect such data. Therefore, the regulation in Portugal guarantees the security of consumers' consumption data.

23. In your country, how is the security of the grid? Are there any regulations about cybersecurity?

In Portugal, the security of the grid is regulated and overseen by the national regulatory authority for energy, the Entidade Reguladora dos Serviços Energéticos (ERSE), and the national transmission system operator, Rede Elétrica Nacional (REN).

In terms of cybersecurity, there are regulations and guidelines in place to ensure the security of the grid and related systems. The Portuguese government has implemented the National Strategy for Cybersecurity (ENCS) and created the Portuguese National Cybersecurity Center (CNCS) to coordinate and implement cybersecurity policies across different sectors, including the energy sector.

The ERSE has also established rules and procedures for the security of the electricity system, which includes measures to prevent and respond to cyber threats. The regulations require that electricity companies implement measures to protect their information systems and networks, as well as report any cybersecurity incidents to the relevant authorities.

Additionally, REN has implemented a cybersecurity program that includes continuous monitoring of the grid and related systems, regular vulnerability assessments, and staff training to ensure the security of the grid. The company also works closely with other stakeholders in the energy sector to share information and coordinate responses to cyber threats.

24. How is your country managing smart metering data?

Centralized data hub ☑ Decentralized data infrastructure ☐

In Portugal, smart metering data is managed through a centralized data hub called the "Gestor de Medição e de Sistemas de Informação do Mercado de Energia Elétrica" (GMSIEE). The GMSIEE is responsible for collecting, processing, and storing smart meter data from all electricity suppliers and distributors in the country, and ensuring that it is made available to market participants in a secure and transparent manner. This centralized approach to smart meter data management is mandated by Portuguese regulations, which require that all electricity market participants share a common data infrastructure.

What are the risks and benefits of the system in place?

Risks:

1. Data privacy and security: Storing all data in one central location may increase the risk of data breaches, which could compromise the privacy and security of consumers' personal information.

2. Dependency on a single point of failure: A centralized system may be vulnerable to cyber-attacks or system failures, leading to potential service disruptions.

3. Limited flexibility: A centralized data hub may be less flexible than a decentralized infrastructure, making it harder to incorporate new technologies or adapt to changing market conditions.

Benefits:

1. Improved data accuracy and consistency: A centralized data hub allows for consistent data management and storage, ensuring that data is accurate and reliable.

2. Cost savings: By centralizing data management, there are economies of scale and reduced duplication of effort, leading to cost savings.

3. Improved customer service: A centralized data hub allows for quicker response times to customer queries and complaints.

5. Summary

25. Can you give recommendations and proposals for changes in the regulation in order to overcome the perceived legal risks and barriers in your country concerning

25.1 Creation of a LFM

1. Foster a regulatory framework that encourages the deployment of LFM technologies, by ensuring that the regulatory structure is sufficiently flexible to accommodate new and innovative business models.

2. Encourage the development of standards and protocols for the interoperability of LFM technologies, as this will help to reduce the complexity and costs associated with implementing these systems.

3. Clarify the legal framework for data privacy and cybersecurity to promote trust and confidence in the use of LFM technologies. This could involve the development of clear data protection regulations, data ownership and management guidelines, and cybersecurity standards.

4. Promote the use of blockchain technology, as this technology can help to address issues of data privacy and security, promote transparency and accountability, and enhance the efficiency of transactions in the energy sector.

5. Encourage collaboration between stakeholders in the energy sector to promote the deployment of LFM technologies. This could involve the establishment of public-private partnerships, joint investment initiatives, and other forms of collaboration to foster innovation and progress in the sector.

25.2 Uptake of the flexibility services

1. Encourage the use of smart contracts: Portugal could consider recognizing smart contracts as legal contracts and implementing regulations to support their use in the energy sector. This would help to improve transparency, reduce transaction costs, and increase the efficiency of transactions related to flexibility services.

2. Implement a framework for blockchain technology: Portugal could implement a legal framework for the use of blockchain technology in the energy sector, including flexibility services. This would help to mitigate risks related to data privacy and security, while promoting innovation and efficiency in the market.

3. Foster a culture of innovation: Portugal could foster a culture of innovation by encouraging experimentation and piloting of new technologies and business models. This could involve setting up sandboxes or regulatory sandboxes where new ideas can be tested without fear of regulatory repercussions.

4. Encourage collaboration and information sharing: Portugal could encourage collaboration between DSOs, TSOs, and other stakeholders in the energy sector to share information and best practices related to the uptake of flexibility services. This would help to ensure that all stakeholders are on the same page and working towards a common goal.

5. Provide financial incentives: Portugal could provide financial incentives for the uptake of flexibility services, such as subsidies, tax credits, or other forms of financial support. This would help to overcome some of the perceived barriers related to the costs of implementing new technologies and business models.

6. Develop a comprehensive regulatory framework: Portugal could develop a comprehensive regulatory framework for the energy sector that takes into account the evolving nature of the market, including the increased uptake of flexibility services. This would help to provide certainty and stability for market participants, while also allowing for flexibility to adapt to changing market conditions.

25.3 Use of blockchain technology for LFMs

1. Promote awareness and education: There is a need for stakeholders to be aware of the benefits and applications of blockchain technology in the energy sector. This can be achieved through awareness campaigns, workshops, and training programs.

2. Encourage collaboration: Collaboration among stakeholders, including regulators, energy companies, and technology providers, is essential to develop blockchain solutions that meet the specific needs of the energy sector. It is recommended that the government promotes collaboration and cooperation among stakeholders to accelerate the development of blockchain-based solutions.

3. Provide regulatory clarity: To encourage investment in blockchain technology, it is essential to provide regulatory clarity on issues such as data privacy, cybersecurity, and interoperability. The government should establish clear guidelines and standards that promote the adoption of blockchain technology while ensuring the protection of consumer data and the security of the energy system.

4. Encourage innovation: The government should provide incentives and support for innovative startups and companies that are developing blockchain solutions for the energy sector. This can be in the form of grants, tax breaks, or other incentives that encourage investment and promote innovation.

5. Foster interoperability: Interoperability is crucial to ensure that different blockchain solutions can work together seamlessly. The government should encourage the development of standards that promote interoperability among different blockchain solutions, enabling different stakeholders to participate in the energy market seamlessly.

25.4 Data Management

1. *Develop clear guidelines for data management: Portugal should develop clear guidelines on how to manage the data generated by LFMs, including who has access to the data, how it is used, and how it is protected.* *2. Establish a data governance framework: Portugal should establish a data governance framework that outlines the responsibilities of various stakeholders involved in data management, including energy providers, regulators, and consumers.* *3. Encourage data sharing: Portugal should encourage data sharing among different stakeholders in the energy sector, including energy providers, technology providers, and consumers. This will help to promote innovation and collaboration, and drive the development of new LFM solutions.* *4. Ensure data privacy and security: Portugal should ensure that LFMs are designed with strong data privacy and security measures in place to protect the personal information of consumers.* *5. Establish a legal framework for data ownership: Portugal should establish a legal framework for data ownership that clearly defines the rights and responsibilities of energy providers, consumers, and other stakeholders involved in data management.* *6. Provide incentives for data management: Portugal should consider providing incentives for energy providers and other stakeholders to manage data responsibly and effectively. This could include financial incentives, such as tax breaks or subsidies, or non-financial incentives, such as public recognition or certification.* *7. Develop a regulatory sandbox: Portugal should establish a regulatory sandbox where new LFMs and data management solutions can be tested in a controlled environment. This will help to identify any legal or regulatory barriers and enable policymakers to develop more effective regulations.*

25.5 Other

26. *Can you give recommendations and proposals for changes in the regulation in order to better foster Local Flexibility Markets uptake, flexibility services and blockchain technologies use for LFMs in your country; thus, creating incentives for their development?*

1. Incentivize the uptake of LFMs: Develop policies and regulatory frameworks that promote the development of LFMs and enable access to the grid for small-scale generators and consumers. This could include incentives such as tax exemptions, grants, and low-interest loans for LFMs. *2. Promote the development of flexibility services: Develop regulatory frameworks that support the development of flexibility services, such as dynamic containment, frequency containment reserve, and automatic frequency restoration reserve. This could include setting up dedicated markets for flexibility services, streamlining the procurement process, and providing financial incentives for flexibility providers.* *3. Enable the use of blockchain technology: Develop clear and consistent legal frameworks for the use of blockchain technology in the energy sector. This could include recognizing smart contracts as legal contracts, setting standards for data privacy and security, and providing support for the development of blockchain-based energy platforms.* *4. Enhance data management for LFMs: Develop data management frameworks that ensure the security and privacy of consumer data while enabling the efficient sharing of data between stakeholders. This could include developing clear guidelines for data sharing, establishing data protection standards, and promoting the use of decentralized data infrastructure.* *5. Encourage research and development: Encourage research and development in the energy sector, particularly in the areas of LFMs, flexibility services, and blockchain technology. This could include funding research and development projects, providing support for startups, and promoting collaboration between industry and academia.*

ANNEX 1

Aggregation	***Distribution System Operator (DSO)***	***Transmission System Operator (TSO)***	***Balance Responsible Party (BRP)***
Art. 2. (18) of IEMD 2019/944	*Art. 2. (29) of IEMD 2019/944*	*Art. 2. (35) of IEMD 2019/944*	*Art.2. (14) of IEMD 2019/943*
'aggregation' means a function performed by a natural or legal person	'DSO' means a natural or legal person who is responsible for operating, ensuring the	'TSO' means a natural or legal person who is responsible for operating, ensuring the	'BRP' means a market participant or its chosen representative responsible

who combines multiple customer loads or generated electricity for sale, purchase or auction in any electricity market	maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity	for its imbalances in the electricity market

---

Self-consumer	***Active customer***	***Renewable Energy Community(REC)***	***Citizens Energy Community (CEC)***
Art. 21. of REDII 2018/2001	Art.15 IEMD of 2019/944	Art. 22. of REDII 2018/2001	Art.16 of IEMD 2019/944
'Renewables self-consumer' means a final customer operating within its premises located within confined boundaries or, where permitted by a MS, within other premises, who generates RE electricity for	'Active customer' means a final customer, or a group of jointly acting final customers, who consumes or stores electricity generated within its premises located within confined	'REC' means a legal entity: (a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the RE projects that are	'CEC' means a legal entity that: (a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, incl. municipalities, or small enterprises;

its own consumption, and who may store or sell self-generated RE electricity, provided that, for a non-household REs self-consumer, those activities do not constitute its primary commercial or professional activity.	boundaries or, where permitted by a MS, within other premises, or who sells self-generated electricity or participates in flexibility or EE schemes, provided that those activities do not constitute its primary commercial or professional activity;	owned and developed by that legal entity; (b) the shareholders or members of which are natural persons, SMEs or local authorities, incl. municipalities; (c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits.	(b) has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; (c) may engage in generation, incl. from RES, distribution, supply, consumption, aggregation, energy storage, EE services or charging services for electric vehicles or provide other energy services to its members or shareholders.

ANNEX 2

Congestion	***Balancing***	***Demand Response***
Art. 2. (4) of IEMD 2019/943	*Art. 2. (10) of IEMD 2019/943*	*Art. 2. (20) of IEMD 2019/944*

‘congestion’ means a situation in which all requests from market participants to trade between network areas cannot be accommodated because they would significantly affect the physical flows on network elements which cannot accommodate those flows	‘balancing’ means all actions and processes, in all timelines, through which transmission system operators ensure, in an ongoing manner, maintenance of the system frequency within a predefined stability range and compliance with the amount of reserves needed with respect to the required quality	‘demand response’ means the change of electricity load by final customers from their normal or current consumption patterns in response to market signals, including in response to time-variable electricity prices or incentive payments, or in response to the acceptance of the final customer's bid to sell demand reduction or increase at a price in an organised market as defined in point (4) of Article 2 of Commission Implementing Regulation (EU) No 1348/2014 (17), whether alone or through aggregation

Ancillary service	***Non-frequency ancillary service***	***Energy storage***
Art. 2. (48) of IEMD 2019/944	*Art. 2. (49) of IEMD 2019/944*	*Art. 2. (59) of IEMD 2019/944*

‘Ancillary service’ means a service necessary for the operation of a transmission or distribution system, including balancing and non-frequency ancillary services, but not including congestion management	‘non-frequency ancillary service’ means a service used by a transmission system operator or distribution system operator for steady state voltage control, fast reactive current injections, inertia for local grid stability, short-circuit current, black start capability and island operation capability	‘Energy storage’ means, in the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical energy or use as another energy carrier

THANK YOU FOR ANSWERING THE QUESTIONS!

8. Romania

DEAR PARTICIPANT,

The following questionnaire is developed under the DE-RISK project in order for a thorough study to be performed to provide an overview of how the regulatory environment in ten European countries and at European Level evolved. The results of the survey will contribute to the Regulatory Impact Analysis (RIA) to deeply assess the current regulatory framework that is enabling or acting as a barrier for the large deployment of Local Flexibility Markets (LFM) and the potential flexibility services.

We invite you to complete this survey to collect your experience and views regarding:

- Awareness of European, national and local policies regarding the regulation on Local Flexibility Markets
- Perceived legal risks and benefits
- Impact of the regulation - barriers and incentives
- Legal background of innovative technologies - block chain transactions and flexibility services
- Perceived legal risks and benefits
- Recommendations about future legal development of the LFM in your country and at European Level.

ABOUT DE-RISK PROJECT

This survey is being conducted as part of the DE-RISK Project funded by the European Union (EU) under Horizon Europe program.. The DE-RISK project will support the market uptake of Renewable Energy Sources (RES) by de-risking the adoption of Local Flexibility Markets to increase the RES hosting capacity of the distribution network.

ABOUT YOUR PARTICIPATION

Your participation in this study is fully voluntary and all data collected will be treated confidentially. Participation is free and there are no mandatory requirements. The research outputs resulting from this work will only include collated data, without the possibility for anyone to identify your individual answers. Your contact details will be used on a need-to-know basis and will be strictly confidential until the end of the project’s lifetime. By submitting this form:

- you confirm that you have read and understood this information.
- you agree to participate in this research study and your answers to be included in our analysis and resulting from its research publications.
- you agree that we will process the data in line with DE-RISK project policy of confidentiality that is in accordance with GDPR 2016/679.

Country:	**Romania**
Organization:	**SOFENA**
Name of expert answering the survey:	**Marc-Antoine Andrieux**
Contact details: (mail, phone, other)	
Date:	**March 2023**

1. LFM Regulation - Definitions of Market Actors and Market Characteristics

The European Commission promotes flexibility markets as they can contribute to the European Union in becoming a climate-neutral continent by 2050. The new market development is taking place in Europe with the transposition in the different Member States of the Clean Energy Package (specifically the Electricity directive EU 944/2019) with new roles for DSOs entering into new activity areas. DSO-TSO cooperation evolves in a beneficial way for energy markets and for consumers as well. Governance of how DSOs and TSOs interact and engage in network planning, as well as arrangements to facilitate effective coordination for system operation, especially for flexibility, have been the key regulatory concerns in this area for the last few years.

Local flexibility markets allow the use of flexibility at local level by distribution and transmission system operators. This means using flexibility from decentralized energy resources (DERs) to solve congestion management problems, minimize power outages and avoid grid expansions. Flexibility markets help energy networks to monitor energy flows and create market signals to motivate changes in energy supply and demand, integrating smart meters and appliances, renewable energy resources and energy efficient resources accordingly. The Clean Energy Package defines and offers an enabling legislative framework for Local Energy Markets participants. The analysis of the LFM regulation will be conducted including some of the following topics that characterize the market:

LFM topic	**Sub-topic**
Market actors	• Aggregator • Balance Responsible Party (BRP) • Citizen energy communities • Distribution System Operator (DSO) • Market operator
Market and product characteristics	• Market entry and exit and market platforms • Product characteristics (e.g., prequalification, standardization of FS)
Infrastructural issues	• Smart metering systems • Energy storage • Network expansion
Contract, bidding, and settlement	• Contract. Bidding, billing, and settlement
Data security issues	• Access to data, data security, privacy protection

The Clean Energy for all Europeans Package defines new ground for consumers by recognizing under EU law, the rights of citizens and communities to engage directly in the energy sector. It also sets out legal frameworks for LFMs. Participants of the whole DR value chain are defined in the laws of the Clean Energy Package. The revised Renewable Energy Directive (EU) 2018/2001 sets the framework for ‘renewable energy communities’ and the revised Internal Electricity Market Directives (EU) 2019/943 & 2019/944 introduce new roles and responsibilities for ‘citizen energy communities’, ‘aggregation’, ‘distribution system operator’, ‘transmission system operator’ and ‘balance responsible party’ in the energy system covering all types of electricity. (Look at Annex 1)

1. *Are the Directives on common rules for the internal market for electricity 2019/943 & 2019/944 already transposed into your national legislation?*

Yes ☐ **No** ☐ **Partially** ■

Is the revised Renewable Energy Directive (EU) 2018/2001 already transposed into your national legislation? **Yes**

☐ **No** ☐ **Partially** ■

*1.1. If your answer is **Yes,** indicate the national / regional / local legislation that defines it and explain it:*

IEMD 2019/943: The transposition of European Directive 2019/943 has been partially done through the enactment of Government Emergency Ordinance n°143/2021 in the *Electricity and Gaz Law n°123/2012*
IEMD 2019/944: The transposition of European Directive 2019/944 has been partially done through the enactment of Government Emergency Ordinance n°143/2021 in the *Electricity and Gaz Law n°123/2012*

REDII 2018/2001: The transposition of European Directive 2018/2001 has been partially done through the enactment of Government Emergency Ordinances n°143/2021 (to modify Electricity and Gaz Law) and n°163/2022 (to promote the use of energy from renewable sources)

*1.2. If your answer is **Partially,** and there is some regulation concerning the definitions below, please, specify:*

For example: Explain if regulation is available, or concepts are under development, or discussions are ongoing, etc.

Aggregation	Distribution System Operator (DSO)	Transmission System Operator (TSO)	Balance Responsible Party (BRP)
Article 3 (6) of the amended law 123/2012 *function performed by a natural or legal person who combines the loads of several customers or the electricity produced by several sources in order to sell, buy or bid on any electricity market.*	Article 3 (70) of the amended law 123/2012 *Any natural or legal person who owns, in any capacity, an electrical distribution network and is responsible for the operation, maintenance and development of the distribution network in a certain area and, where applicable, its interconnections with other systems, as well as the long-term capacity of the network to satisfy a reasonable level of electricity distribution demand.*	Article 3 (71) of the amended law 123/2012 *Any natural or legal person who owns, in any capacity, an electrical transmission network and is responsible for the operation, maintenance and development of the transmission network in a certain area and, where applicable, its interconnections with other electric power systems, as well as the long-term capacity of the transmission network to cover reasonable demands for electric power transmission.*	Article 3 (78) of the amended law 123/2012 *Market player or his elected representative responsible for his imbalances in the electricity market.*

Self-consumers	Active consumers	REC	Citizen energy communities (CEC)
Article 3 (95) of the amended law 123/2012 *End consumer who carries out his activities in his own space located in a determined area or in other spaces located in the immediate proximity and who produces electricity from renewable sources for his own consumption and can store and resell excess electricity (without constituting their principal commercial or professional activity)*	Article 3 (18) of the amended law 123/2012 *End customer or a group of and customers acting together, who consume or store the electricity produced in the premises they own located in limited areas or who sell their own electricity produced or who participate in flexibility or energy efficiency (as long as it isn't their principal commercial or professional activity)*	Article 2 (18) & 22 of the Emergency Ordinance 163/2022 *Legal entity that fulfills the following conditions:* *(1) Based on voluntary and open participation and controlled by partners/shareholders, natural persons, local authorities (incl. municipalities or small businesses) which are located near RES projects* *(2) Provision of environmental, economic or social benefits to its members or the operating territories rather than generate financial profits*	Article 3 (24) of the amended law 123/2012 *Legal entity that fulfills the following conditions:* *(1) Based on voluntary and open participation and controlled by partners/shareholders, natural persons, local authorities (incl. municipalities or small businesses)* *(2) Provision of environmental, economic or social benefits to its members or the operating territories rather than generate financial profits* *(3) Involved in electricity generation (incl. from RES), distribution, supply, consumption, aggregation, energy storage, energy efficiency or charging services for EV*

1.3. Are there other LFM participants in your country? How are they defined?

NRA ■ Suppliers ■ Traders ☐ Other ☐

ANRE (Romanian National Regulatory Authority) was established in 1988 and is defined in Art.7. of the amended law for electricity and gas and has the main following missions:

- Monitoring the implementation of rules concerning TSO, DSO, suppliers, clients and other market players
- Monitoring congestion management and its rules (with market players)
- Supervising the proper functioning of the electricity market

Suppliers are defined (Art.3 (46/47)) as entity who is selling electricity to customers, including resale, as well as supplying electricity to places in the supplier perimeter.

2. *How do DSOs and TSOs cooperate to organize the flexibility market?*

TSOs have access to the balancing market (which is operated by OPCOM, subsidiary of the TSO). DSOs have access to other markets but the cooperation between the two of them is no defined in the law.

3. *How is the Local Flexibility Market organized in your country?*

Platform ■ Aggregation ☐ Other model ☐

OPCOM is operating the markets -> https://www.opcom.ro/acasa/ro under the supervision of the national NRA (ANRE). The TSO manages the operation of the electricity market and is also responsible for electricity exchanges with other countries. The TSO also purchase flexibility services in the balancing market. Market participants mainly use the day-ahead and Intraday market to balance the portfolio of bilateral contracts, availability of generation units and the consumption forecast. In case of a power reduction, transactions occur at the dispatchable unit's level.

4. *Are there any legislative barriers which block the reinforcement of interactions between LFM's participants and slow down the development of LFMs? Please, indicate below:*

The transposition of the EU Directives IEMD and RED II are recent and incomplete. Even with one main law about the electricity market, there are several and complex legislation that are interfering with it.

5 Are there national regulations concerning the market products?

For example: Explain if regulations or guidelines are available, or discussions are ongoing, etc.

5.1. Market entry and exit: *Yes* ☐ *No* ☐

Explain:

5.2. Market Product characteristics (e.g, Are there guides and regulations on product prequalification, standardization and baseline):

Yes [redacted] *No* ☐

Explain: Article 23, Amended Law 123/2012 Authorizing bilateral PPA or bilateral capacity reservation agreement. Long term supply contracts between market players in ANRE President Order 65/2020

6 Infrastructural issues concerning the LFMs.

6.1 Regulation on Smart Metering Systems. Are they adapted to the LFMs? Are they installed?

Yes [redacted] ***Partially*** *No* ☐

Explain: Prosumers & Consumers (>10kW) should have SMS by the end of 2023 and other consumers by the end of 2028 (Art.66 Law 123/2012) which is late compared to other EU countries. Dynamic prices contract for electricity supply are defined in the law (Art.3 (32)) and are adapted for LFMs

6.2 Regulation on Energy Storage: How is energy storage defined in your regulation? Is there any guideline, or discussions ongoing, etc.?

Yes ■ *No* ☐

Explain: Define in Art.3 (57/121) & Art.10 Law 123/2012 In the law, energy storage only appears alongside energy production and is subject to a licensing process

7 Contract, bidding, and settlement. Explain if any specific regulations or guidelines for LFM are established.

Yes ☐ *No* ☐

Explain:

According to IEMD 2019/944 the network development plan published by the DSOs should provide transparency on the medium and long-term flexibility services and shall set out the planned investments for the next five-to-ten years, with particular emphasis on the main distribution infrastructure which is required in order to connect new generation capacity and new loads, including recharging points for electric vehicles. The network development plan shall also include the use of demand response, energy efficiency, energy storage facilities or other resources that the distribution system operator is to use as an alternative to system expansion.

8 Is there any legislation about development plans for the electricity network in your country?

Yes ■ **No** ☐

8.1 If your answer is Yes, indicate the legal regulation that defines it, its statement and how flexibility is included into it.

Art.35 law 123/2012: *The transmission system and network operator is required to draw up ten-year investment and development plans for the transmission system, based on the current state and future development of energy consumption and sources, including energy imports and exports.*
(2) The development plans provided for in para. (1) contain the methods of financing and carrying out investments concerning the transport networks, also taking into account the plans for the development and systematization of the territory they cross, under the conditions of compliance with the rules of protection of the environment.

GEO 143 (66) also mention that the electricity distribution network development should provide transparency on the required flexibility services in the medium and long term and presents the investments planned for the next 5 to 10 years.

8.2 Are there any stimuli or incentives to create flexibility or/and to include flexibility in network development plans? Please, indicate below:

According to Art. 45^1 of law 123/2012, ANRE create a regulatory framework by which distribution operators are incentivized to purchase flexibility services

8.3 Regulation on Network Expansion in compliance with the IEMD 2019/944?

2. Yes ☒ *No* ☐

Explain: Art.3 (45)
The development of the electrical distribution network of public interest belongs to the concessionary DSO who creates, in an area where there is no network, new distribution capacities and who realizes maintenance on existing grid to connect one or more users to the network.

9 Can you note if there are any provisions or regional/local regulations that present legal risks and behave as barriers to the development of Local Energy markets:

/

10 Can you describe any act provisions or regional / local regulations that bring benefits and behave as enablers to LFMs:

GEO 143 & 163 have transformed the electricity market to make it more suitable for RES to connect to the grid and for generation to provide flexibility services. Amendments to the process for connection to the network (Order n°81,82 & 83/2022) aimed at simplifying and speeding up connection to the network for RES. While not being specific to LFM, those regulations set a solid ground for further legislative evolution.

11 Are there any administrative and bureaucratic procedures that hinder LFMs' development and play a restrictive role in their broader application? If yes, please, explain.

/

12 Would you suggest what kind of legal provisions in your country will contribute most to the activation of the interested parties (citizens, commercial and industrial players) to participate in LFMs?

There is a need to aggregate consumer's flexibility in consumption and generation (for prosumers) to create active demand. DSOs should be placed by at the center of the system and should communicate with market participants such as conventional generation but also industrial or small prosumers dispersed in their area (incl. storage facilities, EV …). Legislative texts should clearly mention LFMs and how it should be operated.[1]

13 Can you define any recommendations for improvement of the legislation concerning LFMs in your country or on EU level?

EU Legislation should clearly define Local Flexibility Markets and propose a standardization of Flexibility Services while staying open to innovation in this sector.

2. Policy and Regulatory Framework for LFMs Uptake

14 Does your National (Regional / Local) Energy Action Plans include targets for development and spread of LFMs?

Please, explain:

[1] https://www.mdpi.com/1996-1073/15/2/539

The Romanian National Integrated Plan for Energy and Climate Change 2021/2030[2] states that RES development objectives (49.4% of final energy consumption in electricity from RES by 2030) will provide an increased amount of flexibility into the electricity grid. The planned liberalization of energy markets should provide a wider energy security especially at a local level. They are objectives regarding flexibility services (to foster demand response consumption, to encourage storage facilities …) but not a specific target regarding LFMs

15 What kind of bureaucratic and administrative barriers LFMs can experience

15.1 When flexibility producers connect to the grid?

15.1.1 Complicated application procedure: *Yes* ■ *No* ☐

Grid connection is regulated by the ANRE (Order 59/2013) but the legislation is often evolving (twice in 2022)[3]. Changes in legislation make the application procedure challenging for connection applicants

15.1.2 Uncertainty of approval: *Yes* ■ *No* ☐

Changes in legislation also generate a lack of clarity concerning the approval of new grid connection.

[2] https://energy.ec.europa.eu/system/files/2020-06/ro_final_necp_main_en_0.pdf
[3] https://www.lexology.com/library/detail.aspx?g=f52a3ad8-18a1-4380-b739-42a43711b078

15.1.3 High costs: *Yes ☐ No ☐*

Explain:

15.1.4 Time consuming procedure: *Yes ☐ No ☐*

Explain:
Depending on the type of generation, several administrative procedures are mandatory to construct and operate an electricity generation facility (required by different authorities)[4]

15.1.5 Other: *Yes ☐ No ☐*

Explain:

15.2 When operating the grid (allowance /licensing)?

15.2.1 for System Operators: *Yes ☐ No ☐*

Explain:

[4] https://ca.practicallaw.thomsonreuters.com/4-566-2907?transitionType=Default&contextData=(sc.Default)&firstPage=true#co_anchor_a263701

15.2.2 for prosumers/aggregators: *Yes* ☐ *No* ☐

Explain: ANRE regulation on connecting new users to the network + ANRE regulation on licenses and permits in the electricity sector

15.2.3 for BRP *Yes* ☐ *No* ☐

Explain:

15.2.4 other: *Yes* ☐ *No* ☐

Explain:

3. Flexibility Services in a Local Flexibility Market

Flexibility services are "the services provided by individual or aggregated (residential, commercial or industrial) prosumers to flexibility requesting parties (DSO, BRP, and TSO) or prosumers themselves, in reaction to external signals (price signal or activations), by modifying the consumption and/or production pattern, in order to facilitate the reliable and cost-effective management of variability and uncertainty in the electricity system"[5]. Flexibility services specifically focus on deliberate, time limited changes to the 'normal' energy profile[6].

LFM provides an opportunity for consumers to play a significant role in the operation of the electric grid by reducing or shifting their electricity usage in response to time-based rates or other forms of financial incentives. DR programs are currently being used by some electric system planners and operators, using mainly the flexibility provided by large industrial facilities connected to the high-voltage grid, as resource options for balancing supply and demand. Therefore, LFMs development will foster flexibility services at DSO level using residential and tertiary buildings flexibility (Look at Annex 2).

This questionnaire concerns the legal side of the applicability of the Flexibility Services in LFMs.

16 In your country, is there some regulation concerning the definitions below? If Yes, please, specify.

Congestion	Balancing	Demand Response
Article 3 (28) of the amended law 123/2012 *Situation in which not all market participants' demands to trade between network areas can be satisfied, as they would significantly affect physical flows on those network elements that cannot cope with the respective flows.*	Article 3 (39) of the amended law 123/2012 *Set of actions and processes by which the TSO and the DSO ensure, in a constant manner, both the maintenance of the network frequency within the predefined stability limits and the respect of the volume of reserves required in terms of quality*	Article 3 (29) of the amended law 123/2012 *Changes in the electricity load by end customers from their normal/current consumption patterns in response to market signals, incl. in response to time-varying electricity prices or financial incentives or in response to the acceptance of the and customer's offer to sell the decrease or increase in demand at a certain price on an organized market, individually or by aggregation.*
Ancillary service	Non-frequency ancillary service	Energy storage
Article 3 (106) of the amended law 123/2012	Article 3 (107) of the amended law 123/2012	Article 3 (121) of the amended law 123/2012

[5] Nixiang, A. Flexibility services in Citizen Energy Communities (Master's thesis), University of Technology Eindhoven, the Netherlands. (2020)

[6] USEF White Paper: Energy and Flexibility Services, 2019

Any service necessary for the operation of transmission or distribution systems, incl. balancing services ancillary services not intended for frequency stability, but excluding congestion management.	*Service used by the TSO or DSO for steady-state voltage regulation, for fast injections of reactive current, for local network's stability inertia, for short current-circuit, the ability to start with clean sources and the ability to operate in isolated mode.*	*The process of transforming electrical energy into a form of energy that can be stored in order to postpone its use an instant after the time of generation and the subsequent reconversion of the respective energy into electrical energy or its use in another energy vector.*

17 What kinds of flexibility services are available in your country? [7]

Constraint Management ■ Adequacy ☐ Balancing ■ Wholesale ■

17.1 Which participants are flexibility providers?

17.1.1 Constraint Management

Prosumers ☐ Aggregators ☐ Large Generation ■ Other ☐

17.1.2 Adequacy

Prosumers ☐ Aggregators ☐ Large Generation ☐ Other ☐

17.1.3 Balancing

Prosumers ■ Aggregators ■ Large Generation ■ Other ☐

[7] https://www.transelectrica.ro/web/tel/structura-pietei-romanesti

17.1.4 Wholesale

Prosumers [redacted] Aggregators ☐ Large Generation [redacted] Other ☐

17.2 Which participants are flexibility buyers?

17.2.1 Constraint Management

TSO [redacted] DSO [redacted] Aggregators ☐ BRP ☐ Other ☐

17.2.2 Adequacy

TSO ☐ DSO ☐ Aggregators ☐ BRP ☐ Other ☐

17.2.3 Balancing

TSO [redacted] DSO ☐ Aggregators ☐ BRP ☐ Other ☐

17.2.4 Wholesale

TSO [redacted] DSO [redacted] Aggregators [redacted] BRP [redacted] Other ☐

17.3 What are the procedures to sell flexibility?

17.3.1 Constraint Management

Open market ☐ Tender process ☐ Bid ☐ Other ☐

17.3.2 Adequacy

Open market ☐ Tender process ☐ Bid ☐ Other ☐

17.3.3 Balancing

Open Market ☐ Tender process ☐ Bid ■ Other ☐

17.3.4 Wholesale

Open Market ☐ Tender process ☐ Bid ■ Other ☐

18 Can storage facilities (including Electric Vehicles) provide flexibility services in your country?

Yes ☐ No ☐

If yes, how?

19 Do the following flexibility services exist in your country?

19.1 Constraint Management

19.1.1 Voltage Control Yes ■ No ☐

19.1.2 Grid Capacity Management Yes ■ No ☐

19.1.3 Congestion Management Yes ■ No ☐

19.1.4 Controlled Islanding Yes ☐ No ☐

19.1.5 Optional Downwards Flexibility Management Yes ☐ No ☐

19.1.6 DSO Constraint Management (pre/post fault) Yes ☐ No ☐

19.1.7 Other (please specify:) Yes ☐ No ■

19.1.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.2 Adequacy

19.2.1 Capacity payment Yes ☐ No ■

19.2.2 Capacity Market Yes ☐ No ■

19.2.3 Strategic reserve Yes ☐ No ■

19.2.4 Hedging Yes ☐ No ■

19.2.5 Other (please specify) Yes ☐ No ■

19.2.6 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.3 Balancing

19.3.1 Dynamic Containment Yes ☐ No ■

19.3.2 Frequency Containment Reserve (FCR) Yes ■ No ☐

19.3.3 Automatic Frequency Restoration Reserve (aFRR) Yes ■ No ☐

19.3.4 Manual Frequency Restoration Reserve (mFRR) Yes ■ No ☐

19.3.5 Replacement Reserve (RR) Yes ■ No ☐

19.3.6 other (please specify:) Yes ☐ No ■

19.3.7 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.4 Wholesale

19.4.1 Day-ahead optimization — Yes ■ No ☐

19.4.2 Intraday optimization — Yes ■ No ☐

19.4.3 Self/passive balancing — Yes ■ No ☐

19.4.4 Generation optimization — Yes ☐ No ☐

19.4.5 Exceeding Maximum Export/Import Capacity — Yes ☐ No ☐

19.4.6 Offsetting — Yes ☐ No ☐

19.4.7 Other (please specify:) — Yes ☐ No ■

19.4.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.5 Local Optimization

19.5.1 ToU Optimization	Yes ■	No ☐
19.5.2 kWmax control	Yes ☐	No ☐
19.5.3 Self-balancing	Yes ☐	No ☐
19.5.4 Emergency power supply	Yes ☐	No ☐
19.5.5 Smart Contracts	Yes ☐	No ■
19.5.6 Collective Self-consumption	Yes ■	No ☐
19.5.7 Transmission Charge Management	Yes ☐	No ■
19.5.8 Distribution Charge Management	Yes ☐	No ■
19.5.9 Other (please specify)	Yes ☐	No ■

19.5.10 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

20 Does the regulation in your country allow net-metering?

Yes ■ No ☐

Explain. With the GEO 143/2021, prosumers/ECs/industrial are stimulated to make investments in RES. The Ordinance raises the size limit for being under the net metering regime from 100 to 400 kW (Solar power)

21 Are there any legal incentives and benefits in your national/ regional/ local regulations that act as stimuli to the uptake of LFMs?

Yes ■ No ☐

The Romanian Integrated National Energy and Climate Plan states that the law on renewable energy prosumers should introduce incentives and financial support for RES projects.

4. Blockchain and Data Management in LFMs

1. Blockchain Technology & Smart Contract in Energy Services

Blockchain technology has the potential to transform the energy sector. Of the many use cases for blockchain, energy and sustainability are often less recognized. The energy industry has been consistently catalyzed by innovations including rooftop solar, electric vehicles, and smart metering. The blockchain presents itself as the next emerging technology to spur growth in the energy sector through smart contracts and systems interoperability. A joint report issued in 2018 by the WEF, Stanford Woods Institute for the Environment, and PwC identified more than 65 existing and emerging blockchain use-cases for the environment. These use cases include new business models for energy markets, real-time data management, and moving carbon credits or renewable energy certificates onto the blockchain; the blockchain also offers unique solutions for renewable energy distribution. A range of blockchain products can be tailored to address various energy or sustainability applications, including the following: wholesale electricity distribution; peer-to-peer energy trading; electricity data management; commodity trading; utility providers; etc.

22 Does the regulation in your country allow the use of blockchain or other digital currencies in the energy sector?

Yes ■ No □

If yes, please, specify.

23 Do transactions concerning the flexibility services use Blockchain technology in your country?

Yes □ No ■

If yes, please, specify.

24 Is there any provision or regulation that presents legal risk and behaves as a barrier to the use of Blockchain technology in flexibility services for LFMs?

Yes ☐ No ☐

If Yes, please, specify.

25 Does your country recognize smart contracts as legal contracts?

Yes ■ No ■

Depending on the type of smart contract and its circumstances, SM can be considered as legal contract but there is no specific regulation about this subject yet.

2. Data Management & Protection

According to the General Data Protection Regulation 2016/679, data aggregation shouldn't violate the privacy and security of the customers. This regulation also removes obstacles to ensure a better mobility of personal data while protecting natural persons. LFMs process energy consumption data and shouldn't infer personal information especially when sharing data with third parties.

26 Does the regulation in your country guarantee the security of consumers' consumption data?

Yes ■ No ☐

Data gathered are treated according to the GDPR and the Law 190/2018.

27 In your country, how is the security of the grid? Are there any regulations about cybersecurity?

No specific regulation other than the one on data protection.

28 How is your country managing smart metering data?

Centralized data hub ■ Decentralized data infrastructure ☐

What are the risks and benefits of the system in place?

Risks: More data exposed in the case of a cyber attack Benefits: Cost is lower than several decentralized structures

5. Summary

29 Can you give recommendations and proposals for changes in the regulation in order to overcome the perceived legal risks and barriers in your country concerning

29.1 Creation of a LFM

/

29.2 Uptake of the flexibility services

/

29.3 Use of blockchain technology for LFMs

/

29.4 Data Management

/

29.5 Other

/

30 Can you give recommendations and proposals for changes in the regulation in order to better foster Local Flexibility Markets uptake, flexibility services and blockchain technologies use for LFMs in your country; thus, creating incentives for their development?

/

ANNEX 1

Aggregation	***Distribution System Operator (DSO)***	***Transmission System Operator (TSO)***	***Balance Responsible Party (BRP)***
Art. 2. (18) of IEMD 2019/944	*Art. 2. (29) of IEMD 2019/944*	*Art. 2. (35) of IEMD 2019/944*	*Art.2. (14) of IEMD 2019/943*
'aggregation' means a function performed by a natural or legal person who combines multiple customer loads or generated electricity for sale, purchase or auction in any electricity market	'DSO' means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	'TSO' means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity	'BRP' means a market participant or its chosen representative responsible for its imbalances in the electricity market

Self-consumer	*Active customer*	*Renewable Energy Community(REC)*	*Citizens Energy Community (CEC)*
Art. 21. of REDII 2018/2001	Art.15 IEMD of 2019/944	Art. 22. of REDII 2018/2001	Art.16 of IEMD 2019/944
‘Renewables self-consumer’ means a final customer operating within its premises located within confined boundaries or, where permitted by a MS, within other premises, who generates RE electricity for its own consumption, and who may store or sell self-generated RE electricity, provided that, for a non-household REs self-consumer, those activities do not constitute its primary commercial or professional activity.	‘Active customer’ means a final customer, or a group of jointly acting final customers, who consumes or stores electricity generated within its premises located within confined boundaries or, where permitted by a MS, within other premises, or who sells self-generated electricity or participates in flexibility or EE schemes, provided that those activities do not constitute its primary	‘REC’ means a legal entity: (a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the RE projects that are owned and developed by that legal entity; (b) the shareholders or members of which are natural persons, SMEs or local authorities, incl. municipalities; (c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the	‘CEC’ means a legal entity that: (a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, incl. municipalities, or small enterprises; (b) has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; (c) may engage in generation, incl. from RES, distribution, supply, consumption, aggregation, energy storage, EE services or charging services for electric vehicles or

	commercial or professional activity;	local areas where it operates, rather than financial profits.	provide other energy services to its members or shareholders.

ANNEX 2

Congestion	***Balancing***	***Demand Response***
Art. 2. (4) of IEMD 2019/943	*Art. 2. (10) of IEMD 2019/943*	*Art. 2. (20) of IEMD 2019/944*
'congestion' means a situation in which all requests from market participants to trade between network areas cannot be accommodated because they would significantly affect the physical flows on network elements which cannot accommodate those flows	'balancing' means all actions and processes, in all timelines, through which transmission system operators ensure, in an ongoing manner, maintenance of the system frequency within a predefined stability range and compliance with the amount of reserves needed with respect to the required quality	'demand response' means the change of electricity load by final customers from their normal or current consumption patterns in response to market signals, including in response to time-variable electricity prices or incentive payments, or in response to the acceptance of the final customer's bid to sell demand reduction or increase at a price in an organised market as defined in point (4) of Article 2 of Commission Implementing Regulation (EU) No 1348/2014 (17), whether alone or through aggregation

Ancillary service	***Non-frequency ancillary service***	***Energy storage***
Art. 2. (48) of IEMD 2019/944	*Art. 2. (49) of IEMD 2019/944*	*Art. 2. (59) of IEMD 2019/944*
‘Ancillary service’ means a service necessary for the operation of a transmission or distribution system, including balancing and non-frequency ancillary services, but not including congestion management	‘non-frequency ancillary service’ means a service used by a transmission system operator or distribution system operator for steady state voltage control, fast reactive current injections, inertia for local grid stability, short-circuit current, black start capability and island operation capability	‘Energy storage’ means, in the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical energy or use as another energy carrier

THANK YOU FOR ANSWERING THE QUESTIONS!

DEAR PARTICIPANT,

The following questionnaire is developed under the DE-RISK project in order for a thorough study to be performed to provide an overview of how the regulatory environment in ten European countries and at European Level evolved. The results of the survey will contribute to the Regulatory Impact Analysis (RIA) to deeply assess the current regulatory framework that is enabling or acting as a barrier for the large deployment of Local Flexibility Markets (LFM) and the potential flexibility services.

We invite you to complete this survey to collect your experience and views regarding:

- Awareness of European, national and local policies regarding the regulation on Local Flexibility Markets
- Perceived legal risks and benefits
- Impact of the regulation - barriers and incentives
- Legal background of innovative technologies - block chain transactions and flexibility services
- Perceived legal risks and benefits
- Recommendations about future legal development of the LFM in your country and at European Level.

ABOUT DE-RISK PROJECT

This survey is being conducted as part of the DE-RISK Project funded by the European Union (EU) under Horizon Europe program.. The DE-RISK project will support the market uptake of Renewable Energy Sources (RES) by de-risking the adoption of Local Flexibility Markets to increase the RES hosting capacity of the distribution network.

ABOUT YOUR PARTICIPATION

Your participation in this study is fully voluntary and all data collected will be treated confidentially. Participation is free and there are no mandatory requirements. The research outputs resulting from this work will only include collated data, without the possibility for anyone to identify your individual answers. Your contact details will be used on a need-to-know basis and will be strictly confidential until the end of the project's lifetime. By submitting this form:

- you confirm that you have read and understood this information.
- you agree to participate in this research study and your answers to be included in our analysis and resulting from its research publications.
- you agree that we will process the data in line with DE-RISK project policy of confidentiality that is in accordance with GDPR 2016/679.

Country:	Spain
Organization:	R2M, MIW, EC
Name of expert answering the survey:	Laura Pérez (R2M), Juan Manuel Espeche (R2M), Iván Aranda (R2M) Miguel Miñano (MIW), Ana García Garre (MIW) Jordi Solé (EC)
Contact details: (mail, phone, other)	Laura Pérez, R2M Solution, laura.perez@r2msolution.com
Date:	13/02/2022 (v0)

1. LFM Regulation - Definitions of Market Actors and Market Characteristics

The European Commission promotes flexibility markets as they can contribute to the European Union in becoming a climate-neutral continent by 2050. The new market development is taking place in Europe with the transposition in the different Member States of the Clean Energy Package (specifically the Electricity directive EU 944/2019) with new roles for DSOs entering into new activity areas. DSO-TSO cooperation evolves in a beneficial way for energy markets and for consumers as well. Governance of how DSOs and TSOs interact and engage in network planning, as well as arrangements to facilitate effective coordination for system operation, especially for flexibility, have been the key regulatory concerns in this area for the last few years.

Local flexibility markets allow the use of flexibility at local level by distribution and transmission system operators. This means using flexibility from decentralized energy resources (DERs) to solve congestion management problems, minimize power outages and avoid grid expansions. Flexibility markets help energy networks to monitor energy flows and create market signals to motivate changes in energy supply and demand, integrating smart meters and appliances, renewable energy resources and energy efficient resources accordingly. The Clean Energy Package defines and offers an enabling legislative framework for Local Energy Markets participants. The analysis of the LFM regulation will be conducted including some of the following topics that characterize the market:

LFM topic	**Sub-topic**
Market actors	• Aggregator • Balance Responsible Party (BRP) • Citizen energy communities • Distribution System Operator (DSO) • Market operator
Market and product characteristics	• Market entry and exit and market platforms • Product characteristics (e.g., prequalification, standardization of FS)
Infrastructural issues	• Smart metering systems • Energy storage • Network expansion
Contract, bidding, and settlement	• Contract. Bidding, billing, and settlement
Data security issues	• Access to data, data security, privacy protection

The Clean Energy for all Europeans Package defines new ground for consumers by recognizing under EU law, the rights of citizens and communities to engage directly in the energy sector. It also sets out legal frameworks for LFMs. Participants of the whole DR value chain are defined in the laws of the Clean Energy Package. The revised Renewable Energy Directive (EU) 2018/2001 sets the framework for ‘renewable energy communities’ and the revised Internal Electricity Market Directives (EU) 2019/943 & 2019/944 introduce new roles and responsibilities for ‘citizen energy communities’, ‘aggregation’, ‘distribution system operator’, ‘transmission system operator’ and ‘balance responsible party’ in the energy system covering all types of electricity. (Look at Annex 1)

1. *Are the Directives on common rules for the internal market for electricity 2019/943 & 2019/944 already transposed into your national legislation?*

Yes ☐ **No** ☐ **Partially** **X**

Is the revised Renewable Energy Directive (EU) 2018/2001 already transposed into your national legislation? **Yes**

☐ **No** ☐ **Partially** **X**

1.1. If your answer is ***Yes,*** *indicate the national / regional / local legislation that defines it and explain it:*

IEMD 2019/943:
IEMD 2019/944:

REDII 2018/2001:

*1.2. If your answer is **Partially,** and there is some regulation concerning the definitions below, please, specify:*

For example: Explain if regulation is available, or concepts are under development, or discussions are ongoing, etc.

Aggregation	Distribution System Operator (DSO)	Transmission System Operator (TSO)	Balance Responsible Party (BRP)

Self-consumers	Active consumers	Renewable energy communities (REC)	Citizen energy communities (CEC)
Law 24/2013, of the Electricity Sector, regulates the economic framework for self-production and self-consumption of electricity, and defines “self-consumption” in Article 9	Some aspects of the definition of “active consumer” (as per Art.15 of IEMD 2019/944) can be found in the definition of self-consumption activity, regulated by **Royal Decree 244/2019** and **Royal Decree-law 15/2018**.	The transposition of certain aspects on Renewable Energy Communities has been carried out through Royal Decree-Law 23/2020 of 23 June approving energy measures and in other areas for economic reactivation, by amending article	At this moment national regulations do not mention CECs.

as: consumption of electricity from generation facilities connected inside a consumer network or through a direct line of electricity associated with a consumer and distinguishes several modes of self-consumption. **Royal Decree 244/2019** (regulating the administrative, technical and economic conditions of the self-consumption of electric energy) completes the regulatory framework promoted by **Royal Decree-law 15/2018** (on urgent measures for energy transition and consumer protection). These regulations highlight three main axes: 1) Reduces and simplifies administrative procedures, especially for small self-consumers (installations up to 15kW or up to 100kW, in case of		6 (j) of Law 24/2013, of 26 December, on the Electricity Sector. The **Royal Decree 23/2020**, published on June 23rd 2020. Modifies the article 6 (j)of the Spanish Energy Law to include the Renewable Energy Communities as a new actor in the energy sector. The definition provided by the Royal Decree 23/2020 for RECsis fully based on the definition provided by REDII 2018/2001. It defines Renewable Energy Communities as:"*legal entities based on open and voluntary participation, autonomous and effectively controlled by partners or members who are located in the proximity of renewable energy projects owned and developed by such legal entities, whose partners or members are natural persons, SMEs or local authorities, including municipalities and whose primary purpose is to*	

self-consumption without surpluses). 2) Introduces the figure of collective self-consumption, in such a way that several consumers can associate with the same generation plant, distributing the energy with fixed coefficients. 3) updates the framework for the connection and energy supply to the electricity grid, and the economic compensations attached to different schemes. **Types of self-consumers**: • Individual: One and only prosumer. • Collective: more than one consumer associated with one production system. *Type of installation for collective consumption*: • Users connected to the production facility through an internal network (i.e. neighbours in the same building).		*provide environmental, economic or social benefits to their partners or members or to the local areas where they operate, rather than financial gains*". **Royal Decree 960/2020** from November 3rd which regulates the economic regime of renewable energies for electrical energy production facilities. This decree defines the financial conditions for the renewable production systems to access competing process such as energy bids, and includes RES as valid actors.	

• Users connected to the production facility through the distribution network located <500m from the production facility. **Modes of self-consumption**: • Surplus of energy not fed to the grid. The installation is equipped with systems to avoid feeding unused energy to the grid. • Surplus of energy fed to the grid. This energy can be compensated by the retailer at a lower price or sold directly to the market.			

1.3. Are there other LFM participants in your country? How are they defined?

NRA ☐ Suppliers **X** Traders ☐ Other ☐

2. *How do DSOs and TSOs cooperate to organize the flexibility market?*

Please, specify if there is any guidance or regulation defining it.
In Spain there is only one TSO and several DSOs, which exchange data on the needs of the system. law 24/2013 of the electricity sector regulates this.

3. *How is the Local Flexibility Market organized in your country?*

Platform ☐ Aggregation ☐ Other model ☐

Please, specify. Give the name, link, info about the applicable model in your country.

In Spain there is not still a local flexibility market

4. *Are there any legislative barriers which block the reinforcement of interactions between LFM's participants and slow down the development of LFMs? Please, indicate below:*

Royal Decree 17/2022 establishes a minimum manageable power of 1MW at each supply point in order to be eligible for demand response auctions in Spain. Previously it was 5 MW. Although the trend is downward, small capacities are still not allowed, so in Spain the flexibility market is still limited to large consumers such as industries.

5 Are there national regulations concerning the market products?

For example: Explain if regulations or guidelines are available, or discussions are ongoing, etc.

5.1. Market entry and exit: *Yes X* *No ☐*

Explain: In Spain, system and electricity market stakeholders are intensifying the debate on the figures of the aggregator and flexibility products, in response to European guidelines, but there is still much reticence due to the technical and regulatory complexity. For the time being, the law is conservative and there are no rules on these products. the figures of storage,

aggregation and independent aggregators, renewable energy communities, hybridization or regulatory testbeds, all of which were regulatory test beds, which were incorporated into the regulation by regulation by means of Royal Decree-Law 23/2020,

5.2. Market Product characteristics (e.g, Are there guides and regulations on product prequalification, standardization and baseline):

Yes X No ☐

Explain: Yes, there is a methodology established by Red Electrica (TSO) for the pre-qualification of consumers that can participate in capacity markets, as well as for the calculation of the baseline, which is carried out taking into account the expected energy purchase or sale of that user for that period.

6 Infrastructural issues concerning the LFMs.

6.1 Regulation on Smart Metering Systems. Are they adapted to the LFMs? Are they installed?

Yes X No ☐

Explain:

99,22% of 2.0 tariffs (Those < 15kW) have smart metering with telegestion of hourly based data. Just very small local DSO don´t have smart meters. For 3.0 tariffs

(>15 kW) there is not so broad deployment of smart metering.

6.2 Regulation on Energy Storage: How is energy storage defined in your regulation? Is there any guideline, or discussions ongoing, etc.?

Yes X No ☐

Explain: Royal Decree-Law 23/2020, of June 23, which approves energy and other measures for economic reactivation allows the use of batteries as generation assets and therefore its connection to the grid.

7 Contract, bidding, and settlement. Explain if any specific regulations or guidelines for LFM are established.

Yes ☐ No x

Explain:

According to IEMD 2019/944 the network development plan published by the DSOs should provide transparency on the medium and long-term flexibility services and shall set out the planned investments for the next five-to-ten years, with particular emphasis on the main distribution infrastructure which is required in order to connect new generation capacity and new loads, including recharging points for electric vehicles. The network development plan shall also include the use of demand response, energy efficiency, energy storage facilities or other resources that the distribution system operator is to use as an alternative to system expansion.

8 Is there any legislation about development plans for the electricity network in your country?

Yes X **No ☐**

8.1 If your answer is Yes, indicate the legal regulation that defines it, its statement and how flexibility is included into it.

Regarding connection to the grid- Royal Decree 1183/2020, of December 29, on access and connection to the electricity transmission and distribution networks, Circular 1/2021, of January 20, of the National Commission for Markets and Competition (CNMC), establishes the methodology and conditions for access and connection to the transmission and distribution networks of electricity production facilities, and Resolution of the CNMC establishing the Detailed Specifications (DS) for the evaluation of the generation access capacity to the transmission and distribution networks, and the Resolution of the CNMC establishing the Detailed Specifications (ED) for the determination of the generation access capacity to the transmission grid and distribution networks, constitute the reference regulations for the evaluation of the access capacity in the nodes of the Transmission Network.

Regarding collective self-consumption - Royal Decree 244/2019, of April 5, 2009, which regulates the administrative, technical and economic conditions for self-consumption of electricity. Although not yet legally published, the government has announced the increase of the maximum distance between generation and consumption for collective self-consumption to 2 kms.

8.2 *Are there any stimuli or incentives to create flexibility or/and to include flexibility in network development plans? Please, indicate below:*

The Sànish Integrated Plan for Energy and Climate (PNIEC) includes as a specific line of action Measure 1.2. Demand management, storage and flexibility", which includes among its objectives the following the necessary development of the regulatory and normative framework and regulatory framework for demand management.
The PNIEC is currently in the process of being due to the requirement of the European regulations, which set a deadline of 30 European regulations, which set a deadline of June 30, 2023, as well as the need for and the need to incorporate the new revised climate targets into the new upwardly revised climate targets.

8.3 *Regulation on Network Expansion in compliance with the IEMD 2019/944?*

2. *Yes ☐* *No ☐*

3.

Explain:

4.

9 Can you note if there are any provisions or regional/local regulations that present legal risks and behave as barriers to the development of Local Energy markets:

In Spain, energy competences are state-owned, and only some competences in regions such as the Basque Country or Navarra can be of local character. For example, the simplified compensation of surpluses of self-consumption facilities has been different in Navarra than in the rest of Spain. However, these are anecdotal cases since the bulk of the legislation is state legislation.

10 Can you describe any act provisions or regional / local regulations that bring benefits and behave as enablers to LFMs:

11 Are there any administrative and bureaucratic procedures that hinder LFMs' development and play a restrictive role in their broader application? If yes, please, explain.

Although the legislation is national, the processing of self-consumption files (including collective ones) is regional. The delay and the differences in processes and efficiency between the different regions, as well as the delays in the procedures before the DSO, are a huge problem for the promotion of collective self-consumption. The delays from the execution of the installation to its authorization are about **six months.**

12 Would you suggest what kind of legal provisions in your country will contribute most to the activation of the interested parties (citizens, commercial and industrial players) to participate in LFMs?

Incentives for demand response at lower powers. For example, grants to change appliances with manageable consumption (electric water heater, etc.) for others with cloud connectivity that allows automatic control, as it exists in the USA market

13 Can you define any recommendations for improvement of the legislation concerning LFMs in your country or on EU level?

Allow the use of really dynamic coefficients of distribution of energy production among users of collective self-consumption

2. Policy and Regulatory Framework for LFMs Uptake

14 Does your National (Regional / Local) Energy Action Plans include targets for development and spread of LFMs?

Please, explain:

15 What kind of bureaucratic and administrative barriers LFMs can experience

15.1 When flexibility producers connect to the grid?

15.1.1 Complicated application procedure: *Yes* ***X*** *No ☐*

Explain:

15.1.2 Uncertainty of approval: *Yes* ***X*** *No ☐*

Explain:

15.1.3 High costs: *Yes ☐* *No* ***X***

Explain:

15.1.4 Time consuming procedure: *Yes* ***X*** *No ☐*

Explain:

15.1.5 Other: *Yes ☐* *No ☐*

Explain:

15.2 When operating the grid (allowance /licensing)?

15.2.1 for System Operators: *Yes* ***X*** *No ☐*

Explain: The DSO does not receive a great incentive

15.2.2 for prosumers/aggregators: *Yes ☐* *No ☐*

Explain:

15.2.3 for BRP *Yes ☐* *No* ***X***

Explain:

15.2.4 other: *Yes* ☐ *No* ☐

Explain:

3. Flexibility Services in a Local Flexibility Market

Flexibility services are "the services provided by individual or aggregated (residential, commercial or industrial) prosumers to flexibility requesting parties (DSO, BRP, and TSO) or prosumers themselves, in reaction to external signals (price signal or activations), by modifying the consumption and/or production pattern, in order to facilitate the reliable and cost-effective management of variability and uncertainty in the electricity system"[1]. Flexibility services specifically focus on deliberate, time limited changes to the 'normal' energy profile[2].

LFM provides an opportunity for consumers to play a significant role in the operation of the electric grid by reducing or shifting their electricity usage in response to time-based rates or other forms of financial incentives. DR programs are currently being used by some electric system planners and operators, using mainly the flexibility provided by large industrial facilities connected to the high-voltage grid, as resource options for balancing supply and demand. Therefore, LFMs development will foster flexibility services at DSO level using residential and tertiary buildings flexibility (Look at Annex 2).

This questionnaire concerns the legal side of the applicability of the Flexibility Services in LFMs.

[1] Nixiang, A. Flexibility services in Citizen Energy Communities (Master's thesis), University of Technology Eindhoven, the Netherlands. (2020)

[2] USEF White Paper: Energy and Flexibility Services, 2019

16 In your country, is there some regulation concerning the definitions below? If Yes, please, specify.

Congestion	Balancing	Demand Response
Ancillary service	Non-frequency ancillary service	Energy storage

17 What kinds of flexibility services are available in your country?

Constraint Management **X** Adequacy □ Balancing **X** Wholesale **X**

17.1 Which participants are flexibility providers?

17.1.1 Constraint Management

Prosumers □ Aggregators □ Large Generation **X** Other □

17.1.2 Adequacy

Prosumers ☐ Aggregators ☐ Large Generation ☐ Other ☐

17.1.3 Balancing

Prosumers ☐ Aggregators ☐ Large Generation **X** Other **X**

17.1.4 Wholesale

Prosumers ☐ Aggregators ☐ Large Generation **X** Other **X**

17.2 Which participants are flexibility buyers?

17.2.1 Constraint Management

TSO **X** DSO **X** Aggregators ☐ BRP ☐ Other ☐

17.2.2 Adequacy

TSO ☐ DSO ☐ Aggregators ☐ BRP ☐ Other ☐

17.2.3 Balancing

TSO **X** DSO **X** Aggregators ☐ BRP X Other ☐

17.2.4 Wholesale

TSO □ DSO □ Aggregators **X** BRP **X** Other □

17.3 What are the procedures to sell flexibility?

17.3.1 Constraint Management

Open market □ Tender process □ Bid □ Other □

17.3.2 Adequacy

Open market □ Tender process □ Bid □ Other □

17.3.3 Balancing

Open Market □ Tender process **X** Bid □ Other □

17.3.4 Wholesale

Open Market **X** Tender process □ Bid □ Other □

18 Can storage facilities (including Electric Vehicles) provide flexibility services in your country?

Yes □ No **X**

If yes, how?

19 Do the following flexibility services exist in your country?

19.1 Constraint Management

19.1.1 Voltage Control Yes **X** No ☐

19.1.2 Grid Capacity Management Yes x No ☐

19.1.3 Congestion Management Yes **X** No ☐

19.1.4 Controlled Islanding Yes ☐ No ☐

19.1.5 Optional Downwards Flexibility Management Yes ☐ No ☐

19.1.6 DSO Constraint Management (pre/post fault) Yes **X** No ☐

19.1.7 Other (please specify:) Yes ☐ No ☐

19.1.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes x No ☐

Explain:

19.2 Adequacy

19.2.1 Capacity payment Yes ☐ No ☐

19.2.2 Capacity Market Yes ☐ No **X**

19.2.3 Strategic reserve Yes **X** No ☐

19.2.4 Hedging Yes **X** No ☐

19.2.5 Other (please specify) Yes ☐ No ☐

19.2.6 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.3 Balancing

19.3.1 Dynamic Containment Yes ☐ No ☐

19.3.2 Frequency Containment Reserve (FCR) Yes **X** No ☐

19.3.3 Automatic Frequency Restoration Reserve (aFRR) Yes **X** No ☐

19.3.4 Manual Frequency Restoration Reserve (mFRR) Yes **X** No ☐

19.3.5 Replacement Reserve (RR) Yes **X** No ☐

19.3.6 other (please specify:) Yes ☐ No ☐

19.3.7 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.4 Wholesale

19.4.1 Day-ahead optimization Yes **X** No ☐

19.4.2 Intraday optimization Yes **X** No ☐

19.4.3 Self/passive balancing Yes **X** No ☐

19.4.4 Generation optimization Yes **X** No ☐

19.4.5 Exceeding Maximum Export/Import Capacity Yes **X** No ☐

19.4.6 Offsetting Yes ☐ No ☐

19.4.7 Other (please specify:) Yes ☐ No ☐

19.4.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

19.5 Local Optimization

19.5.1 ToU Optimization Yes **X** No ☐

19.5.2 kWmax control Yes **X** No ☐

19.5.3 Self-balancing Yes ☐ No **X**

19.5.4 Emergency power supply Yes **X** No ☐

19.5.5 Smart Contracts Yes ☐ No **X**

19.5.6 Collective Self-consumption Yes **X** No ☐

19.5.7 Transmission Charge Management Yes **X** No ☐

19.5.8 Distribution Charge Management Yes **X** No ☐

19.5.9 Other (please specify) Yes ☐ No ☐

19.5.10 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ☐

Explain:

20 Does the regulation in your country allow net-metering?

Yes ☐ No ☐

Explain.

21 Are there any legal incentives and benefits in your national/ regional/ local regulations that act as stimuli to the uptake of LFMs?

Yes **X** No ☐

The laws that continuously increase the distance between generation and consumption in collective self-consumption (among other norms favoring collective self-consumption), and the impulse to local energy communities, is a great support to the creation of LFM..

4. Blockchain and Data Management in LFMs

1. Blockchain Technology & Smart Contract in Energy Services

Blockchain technology has the potential to transform the energy sector. Of the many use cases for blockchain, energy and sustainability are often less recognized. The energy industry has been consistently catalyzed by innovations including rooftop solar, electric vehicles, and smart metering. The blockchain presents itself as the next emerging technology to spur growth in the energy sector through smart contracts and systems interoperability. A joint report issued in 2018 by the WEF, Stanford Woods Institute for the Environment, and PwC identified more than 65 existing and emerging blockchain use-cases for the environment. These use cases include new business models for energy markets, real-time data management, and moving carbon credits or renewable energy certificates onto the blockchain; the blockchain also offers unique solutions for renewable energy distribution. A range of blockchain products can be tailored to address various energy or sustainability applications, including the following: wholesale electricity distribution; peer-to-peer energy trading; electricity data management; commodity trading; utility providers; etc.

22 Does the regulation in your country allow the use of blockchain or other digital currencies in the energy sector?

Yes □ No **X**

If yes, please, specify.

23 Do transactions concerning the flexibility services use Blockchain technology in your country?

Yes □ No **X**

If yes, please, specify.

24 Is there any provision or regulation that presents legal risk and behaves as a barrier to the use of Blockchain technology in flexibility services for LFMs?

Yes **X** No □

If Yes, please, specify.

The Spanish electricity market is centralized. The existence of bilateral contracts that are merely financial instruments (PPA) does not exempt the system from having to be informed and regulate any activity between two parties that involves the use of the transmission or distribution networks. The operators of these networks are the ones who legally control the data (consumption, production, etc.) that have legal validity, without decentralized systems such as blockchain being able to replace them.

25 Does your country recognize smart contracts as legal contracts?

Yes **X** No □

If Yes, please, specify.

In Spain, smart contracts are legal and are considered an evolution of digital contracts. In sectors such as transport of goods, or insurance, they are already used, although their use is very incipient.

2. Data Management & Protection

According to the General Data Protection Regulation 2016/679, data aggregation shouldn't violate the privacy and security of the customers. This regulation also removes obstacles to ensure a better mobility of personal data while protecting natural persons. LFMs process energy consumption data and shouldn't infer personal information especially when sharing data with third parties.

26 Does the regulation in your country guarantee the security of consumers' consumption data?

Yes **X** No ☐

If Yes, please, specify.

The General Data Protection Regulation (Regulation (EU) 2016/679) ('GDPR') has been implemented with the Organic Law 3/2018 of 5 December, on the Protection of Personal Data and Guarantee of Digital Rights (only available in Spanish here).

27 In your country, how is the security of the grid? Are there any regulations about cybersecurity?

Explain.

Red Electrica Española (TSO) has a comprehensive risk system (ISO 31000) but to our knowledge there are no specific legal provisions on cybersecurity in the energy sector.

28 How is your country managing smart metering data?

Centralized data hub **X** Decentralized data infrastructure □

What are the risks and benefits of the system in place?

Risks:

The falsity of measurement data is considered a very serious infraction by the law of the electricity sector in Spain. However, the current system is not exempt from the risk of cyber-attacks or data fraud by the data custodian (DSO) or a third party.

Benefits:

The smart meters feed the database of the DSO. The DSO provides the retailer, the consumer and any other parties involved (Market operator) the data. The DSO is the responsible for hosting the data. The benefits are:

1) universal access to the participants' information, ensuring its security and privacy,

2) agile provision of aggregated information,

3) a secure and agile system of authorization of access to third parties, preventing consumer data from being processed by third parties to whom the consumer has not given his or her consent (In Spain https://datadis.es/home)

4) avoid duplication of data servers, simplify the data extraction process and avoid increased communication costs, thus minimizing the costs of the adopted solution.

5. Summary

29 Can you give recommendations and proposals for changes in the regulation in order to overcome the perceived legal risks and barriers in your country concerning

29.1 Creation of a LFM

The DSO revenue model must be substantially modified so that there can be real support for local flexibility markets. The DSO payment system takes into account that it is an oligopoly, and therefore is determined by law and not by the free market. This payment system establishes provisions that promote an efficient and well-managed network on the part of DSOs. However, this does not currently materialize in models that actually generate revenue for the DSO by favoring flexibility or innovation; on the contrary, investment in assets and infrastructure is currently the main item of revenue for DSOs, followed by their operation, which is the second. The payment system rewards more intensely the first years of investments, so when investments are in their last years of amortisation, it is more convenient for DSOs to generate new investments.

29.2 Uptake of the flexibility services

The use of dynamic production sharing coefficients in collective self-consumption is necessary so that there can be a large number of products related to MFLs.

29.3 Use of blockchain technology for LFMs

It is very difficult to implement blockchain in such a regulated market in Spain.

29.4 Data Management

29.5 Other

30 Can you give recommendations and proposals for changes in the regulation in order to better foster Local Flexibility Markets uptake, flexibility services and blockchain technologies use for LFMs in your country; thus, creating incentives for their development?

Improve the revenues model of the DSO fostering innovation and local flexibility.

ANNEX 1

Aggregation	***Distribution System Operator (DSO)***	***Transmission System Operator (TSO)***	***Balance Responsible Party (BRP)***
Art. 2. (18) of IEMD 2019/944	*Art. 2. (29) of IEMD 2019/944*	*Art. 2. (35) of IEMD 2019/944*	*Art.2. (14) of IEMD 2019/943*
‘aggregation’ means a function performed by a natural or legal person who combines multiple customer loads or generated electricity for sale, purchase or auction in any electricity market	‘DSO’ means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	‘TSO’ means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity	‘BRP’ means a market participant or its chosen representative responsible for its imbalances in the electricity market

Self-consumer	***Active customer***	***Renewable Energy Community(REC)***	***Citizens Energy Community (CEC)***
Art. 21. of REDII 2018/2001	Art.15 IEMD of 2019/944	Art. 22. of REDII 2018/2001	Art.16 of IEMD 2019/944
'Renewables self-consumer' means a final customer operating within its premises located within confined boundaries or, where permitted by a MS, within other premises, who generates RE electricity for its own consumption, and who may store or sell self-generated RE electricity, provided that, for a non-household REs self-consumer, those activities do not constitute its primary commercial or professional activity.	'Active customer' means a final customer, or a group of jointly acting final customers, who consumes or stores electricity generated within its premises located within confined boundaries or, where permitted by a MS, within other premises, or who sells self-generated electricity or participates in flexibility or EE schemes, provided that those activities do not constitute its primary commercial or professional activity;	'REC' means a legal entity: (a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the RE projects that are owned and developed by that legal entity; (b) the shareholders or members of which are natural persons, SMEs or local authorities, incl. municipalities; (c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits.	'CEC' means a legal entity that: (a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, incl. municipalities, or small enterprises; (b) has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; (c) may engage in generation, incl. from RES, distribution, supply, consumption, aggregation, energy storage, EE services or charging services for electric vehicles or provide other energy services to its members or shareholders.

ANNEX 2

Congestion	***Balancing***	***Demand Response***
Art. 2. (4) of IEMD 2019/943	*Art. 2. (10) of IEMD 2019/943*	*Art. 2. (20) of IEMD 2019/944*
‘congestion’ means a situation in which all requests from market participants to trade between network areas cannot be accommodated because they would significantly affect the physical flows on network elements which cannot accommodate those flows	‘balancing’ means all actions and processes, in all timelines, through which transmission system operators ensure, in an ongoing manner, maintenance of the system frequency within a predefined stability range and compliance with the amount of reserves needed with respect to the required quality	‘demand response’ means the change of electricity load by final customers from their normal or current consumption patterns in response to market signals, including in response to time-variable electricity prices or incentive payments, or in response to the acceptance of the final customer's bid to sell demand reduction or increase at a price in an organised market as defined in point (4) of Article 2 of Commission Implementing Regulation (EU) No 1348/2014 (17), whether alone or through aggregation

Ancillary service	***Non-frequency ancillary service***	***Energy storage***
Art. 2. (48) of IEMD 2019/944	*Art. 2. (49) of IEMD 2019/944*	*Art. 2. (59) of IEMD 2019/944*
‘Ancillary service’ means a service necessary for the operation of a transmission or distribution system, including balancing and non-frequency ancillary services, but not including congestion management	‘non-frequency ancillary service’ means a service used by a transmission system operator or distribution system operator for steady state voltage control, fast reactive current injections, inertia for local grid stability, short-circuit current, black start capability and island operation capability	‘Energy storage’ means, in the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical energy or use as another energy carrier

THANK YOU FOR ANSWERING THE QUESTIONS!

10. Türkiye

DEAR PARTICIPANT,

The following questionnaire is developed under the DE-RISK project in order for a thorough study to be performed to provide an overview of how the regulatory environment in ten European countries and at European Level evolved. The results of the survey will contribute to the Regulatory Impact Analysis (RIA) to deeply assess the current regulatory framework that is enabling or acting as a barrier for the large deployment of Local Flexibility Markets (LFM) and the potential flexibility services.

We invite you to complete this survey to collect your experience and views regarding:

- Awareness of European, national and local policies regarding the regulation on Local Flexibility Markets
- Perceived legal risks and benefits
- Impact of the regulation - barriers and incentives
- Legal background of innovative technologies - block chain transactions and flexibility services
- Perceived legal risks and benefits
- Recommendations about future legal development of the LFM in your country and at European Level.

ABOUT DE-RISK PROJECT

This survey is being conducted as part of the DE-RISK Project funded by the European Union (EU) under Horizon Europe program.. The DE-RISK project will support the market uptake of Renewable Energy Sources (RES) by de-risking the adoption of Local Flexibility Markets to increase the RES hosting capacity of the distribution network.

ABOUT YOUR PARTICIPATION

Your participation in this study is fully voluntary and all data collected will be treated confidentially. Participation is free and there are no mandatory requirements. The research outputs resulting from this work will only include collated data, without the possibility for anyone to identify your individual answers. Your contact details will be used on a need-to-know basis and will be strictly confidential until the end of the project's lifetime. By submitting this form:

- you confirm that you have read and understood this information.
- you agree to participate in this research study and your answers to be included in our analysis and resulting from its research publications.
- you agree that we will process the data in line with DE-RISK project policy of confidentiality that is in accordance with GDPR 2016/679.

Country:	TURKEY
Organization:	WEglobal
Name of expert answering the survey:	Eser Özdil
Contact details: (mail, phone, other)	melike.gulluoglu@weglobal.org eser.ozdil@impactprojecthouse.com (Technical Expert-energy)
Date:	21.03.2023

1. LFM Regulation - Definitions of Market Actors and Market Characteristics

The European Commission promotes flexibility markets as they can contribute to the European Union in becoming a climate-neutral continent by 2050. The new market development is taking place in Europe with the transposition in the different Member States of the Clean Energy Package (specifically the Electricity directive EU 944/2019) with new roles for DSOs entering into new activity areas. DSO-TSO cooperation evolves in a beneficial way for energy markets and for consumers as well. Governance of how DSOs and TSOs interact and engage in network planning, as well as arrangements to facilitate effective coordination for system operation, especially for flexibility, have been the key regulatory concerns in this area for the last few years.

Local flexibility markets allow the use of flexibility at local level by distribution and transmission system operators. This means using flexibility from decentralized energy resources (DERs) to solve congestion management problems, minimize power outages and avoid grid expansions. Flexibility markets help energy networks to monitor energy flows and create market signals to motivate changes in energy supply and demand, integrating smart meters and appliances, renewable energy resources and energy efficient resources accordingly. The Clean Energy Package defines and offers an enabling legislative framework for Local Energy Markets participants. The analysis of the LFM regulation will be conducted including some of the following topics that characterize the market:

LFM topic	**Sub-topic**
Market actors	• Aggregator • Balance Responsible Party (BRP) • Citizen energy communities • Distribution System Operator (DSO) • Market operator
Market and product characteristics	• Market entry and exit and market platforms • Product characteristics (e.g., prequalification, standardization of FS)
Infrastructural issues	• Smart metering systems • Energy storage • Network expansion
Contract, bidding, and settlement	• Contract. Bidding, billing, and settlement
Data security issues	• Access to data, data security, privacy protection

The Clean Energy for all Europeans Package defines new ground for consumers by recognizing under EU law, the rights of citizens and communities to engage directly in the energy sector. It also sets out legal frameworks for LFMs. Participants of the whole DR value chain are defined in the laws of the Clean Energy Package. The revised Renewable Energy Directive (EU) 2018/2001 sets the framework for ‘renewable energy communities’ and the revised Internal Electricity Market Directives (EU) 2019/943 & 2019/944 introduce new roles and responsibilities for ‘citizen energy communities’, ‘aggregation’, ‘distribution system operator’, ‘transmission system operator’ and ‘balance responsible party’ in the energy system covering all types of electricity. (Look at Annex 1)

1. *Are the Directives on common rules for the internal market for electricity 2019/943 & 2019/944 already transposed into your national legislation?*

Yes ☒ **No** ☐ **Partially** ☒

Is the revised Renewable Energy Directive (EU) 2018/2001 already transposed into your national legislation? **Yes** ☒ **No** ☐ **Partially** ☐

*1.1. If your answer is **Yes,** indicate the national / regional / local legislation that defines it and explain it:*

IEMD 2019/943: Electricity Market Law Nr.6446, dated 14.03.2013 and amended several times.
IEMD 2019/944: Electricity Market Balancing and Settlement Regulation, dated 14.04.2019, published in Resmi Gazete Nr. 27200 and amended several times.

Electricity Market Import and Export Regulation, dated 17.05.2014, published in Resmi Gazete Nr. 29003 and amended several times.
REDII 2018/2001: Law for Using Renewable Energy Sources for the Purpose of Electricity Production, Nr. 5346, dated 10.05.2005 and amended several times. Regulation for the Certification and Supporting of the Renewable Energy Sources, dated 01.10.2013, published in Resmi Gazete Nr. 28782 and amended several times.

*1.2. If your answer is **Partially,** and there is some regulation concerning the definitions below, please, specify:*

For example: Explain if regulation is available, or concepts are under development, or discussions are ongoing, etc.

Aggregation	Distribution System Operator (DSO)	Transmission System Operator (TSO)	Balance Responsible Party (BRP)
Definition added to the Electricity Market Law Nr.6446, regulation has not yet been published.	Privatized DSOs, well established and subject to several regulations.	Electricity Market Capacity Mechanism Regulation, dated 18.12.2021. Electricity Market Ancillary Services Regulation, dated 26.11.2017.	BRP is defined in Electricity Market Balancing and Settlement Regulation, dated 14.04.2019.

Self-consumers	Active consumers	Renewable energy communities (REC)	Citizen energy communities (CEC)

Unlicensed Electricity Production Regulation in the Electricity Market, dated 12.05.2019.	Unlicensed Electricity Production Regulation in the Electricity Market, dated 12.05.2019.	Not defined.	Not defined.

1.3. Are there other LFM participants in your country? How are they defined?

NRA ☐ Suppliers ☐ Traders ■ Other ☐

2. *How do DSOs and TSOs cooperate to organize the flexibility market?*

Please, specify if there is any guidance or regulation defining it. DSOs and TSOs consider the technical aspects of the grid. Organization of the market is out of their interest.

3. *How is the Local Flexibility Market organized in your country?*

Platform ■ Aggregation ☐ Other model ☐

Please, specify. Give the name, link, info about the applicable model in your country. EPİAŞ (Energy Market Operation Inc.), a member of APEX and EUROPEX, is responsible for operation of intraday, day ahead, balancing and future markets for power and gas. EPİAŞ shareholders are 30% TEİAŞ (TSO), 30% Borsa İstanbul (Istanbul Stock Exchange) and 40% Market Participants.

The transparency platform is publicly available: https://seffaflik.epias.com.tr/transparency/ Traders login to Continuous Trading Platform: https://stp.epias.com.tr

4. *Are there any legislative barriers which block the reinforcement of interactions between LFM's participants and slow down the development of LFMs? Please, indicate below:*

No. License requirement for the participants should not be considered as an entry barrier, since the license obtaining procedure is well defined and working. Peer to peer trading may be tricky but in the overall, regulations are not blocking interactions between LFM's participants.

5 Are there national regulations concerning the market products?

For example: Explain if regulations or guidelines are available, or discussions are ongoing, etc.

5.1. Market entry and exit: *Yes* ☒ *No* ☐

Explain: As a pre-requisite, a license should be obtained as per Electricity Market License Regulation, dated 02.11.2013 and published in Resmi Gazete Nr. 28809.

Financial criteria should be satisfied to be enrolled to EPİAŞ trading platform. A guarantee letter or cash collateral may be required.

5.2. Market Product characteristics (e.g, Are there guides and regulations on product prequalification, standardization and baseline):

Yes ☑ *No* ☐

Explain: Yes. At EPİAŞ page, they are listed https://www.epias.com.tr/en/board-resolution/ Namely, • Power Futures Market Operation Procedures And Principles • Yek-G System And Organized Yek-G Market Operating Procedures And Principles • Collateral Procedures And Principles

• Procedures And Principles Regarding The Structure Of The Day-Ahead Market Orders And Evaluation Of Orders • Procedures And Principles For The Determination Of The Minimum And Maximum Price Limits In The Day-Ahead Market And The Balancing Power Market • Procedures And Principles For Ensuring Transparency In Organized Wholesale Electricity Markets • List Of Data To Be Published On The Transparency Platform • Procedures And Principles Regarding The Determination And Implementation Of Resource-Based Support Fee • Board Decision Regarding The Determination Of Maximum Settlement Prices • Board Decision Regarding The Revision Of Maximum Settlement Price

• Procedures And Principles Regarding Payments Not Made Within The Scope Of Unlicensed Generation • Communique On Regulation Of Market Operating Income

6 Infrastructural issues concerning the LFMs.

6.1 Regulation on Smart Metering Systems. Are they adapted to the LFMs? Are they installed?

Yes ☐ *No* ☒

Explain: Smart Meters are widely used by DSOs at the consumer and prosumer sides. But they are not integral part of the LFM.

6.2 Regulation on Energy Storage: How is energy storage defined in your regulation? Is there any guideline, or discussions ongoing, etc.?

Yes ☒ *No* ☐

Explain:

Energy storage is defined in Energy Market Storage Activities Regulation, dated 09.05.2021 and published in Resmi Gazete Nr. 31479. There are four categories defined, as:

- Energy storage unit integrated to production facility
- Energy storage unit integrated to consumption facility
- Independent energy storage unit
- Energy storage unit installed by system operators

Energy storage units are incentivized through energy storage units integrated to production facility. System connection allowance for renewable power production facilities are easier when combined with a storage facility.

7 Contract, bidding, and settlement. Explain if any specific regulations or guidelines for LFM are established.

Yes ■ *No* ☐

Explain:

At EPİAŞ page, they are listed

https://www.epias.com.tr/en/board-resolution/

Namely,

- Power Futures Market Operation Procedures And Principles
- Yek-G System And Organized Yek-G Market Operating Procedures And Principles
- Collateral Procedures And Principles
- Procedures And Principles Regarding The Structure Of The Day-Ahead Market Orders And Evaluation Of Orders
- Procedures And Principles For The Determination Of The Minimum And Maximum Price Limits In The Day-Ahead Market And The Balancing Power Market

- Procedures And Principles For Ensuring Transparency In Organized Wholesale Electricity Markets
- List Of Data To Be Published On The Transparency Platform
- Procedures And Principles Regarding The Determination And Implementation Of Resource-Based Support Fee
- Board Decision Regarding The Determination Of Maximum Settlement Prices
- Board Decision Regarding The Revision Of Maximum Settlement Price
- Procedures And Principles Regarding Payments Not Made Within The Scope Of Unlicensed Generation
- Communique On Regulation Of Market Operating Income

According to IEMD 2019/944 the network development plan published by the DSOs should provide transparency on the medium and long-term flexibility services and shall set out the planned investments for the next five-to-ten years, with particular emphasis on the main distribution infrastructure which is required in order to connect new generation capacity and new loads, including recharging points for electric vehicles. The network development plan shall also include the use of demand response, energy efficiency, energy storage facilities or other resources that the distribution system operator is to use as an alternative to system expansion.

8 Is there any legislation about development plans for the electricity network in your country?

Yes ☒ **No** ☐

8.1 If your answer is Yes, indicate the legal regulation that defines it, its statement and how flexibility is included into it.

There are 21 DSOs in Turkey, all are privatized. Their development plans are made for 5 years, as per Communique For Regulation of Distribution Tariff. The investment plan is prepared by DSO and submitted to EMRA (Regulatory Authority), so that their tariff for the 5 year term is defined.
Although there are no specific definition for flexibility, "Service Quality and Performance Incentive" is defined in the Communique so that DSO has to plan their investments in order to provide a flexible operation regime.
DSOs usually publicly announce their investment plans on their web pages but there are only a list of investment projects, including name and location and sometimes the planned budget, which is indeed far from being informative to those who are not expert-level familiar with them.

8.2 Are there any stimuli or incentives to create flexibility or/and to include flexibility in network development plans? Please, indicate below:

No, not clearly. However, their investment plan for the 5 year is thoroughly inspected by EMRA experts. If EMRA experts decline the investment plan due to lack of flexibility, DSOs have to revise it.

8.3 Regulation on Network Expansion in compliance with the IEMD 2019/944?

2. Yes ■ *No* ☐

3.

Explain:

Flexibility for distributed generation, storage facilities of EV chargers should be taken into consideration in order EMRA experts are convinced to approve investments plans.

Although it is not written explicitly, the nature of the whole set of regulation supports flexible market and integration of renewable sources.

For instance, Law for Using Renewable Energy Sources for the Purpose of Electricity Production, Nr. 5346, Article 1 states that: The purpose of this Law; to expand the use of renewable energy resources for electrical energy production, to bring these resources to the economy in a reliable, economical and high quality manner, to increase the diversity of resources, to reduce greenhouse gas emissions, to evaluate waste, to protect the environment and to develop the manufacturing sector needed for the realization of these goals.

So, I would consider Regulation on Network Expansion in compliance with the IEMD 2019/944.

4.

9 Can you note if there are any provisions or regional/local regulations that present legal risks and behave as barriers to the development of Local Energy markets:

Before formally applying for a connection to a transformer substation, an investor has no chance to learn if there are available capacity. This would behave as an entry barrier at the feasibility stage. However, the experienced engineering firms are usually able to predict the available capacity correctly and this barrier is passed. It would be better to have an open, transparent investment plan and announcement of the available capacity in the mid term, forced by regulation.

10 Can you describe any act provisions or regional / local regulations that bring benefits and behave as enablers to LFMs:

N/A

11 Are there any administrative and bureaucratic procedures that hinder LFMs' development and play a restrictive role in their broader application? If yes, please, explain.

For licensed renewable investments, EMRA usually accepts applications within a few months of time frame and then, no new time frame is announced for several years. This behavior creates two main problems:

- An investor has to wait until the time frame starts. Until then, the economic indicators may change, the cost of capital may change and the investor may decide not to invest.

- Some companies tend to apply for license even if they do not have intention to realize the investment. Then, if obtained, that license becomes an asset itself. An investor needs to purchase that license from the licensee. That increases the investment cost. Also, that disturbs the forecasts, as there are licenses obtained for investment but no one knows if the investment will be realized or not.

12 Would you suggest what kind of legal provisions in your country will contribute most to the activation of the interested parties (citizens, commercial and industrial players) to participate in LFMs?

Legal provisions that secure liberal market are necessary. Subsidization of natural gas and electricity should be methodologic and predictable. So that, interested parties have faith in liberal market, grow interest in alternative solutions in order to optimize their electricity consumption and electricity costs.

13 Can you define any recommendations for improvement of the legislation concerning LFMs in your country or on EU level?

N/A

2. Policy and Regulatory Framework for LFMs Uptake

14 Does your National (Regional / Local) Energy Action Plans include targets for development and spread of LFMs?

Please, explain: Yes. Ministry of Energy and Natural Resources, Strategic Plan 2019-2023, Objective 1.1 (It will be ensured that the ratio of installed capacity based on domestic and renewable energy resources to the total installed capacity will be increased from 59% to 65%.) and Objective 2.2 (A market infrastructure will be established for demand-side participation in electricity and natural gas.) are most relevant. EPİAŞ Strategic Plan 2019-2023, Objective 1 (Strengthening the Sustainability and Predictability of Energy Markets) and Objective 2 (Developing New Products and Services in Energy Markets) are most relevant.

15 What kind of bureaucratic and administrative barriers LFMs can experience

15.1 When flexibility producers connect to the grid?

15.1.1 Complicated application procedure: *Yes* ☐ *No* ■

Explain: Application procedure is well defined and documented.

15.1.2 Uncertainty of approval: *Yes* [redacted] *No ☐*

Explain:
The application may be rejected due to the lack of capacity at the transformer substation, which the applicant has no chance to confirm.

15.1.3 High costs: *Yes* [redacted] *No ☐*

Explain:
For small investors, costs of engineering and procedures are high.

15.1.4 Time consuming procedure: *Yes ☐* *No* [redacted]

Explain:

15.1.5 Other: *Yes ☐* *No* [redacted]

Explain:

15.2 When operating the grid (allowance /licensing)?

15.2.1 for System Operators: *Yes* ☐ *No* ■

Explain:

15.2.2 for prosumers/aggregators: *Yes* ☐ *No* ■

Explain:

15.2.3 for BRP *Yes* ☐ *No* ■

Explain:

15.2.4 other: *Yes* ☐ *No* ■

Explain:

3. Flexibility Services in a Local Flexibility Market

Flexibility services are “the services provided by individual or aggregated (residential, commercial or industrial) prosumers to flexibility requesting parties (DSO, BRP, and TSO) or prosumers themselves, in reaction to external signals (price signal or activations), by modifying the consumption and/or production pattern, in order to facilitate the reliable and cost-effective management of variability and uncertainty in the electricity system”[1]. Flexibility services specifically focus on deliberate, time limited changes to the ‘normal’ energy profile[2].

LFM provides an opportunity for consumers to play a significant role in the operation of the electric grid by reducing or shifting their electricity usage in response to time-based rates or other forms of financial incentives. DR programs are currently being used by some electric system planners and operators, using mainly the flexibility provided by large industrial facilities connected to the high-voltage grid, as resource options for balancing supply and demand. Therefore, LFMs development will foster flexibility services at DSO level using residential and tertiary buildings flexibility (Look at Annex 2).

This questionnaire concerns the legal side of the applicability of the Flexibility Services in LFMs.

16 In your country, is there some regulation concerning the definitions below? If Yes, please, specify.

Congestion	Balancing	Demand Response
Transmission System Operator acts as per internal guide.	Electricity Market Balancing and Settlement Regulation, dated 14.04.2009 and published in Resmi Gazete Nr. 27200	Electricity Market Ancillary Services Regulation, dated 26.11.2017 and published in Resmi Gazete Nr. 30252

[1] Nixiang, A. Flexibility services in Citizen Energy Communities (Master’s thesis), University of Technology Eindhoven, the Netherlands. (2020)

[2] USEF White Paper: Energy and Flexibility Services, 2019

Ancillary service	Non-frequency ancillary service	Energy storage
Electricity Market Ancillary Services Regulation, dated 26.11.2017 and published in Resmi Gazete Nr. 30252	Electricity Market Ancillary Services Regulation, dated 26.11.2017 and published in Resmi Gazete Nr. 30252	Regulation of Storage Activities in Electricity Market, dated 09.05.2021 and published in Resmi Gazete Nr. 31479

17 What kinds of flexibility services are available in your country?

Constraint Management ☐ Adequacy ☐ Balancing ■ Wholesale ■

17.1 Which participants are flexibility providers?

17.1.1 Constraint Management

Prosumers ☐ Aggregators ☐ Large Generation ■ Other ☐

17.1.2 Adequacy

Prosumers ☐ Aggregators ☐ Large Generation ■ Other ☐

17.1.3 Balancing

Prosumers ☐ Aggregators ■ Large Generation ■ Other ☐

17.1.4 Wholesale

Prosumers ☐ Aggregators ■ Large Generation ■ Other ☐

17.2 Which participants are flexibility buyers?

17.2.1 Constraint Management

TSO ☐ DSO ■ Aggregators ☐ BRP ■ Other ☐

17.2.2 Adequacy

TSO ■ DSO ■ Aggregators ☐ BRP ☐ Other ☐

17.2.3 Balancing

TSO ■ DSO ☐ Aggregators ☐ BRP ☐ Other ☐

17.2.4 Wholesale

TSO ☐ DSO ☐ Aggregators ■ BRP ☐ Other ☐

17.3 What are the procedures to sell flexibility?

17.3.1 Constraint Management

Open market ■ Tender process ■ Bid ■ Other ☐

17.3.2 Adequacy

Open market ☐ Tender process ■ Bid ☐ Other ☐

17.3.3 Balancing

Open Market ☐ Tender process ■ Bid ■ Other ☐

17.3.4 Wholesale

Open Market ■ Tender process ☐ Bid ■ Other ☐

18 Can storage facilities (including Electric Vehicles) provide flexibility services in your country?

Yes ☐ No ■

If yes, how? – Not operational yet.

19 Do the following flexibility services exist in your country?

19.1 Constraint Management

19.1.1 Voltage Control Yes ■ No ☐

19.1.2 Grid Capacity Management Yes ■ No ☐

19.1.3 Congestion Management Yes ■ No ☐

19.1.4 Controlled Islanding Yes ☐ No ■

19.1.5 Optional Downwards Flexibility Management Yes ☐ No ■

19.1.6 DSO Constraint Management (pre/post fault) Yes ■ No ☐

19.1.7 Other (please specify:) Yes ☐ No ■

19.1.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ■

Explain:

19.2 Adequacy

19.2.1 Capacity payment Yes ■ No ☐

19.2.2 Capacity Market Yes ■ No ☐

19.2.3 Strategic reserve Yes ■ No ☐

19.2.4 Hedging Yes ☐ No ■

19.2.5 Other (please specify) Yes ☐ No ■

19.2.6 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ■

Explain:

19.3 Balancing

19.3.1 Dynamic Containment Yes ■ No ☐

19.3.2 Frequency Containment Reserve (FCR) Yes ■ No ☐

19.3.3 Automatic Frequency Restoration Reserve (aFRR) Yes ■ No ☐

19.3.4 Manual Frequency Restoration Reserve (mFRR) Yes ■ No ☐

19.3.5 Replacement Reserve (RR) Yes ■ No ☐

19.3.6 other (please specify:) Yes ☐ No ■

19.3.7 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ■

Explain:

19.4 Wholesale

19.4.1 Day-ahead optimization Yes ■ No ☐

19.4.2 Intraday optimization Yes ■ No ☐

19.4.3 Self/passive balancing Yes ■ No ☐

19.4.4 Generation optimization Yes ■ No ☐

19.4.5 Exceeding Maximum Export/Import Capacity Yes ☐ No ■

19.4.6 Offsetting Yes ☐ No ■

19.4.7 Other (please specify:) Yes ☐ No ■

19.4.8 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ■

Explain:

19.5 Local Optimization

19.5.1 ToU Optimization Yes ☐ No ■

19.5.2 kWmax control Yes ■ No ☐

19.5.3 Self-balancing Yes ■ No ☐

19.5.4 Emergency power supply Yes ■ No ☐

19.5.5 Smart Contracts Yes ☐ No ■

19.5.6 Collective Self-consumption Yes ☐ No ■

19.5.7 Transmission Charge Management Yes ■ No ☐

19.5.8 Distribution Charge Management Yes ■ No ☐

19.5.9 Other (please specify) Yes ☐ No ■

19.5.10 Are there any legal constraints in your national/ regional/ local regulations that act as barriers to those flexibility services?

Yes ☐ No ■

Explain:

20 Does the regulation in your country allow net-metering?

Yes ☐ No ■

Explain.
For prosumers, as per EMRA Board Resolution Nr. 10892, dated 31.03.2022, the amount of electricity supplied to the grid will be priced according to graded tariff principles. Meter works both ways. Instead of net-metering, netting of the invoices is applied.

21 Are there any legal incentives and benefits in your national/ regional/ local regulations that act as stimuli to the uptake of LFMs?

Yes ☐ No ■

Explain.

4. Blockchain and Data Management in LFMs

1. Blockchain Technology & Smart Contract in Energy Services

Blockchain technology has the potential to transform the energy sector. Of the many use cases for blockchain, energy and sustainability are often less recognized. The energy industry has been consistently catalyzed by innovations including rooftop solar, electric vehicles, and smart metering. The blockchain presents itself as the next emerging technology to spur growth in the energy sector through smart contracts and systems interoperability. A joint report issued in 2018 by the WEF, Stanford Woods Institute for the Environment, and PwC identified more than 65 existing and emerging blockchain use-cases for the environment. These use cases include new business models for energy markets, real-time data management, and moving carbon credits or renewable energy certificates onto the blockchain; the blockchain also offers unique solutions for renewable energy distribution. A range of blockchain products can be tailored to address various energy or sustainability applications, including the following: wholesale electricity distribution; peer-to-peer energy trading; electricity data management; commodity trading; utility providers; etc.

22 Does the regulation in your country allow the use of blockchain or other digital currencies in the energy sector?

Yes ☐ No ■

If yes, please, specify.

23 Do transactions concerning the flexibility services use Blockchain technology in your country?

Yes ☐ No ■

If yes, please, specify.

24 *Is there any provision or regulation that presents legal risk and behaves as a barrier to the use of Blockchain technology in flexibility services for LFMs?*

Yes ■ No ☐

If Yes, please, specify. In terms of decentralized (peer to peer) energy trading using block chain technologies, it is not possible for a prosumer to sell energy directly to another consumer, without obtaining electricity supply license. The prosumer sells energy through grid. In terms of using block chain technologies as a financial tool (cryptocoins), the accounting would be a problem. The invoices should be issued in Turkish Lira (even if they are issued in USD/EUR, the books are kept in Turkish Lira) and the bank transactions should be compatible with the books. Off-grid systems are not considered as a part of LFM.

25 *Does your country recognize smart contracts as legal contracts?*

Yes ☐ No ■

If Yes, please, specify.

2. Data Management & Protection

According to the General Data Protection Regulation 2016/679, data aggregation shouldn't violate the privacy and security of the customers. This regulation also removes obstacles to ensure a better mobility of personal data while protecting natural persons. LFMs process energy consumption data and shouldn't infer personal information especially when sharing data with third parties.

26 Does the regulation in your country guarantee the security of consumers' consumption data?

Yes ☐ No ■

If Yes, please, specify.

27 In your country, how is the security of the grid? Are there any regulations about cybersecurity?

Explain.

According to National Cyber Security Strategy and Action Plan 2020-2023, the cybersecurity measures are defined. But pages 36-115 of the document are not publicly available.

Cybersecurity Regulation for Industrial Control Systems to be used in Energy Sector, dated 13.07.2017 and published in Resmi Gazete Nr. 30123 is publicly available, short document, which roughly covers the issue.

28 How is your country managing smart metering data?

Centralized data hub ■ Decentralized data infrastructure □

What are the risks and benefits of the system in place?

Risks: N/A Benefits: DSO is responsible of storing and securing the smart metering data.

5. Summary

29 Can you give recommendations and proposals for changes in the regulation in order to overcome the perceived legal risks and barriers in your country concerning

29.1 Creation of a LFM

Peer-to-peer energy trading may be allowed, without complicated license procedures.

For instance, instead of obtaining a Charging Network Operator License for EV charging stations or a certificate issued by a Charging Network Operator, individuals / companies should be allowed to sell energy to an EV.

Another example, energy communities should be allowed within a neighborhood. For instance, installing solar panels on the roof of an apartment and share the produced electricity among the residents is a complicated procedure.

29.2 Uptake of the flexibility services

Financial aid for distributed energy production and storage units would be useful.

29.3 Use of blockchain technology for LFMs

EMRA may act as a facilitator in order companies to develop block chain concepts / applications for the energy market. EMRA already gathers R&D project ideas from DSO's twice a year and evaluates the ideas. Block chain technology may be a thematic call.

29.4 Data Management

N/A.

29.5 Other

30 Can you give recommendations and proposals for changes in the regulation in order to better foster Local Flexibility Markets uptake, flexibility services and blockchain technologies use for LFMs in your country; thus, creating incentives for their development?

Accounting principles should be modified.

ANNEX 1

Aggregation	***Distribution System Operator (DSO)***	***Transmission System Operator (TSO)***	***Balance Responsible Party (BRP)***
Art. 2. (18) of IEMD 2019/944	*Art. 2. (29) of IEMD 2019/944*	*Art. 2. (35) of IEMD 2019/944*	*Art.2. (14) of IEMD 2019/943*
'aggregation' means a function performed by a natural or legal person who combines multiple customer loads or	'DSO' means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the distribution system	'TSO' means a natural or legal person who is responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system	'BRP' means a market participant or its chosen representative responsible

generated electricity for sale, purchase or auction in any electricity market	in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity	in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity	for its imbalances in the electricity market

Self-consumer	***Active customer***	***Renewable Energy Community(REC)***	***Citizens Energy Community (CEC)***
Art. 21. of REDII 2018/2001	Art.15 IEMD of 2019/944	Art. 22. of REDII 2018/2001	Art.16 of IEMD 2019/944
‘Renewables self-consumer’ means a final customer operating within its premises located within confined boundaries or, where permitted by a MS, within other premises, who generates RE electricity for its own consumption, and who may store or sell self-generated RE electricity,	‘Active customer’ means a final customer, or a group of jointly acting final customers, who consumes or stores electricity generated within its premises located within confined boundaries or, where permitted by a MS, within other premises,	‘REC’ means a legal entity: (a) which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the RE projects that are owned and developed by that legal entity;	‘CEC’ means a legal entity that: (a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, incl. municipalities, or small enterprises; (b) has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the

provided that, for a non-household REs self-consumer, those activities do not constitute its primary commercial or professional activity.	or who sells self-generated electricity or participates in flexibility or EE schemes, provided that those activities do not constitute its primary commercial or professional activity;	(b) the shareholders or members of which are natural persons, SMEs or local authorities, incl. municipalities; (c) the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits.	local areas where it operates rather than to generate financial profits; (c) may engage in generation, incl. from RES, distribution, supply, consumption, aggregation, energy storage, EE services or charging services for electric vehicles or provide other energy services to its members or shareholders.

ANNEX 2

Congestion	***Balancing***	***Demand Response***
Art. 2. (4) of IEMD 2019/943	*Art. 2. (10) of IEMD 2019/943*	*Art. 2. (20) of IEMD 2019/944*
'congestion' means a situation in which all requests from market participants to trade between network areas cannot be accommodated because they would significantly affect the physical flows on network	'balancing' means all actions and processes, in all timelines, through which transmission system operators ensure, in an ongoing manner, maintenance of the system frequency within a predefined stability range and compliance with the amount of	'demand response' means the change of electricity load by final customers from their normal or current consumption patterns in response to market signals, including in response to time-variable electricity prices or incentive payments, or in response to the acceptance of the final customer's bid to sell demand reduction or increase at a price in an organised market as defined in point (4) of Article 2

elements which cannot accommodate those flows	reserves needed with respect to the required quality	of Commission Implementing Regulation (EU) No 1348/2014 (17), whether alone or through aggregation

Ancillary service	***Non-frequency ancillary service***	***Energy storage***
Art. 2. (48) of IEMD 2019/944	*Art. 2. (49) of IEMD 2019/944*	*Art. 2. (59) of IEMD 2019/944*
‘Ancillary service’ means a service necessary for the operation of a transmission or distribution system, including balancing and non-frequency ancillary services, but not including congestion management	‘non-frequency ancillary service’ means a service used by a transmission system operator or distribution system operator for steady state voltage control, fast reactive current injections, inertia for local grid stability, short-circuit current, black	‘Energy storage’ means, in the electricity system, deferring the final use of electricity to a moment later than when it was generated, or the conversion of electrical energy into a form of energy which can be stored, the storing of such energy, and the subsequent reconversion of such energy into electrical energy or use as another energy carrier

	start capability and island operation capability	

THANK YOU FOR ANSWERING THE QUESTIONS!

The project has received funding from the **European Union's Horizon EUROPE Programme under grant agreement No. 101075515**

DE-RISK