

Study on the interlink between good regulatory principles and the energy transformation challenge

*Empowering Mediterranean regulators for a common
energy future*



ABSTRACT

This document presents a study on the relation between the good regulatory principles and the challenges arising in the near future with the energy transition.

In 2020, MEDREG published an update on the status of energy regulation in the Mediterranean basin in 2020, and this study has been the starting point for the 2021 report. In the regulatory outlook, MEDREG provides a complete overview on how energy regulators are ruled and analyzes all the characteristics of each NRA. This analysis may help categorize NRAs having similar characteristics into clusters, and with these clusters, a comparison with the state of development of the energy transformation can be done. Furthermore, this will help identify the coming challenges for the clusters and, depending on the experiences of each NRA, provide recommendations based on the lesson learned from the more developed NRAs.

ACKNOWLEDGMENTS

This report is the result of a work carried out by the MEDREG Institutional Working Group (INS WG), which provided the data and comments.

MEDREG wishes to thank the INS Working Group members for their contribution and efforts, as well as the consultant Zyhrada Kongoli who supported the drafting of the report.

Main drafters: Ms. Zyhrada Kongoli (Consultant), Mr. Mohammad Maayah (Jordan, EMRC), Ms. Anne-Lise Teani (France, CRE) and Ms. Bagdagul Kaya-Caner (Turkey, EMRA)

Co-drafters: Bardhi Hoxha and Lamine Abdalkader Zitouni (MEDREG Secretariat)

If you have any queries relating to this document, please contact:

MEDREG Secretariat

E-mail: info@medreg-regulators.org

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ABOUT MEDREG

MEDREG is the association of Mediterranean energy regulators, bringing together 27 regulators from 22 countries that span the European Union (EU), the Balkans, and North Africa.

MEDREG acts as a platform for facilitating information exchange and providing assistance to its members in addition to fostering capacity development activities through webinars, training sessions, and workshops. Mediterranean regulators work together to improve the harmonization of regional energy markets and legislations, seeking a progressive market integration in the Euro-Mediterranean Basin.

Through constant cooperation and information exchange among members, MEDREG aims at fostering consumer rights, energy efficiency, infrastructure investment, and development by employing safe, secure, cost-effective, and environmentally sustainable energy systems.

The MEDREG Secretariat is located in Milan, Italy. For more information, visit www.medreg-regulators.org

Executive Summary

The objective of this report is to develop a solid governance model by assessing the future characteristics of energy markets (smart and agile) against the core institutional elements of each regulator, identifying the requirement for quick adaptation and further improvement.

The last edition of the regulatory outlook, published in 2020, provided the first complete overview of the competences of Mediterranean energy regulators and their role in the market, and it can be used as a starting point to assess the link between future technologies and the development of the energy market and the traditional development of the regulators.

Energy transformation is first and mainly linked to climate change mitigation risks by reducing of greenhouse gas (GHG) emissions and producing energy from renewable energy sources. It is also associated with energy security. All MEDREG members except for Palestine are signatory parties or have ratified the Kyoto Protocol and Paris Agreement, which follow the UN Framework Convention principle of common but differentiated responsibility and respective capabilities of different countries.

Based on that principle, different countries have committed to individual targets on reducing GHG emissions, with the more developed countries carrying out more responsibilities due to the higher part they play in producing GHG emissions. For example, EU member states aim to become climate-neutral by 2050, while Morocco has set an ambitious objective to reduce CO₂ emission by 45.5% by 2030. However, all the countries have the obligation to adopt policies and measures pertaining to the reduction of GHG emissions and reporting the numbers periodically. On the other hand, the Paris Agreement provides a framework for financial, technical, and capacity building support to the most vulnerable countries by, again, giving the lead to more developed countries in this regard.

Therefore, combining energy and climate policies has become an imperative task for countries worldwide, including the MEDREG member countries. This requires accountable and transparent actions to ensure that the financial burden of energy transformation is shared fairly among all parties involved while taking into consideration the needs of vulnerable consumers.

The transformation processes should not only be fair but also be inclusive. Energy transformation carries a considerable financial load, requiring adequate long-term planning with an increased focus on innovation. In this respect, NRAs have a great role to play in promoting and enabling energy transition by always considering the needs of all categories of consumers. Therefore, the observation of regulatory principles is of crucial importance along the energy transformation process.

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INTRODUCTION

Approach and Methodology

Based on the 2020 regulatory outlook, the INS WG can identify the most relevant elements that characterize the aspects linked to the energy transition. However, additional feedback was collected using questionnaires, which were completed by NRAs, to assess the level of preparedness of the energy market, among responding members, towards the upcoming challenges and developments of the energy market in the framework of energy transformation.

The analysis of the collected feedback will help group NRAs in clusters, based on the similarities they present in the regulatory outlook report and questionnaires. The aim is to identify best practices and recommend actions toward a common regulatory framework, overcoming challenges and barriers. Finally, for each group, we may identify the conditions and ways to foster and improve the development of the regulators to adapt with the upcoming changes.

The advanced aspects identified in particular countries will contribute to the recommendation drawn for that, and it can be used by other countries as a reference in the context of a closer cooperation between countries in those fields.

Energy transformation challenges

The energy sector is currently facing two major developments:

- One is provoked by the need to reduce CO2 emissions: the energy transition
- The other one is more global but affects the sector: it is the digital revolution/technological transition

These developments, as positive as they are in terms of well-being and the protection of the environment, also come with challenges (intermittency, decentralization, need to adapt the networks, amount of time allocated, arrival of new players, protection of personal data of consumers, and so on).

In that regard, the regulatory framework plays, and will continue to play in the future, a growing role, as it will have to set the appropriate incentive for innovation.

The regulatory framework should be updated regularly and amended, when necessary, as the regulated infrastructures and markets are evolving and will continue in the future.

1

OVERVIEW ON THE REGULATORY BACKGROUND IN THE MEDREG REGION

In this chapter, the most relevant data and element related to the future energy transformation is identified from the feedback collected by respondent countries and the regulatory outlook document. The objective is to identify the best practices implemented along the transition, which can guide other countries in the policy development process, responding to energy transition challenges in a way that creates the optimal terrain in the context of the country, maximizing economic and social benefits and ensuring the inclusion of all stakeholders.

Energy systems are being globally transformed in a dynamic and irreversible way. The renewables have extended their share, mostly in the electricity sector, associated with new technological developments and innovation. Adoption of the effective policies and adequate planning is a prerequisite for enabling energy transformation and achieving the targets set by the countries. The Paris Agreement has challenged the signatory parties with ambitious targets.

MEDREG, as a collaborative platform, connects member regulators and supports the knowledge sharing with respect to more advanced policies, actions, and initiatives undertaken by different countries. In this respect, the report identifies good practices regarding energy transformation processes.

The NRAs in the Mediterranean region are established in various timeframes and regulatory contexts, which are also reflected in the different level of maturity and preparedness that the countries have in handling the energy transformation. In some cases, a certain period passed between the legal establishment of the NRA and the actual initiation of its activities in the market, as in case of ANRE (Morocco), which was established in 2016 and became effectively operational in the beginning of 2021. The year of establishment of NRAs in the Mediterranean region is reported in Figure 1:

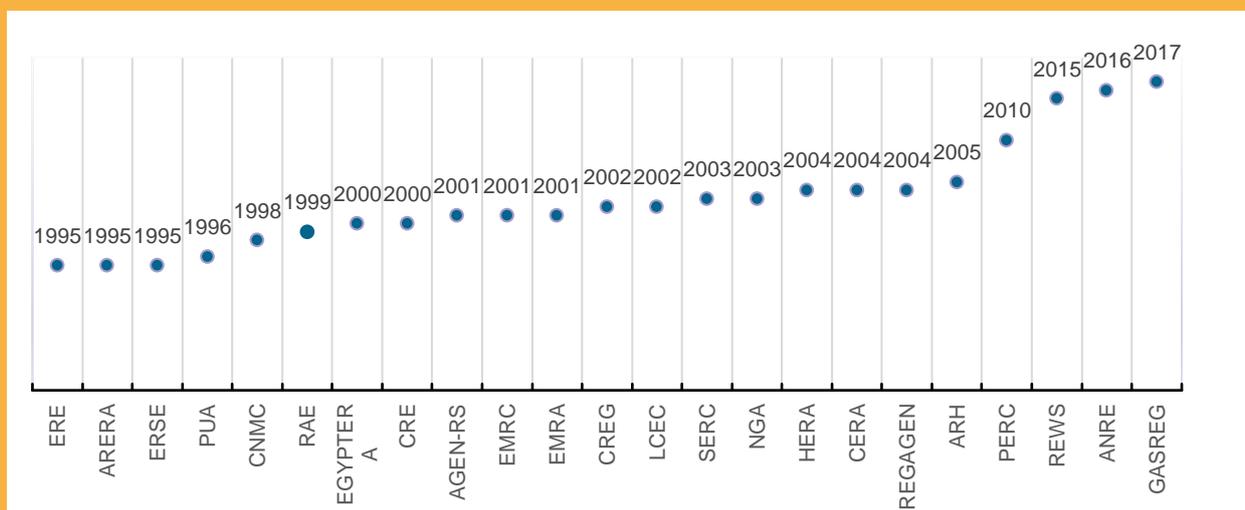


Figure 1. Year of establishment of NRAs in the Mediterranean region¹

¹ Although the CREG was created by law in 2002, its implementation was in 2005.

Based on the 2020 regulatory outlook, most of the NRAs (17 and 16 out of 22, respectively) are involved in setting or approving standards related to the quality of supply and in establishing congestion management rules/standards. Fifteen NRAs are involved in the issuance of market rules and grid codes, address of congestion, definition of metering rules and charges, and setting of incentive regulations. Figure 2 below provides a summary of NRA competences regarding the regulation of the energy sector:



Figure 2. NRA competences regarding the regulation of the energy sector

In case of violations of service standards, most NRAs have the power to impose sanctions or intervene. For instance, according to the legal framework, CERA (Cyprus) may impose effective, proportionate, and dissuasive sanctions on electricity undertakings that fail to comply with their obligations under the laws or any relevant, legally binding regulatory decision and/or propose to the court to impose the sanctions. CRE (France) has defined that each quality indicator is subject to a financial incentive as a reference objective. On reaching below this, the operator will pay a penalty, and on reaching above it, the operator will receive a bonus. ARERA (Italy) has set automatic refund mechanisms for users and consumers in cases where standards are not met, monitoring the conditions under which the services are provided, with the power to demand documentation and data, carry out inspections, obtain access to plants and apply sanctions, and determine cases in which operators should be required to provide refunds to users and consumers. REGAGEN (Montenegro) has set rules for minimum quality standards for electricity delivery and supply with thresholds for standard services, and energy utilities are obliged to pay financial compensation for breaching the target values. Regarding the grant of exemption/s for third party access, in case of CREG (Algeria), the regulator has the power consult with the ministry that develops all the regulations and approves procedures for operators, and the ministry decides on granting the exemption/s based on the CREG opinion.

Only a few NRAs maintain an audited account of revenues collected pursuant to congestion management mechanisms. Regarding infrastructure development planning, NRAs have differentiated roles in investment planning and cost recovery, both nationally and regionally. This is most likely due to the fact that many of these tasks are carried out in cooperation with the relevant ministries and national governments, depending on the legislative framework in place in each country. An overview is provided below, in Figure 3:

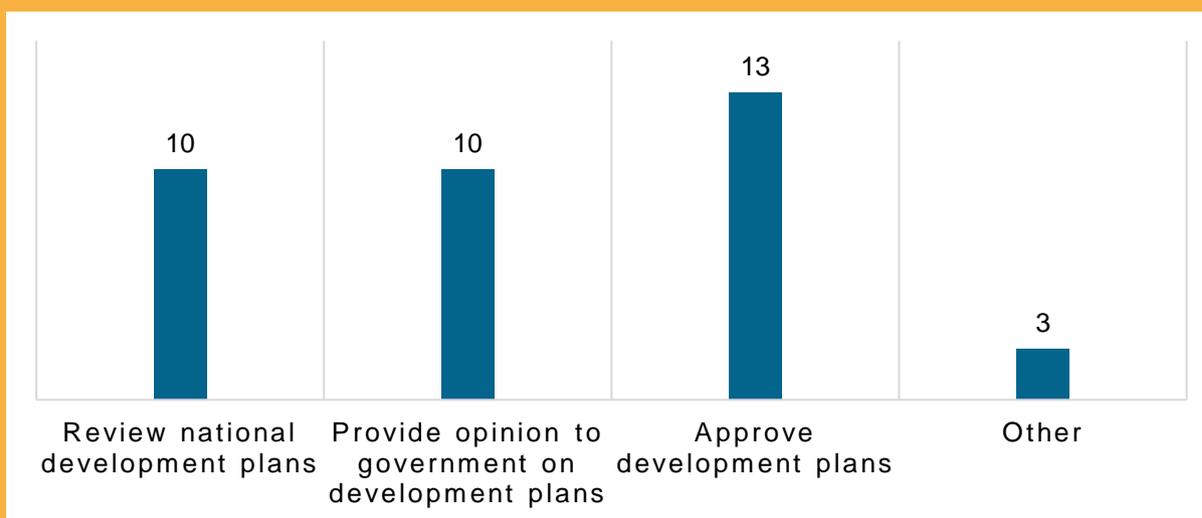


Figure 3. NRA roles in investment planning and cost recovery

1.1 Regulatory framework as a tool to incentivize innovation and the state of play among MEDREG countries

Integration of renewables requires well-planned and visionary energy markets, aiming to establish consistent, supportable, and properly functioning power systems. Such systems should offer flexibility, encourage innovation, and provide incentives while ensuring the fair inclusion of existing and new competitors.

Within its questionnaire, MEDREG INS WG aimed to assess how enabling the current legal regulatory framework is, among MEDREG members, with regards to the development and implementation of innovation and incentive approaches. Based on the feedback, almost all the respondent countries have in place a regulatory framework that allows for innovation and incentive schemes, except Egypt, which has already started the process of reviewing the current regulation to promote incentive- and innovation-supporting regulations, and Morocco.

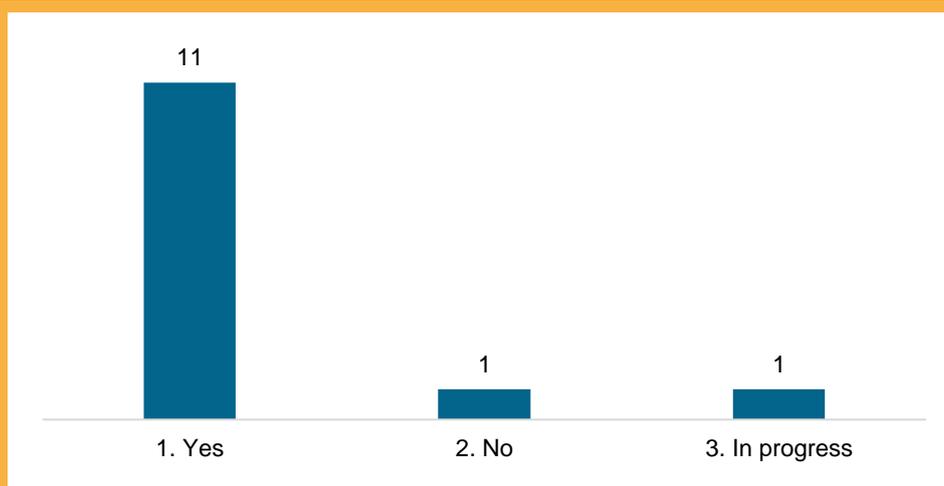


Figure 4. Regulatory framework that allows for innovation and incentive schemes

In **Albania**, examples of this approach are found in the feed-in tariffs provided to eligible small-scale renewable energy power plants, which include wind energy plants up to 3MW, hydropower plants up to 15MW, and solar photovoltaic plants up to 2MW. The unbundled subsidiary of the Distribution System Operator (OSHEE) is obliged to purchase renewable energy power generated by eligible power plants at a tariff set by the regulator. The tariff is defined by the regulator based on the assumption of a reasonable return on investment. The feed-in tariff mechanism will be available for a period of 15 years to renewable energy producers that started operation before December 31, 2020. Renewable energy producers that started operations after December 31, 2020 will no longer benefit from the feed-in tariff mechanism, with the exception of small wind and solar plants. The rest of the renewable energy producers will be able to apply for the new financial support mechanism as provided in the National Consolidated Action Plan on Renewable Energy Resources, 2019–2020, including the Contract for Difference.

The regulatory framework, including the law regulating the electricity market and Council of Ministers decisions, is also enabling in the case of **Cyprus**. In addition, CERA (Cyprus) issues regulatory acts that regulate the electricity market and methodologies aiming to promote energy efficiency by instructing electricity companies to optimize the use of electricity, for example, by offering energy management services, developing innovative pricing methods, or introducing smart metering or smart systems/grids, where appropriate. CERA also provides appropriate incentives to network operators and users, both in the short term and the long term, to increase network performance efficiency and enhance market integration.

A novel concept has been introduced in the **French** legal framework. A regulatory sandbox is being used to implement innovative regulation, which allows the regulator to test innovative concepts in the market under relaxed regulatory requirements, at a smaller scale, even without having to fit into an existing regulatory framework. So, CRE can temporarily adapt the regulatory framework, allowing stakeholders to test innovative services and technologies. CRE also uses incentive regulation, where, first, DSOs and TSOs are incentivized to enable innovation through network tariffs. For instance, DSOs and TSOs are incentivized to provide high-quality data access to stakeholders, so the latter can provide data-based services to customers. In particular, in 2019, CRE consulted stakeholders on the implementation of an incentive regulation framework (i.e., new tariff period) that would be based on the publication of consumption data (link to the

smart meters roll-out) and network data (based on access to a rich network-mapping). This framework aims to support stakeholders in the development of their own innovative projects.

Italy has also put in place a regulatory framework that enables innovation. In general terms, ARERA's tariffs schemes for regulated assets include implicit incentives through pre-defined rates of return on capital expenses, which can provide extra return in relation to innovative investments. Explicit innovation-supporting regulation has been recently introduced in the electricity and gas sectors and will be progressively extended to the water and waste domains, which are also overseen by ARERA.

In the “quality-of-service” domain in the electricity sector, ARERA provides DSOs with the possibility to participate in “**regulatory experiments**” deemed to design, test, and implement “on field” innovative solutions and services related to distribution networks. The adoption of an intervention plan driven by research and innovative technologies allows the involved distributors to temporarily derogate from current regulation on the technical quality of the distribution services, in order to adapt to local needs and characteristics. Distributors applying for such derogation currently serve around 10 million clients.

Regulatory experiments have also been taking place in the domain of **network balancing** in the broader context of RES transition. Based on experimental regulation, distributed electricity generators (not necessarily RES producers) are allowed to offer balancing services in the market of network ancillary services, with the idea being that the intermittent-sources generator may and should contribute to balance the energy market, as RES spreading makes instantaneous balancing increasingly complex and costly.

In the **gas sector**, a consultation was launched in 2020 to promote pilot projects devoted to decarbonization, with reference to “renewable gases” (including hydrogen, in a first phase, even if not from a strictly renewable source) as well as to new technologies, techniques, and practices that would render positive environmental externalities.

Following this strategy, the regulator also introduced innovation-supporting provisions in the **water services** regulation, namely incentivization for innovative projects devoted to mitigating the environmental impact of service management by, for instance, promoting energy efficiency, plastic reduction, and wastewater reuse. Even more innovatively, ARERA is in the process of pushing the installation of individual (smart) meters in the water sector as well as of measurement equipment in the forthcoming regulation on pay-as-you-throw **municipal waste tariffs**, in order to concretely implement the “polluter pays” principles as well as to make customers of regulated services aware of actual environmental costs.

In line with its commitment to boosting innovation, ARERA is willing to include in water service regulation explicit financing mechanisms as far as research and technology innovation is concerned. Innovative projects shall enjoy **financial support by a special fund** established by collecting resources through water service tariffs.

Digitalization made it possible to promote significant advancements for innovation in the relationship between utilities and customers. Retail energy market regulation has made significant use of the opportunities made possible by digitalization to develop new functionalities for the benefit of end-consumers. These include access via digital identity to the Consumption Portal, direct access to the reading of consumption patterns through 2G meters, and the automatization of the “bonuses” (price and tariffs rebates provided for disadvantaged customers).

In **Jordan**, EMRC codes and instructions provide space for promoting and incentivizing innovation and efficiency. For example, in line with the tariffs code, the EMRC applies incentives for distribution companies if they achieve low electrical losses in their utilities and energy saving projects. The amount of incentive is based on sharing with the DSO part of the benefits such as providing services to the consumers. Additionally, the EMRC provides incentives for renewable energy users through certain instructions.

In **Montenegro**, the regulatory framework for regulated entities is a “hybrid regulatory method,” with the goal of limiting allowed revenue, providing efficiency improvement incentives and investment incentives and allowing risk-sharing between system operators and users (risk related to changes in deployed capacity). The incentive-based regulatory framework in place has encouraged regulated entities to invest in the development of the systems they operate in order to ensure the long-term ability of the system to meet the requirements for electricity transmission and distribution in a secure and quality manner. The applied regulatory framework provided sustainability to regulated undertakings, improvement of efficiency and realization of significant investments in the system, and stability of system usage prices.

Portugal's regulatory codes allow for the promotion and incentivization of efficiency and innovation. Incentives are applied to network access tariffs in accordance with the tariffs code. The 2018 Code on Services for Smart Electricity Distribution Networks also includes a pilot project option for regulated companies as well as an output-based incentive to provide smart grid services. In the meantime, the self-consumption code of 2021 includes provisions for pilot projects. The ERSE has approved a number of pilot projects (sandboxes) for energy companies to try out new ideas, such as demand response in the reserve regulation market, time-of-use tariffs, smart grids, and electric mobility. In 2021, a new pilot project to test data algorithms for more sophisticated electricity sharing will be launched. Other pilot projects to test innovative solutions from the standpoint of self-consumption can also be presented. In the area of energy efficiency, ERSE oversees a competitive mechanism known as the Consumption Efficiency Promotion Plan (PPEC), which was created to promote demand management measures. DSO regulation includes two different incentives for innovative investments: incentive for innovative investments and incentive for consumer access to smart grid services, in addition to the traditional incentives for reducing power losses and improving service quality.

In **Spain**, the CNMC has the authority to establish the methodology for calculating remuneration for electricity distribution. In this regard, CNMC's Circular 6/2019 includes a return for those investments that could be recognized in pilot projects, indicating that these investments will not be counted against the regulatory investment limits. Circular 3/2019, on the other hand, establishes the requirements for demonstration projects involving market design and system operations in order to request specific regulatory conditions in order to demonstrate viability. It establishes a derogation period of up to 36 months.

Tariff regulations in **Turkey** are developed using performance-based models, quality practices, and efficiency analyses, in accordance with the provisions of the laws governing electricity and natural gas markets, with the goal of providing sufficient, high-quality, continuous, low-cost, and environmentally friendly electricity and natural gas to consumers. In addition, for electricity and natural gas market activities that are subject to price regulation, incentive-based tariff procedures are implemented. Companies are forced to be more efficient and creative in order to improve and maintain their efficiency in this

environment. For natural gas distribution tariffs, price capping is preferred, whereas revenue capping is used for other activities such as gas transmission and underground gas storage, electricity transmission and distribution, last resort supply, and market operation.

In the cases of **Greece**, **Algeria**, and **Palestine**, the enabling regulatory framework is also stated. By derogating from the provisions of the Operation Code of Non-Interconnected Islands, RAE (Greece) is given the authority by law to set the framework for the operation of hybrid plants in Agios Efstratios island. Algerian legislation offers incentives to cut costs and improve service quality. PERC (Palestine) has policies in place that support incentive regulations such as lower tariffs for lower consumption and special tariffs to promote renewable energy on rooftops.

Morocco's electricity regulator (ANRE) has been operational since the beginning of the year 2021. Unbundling, setting tariffs for transport and distribution grid use, and providing fair access to electricity grids are all priorities for ANRE. However, once ANRE has progressed in her responsibilities, she is permitted by law to propose new legal framework projects and strategic proposals to improve the national energy sector. Incentives to develop a new innovative technology or to promote green energy sources are examples of such suggestions. There is no legal or regulatory framework in place in **Egypt** to allow for the development and implementation of innovative and incentive regulations. There are, however, some steps that can be taken in this regard, such as the preparation of studies and projects.

According to the feedback received from respondent member countries, the legislation and regulatory approach to innovation and incentives appears to be at a different stage of development. In terms of innovation and incentives, all of the countries that responded have made significant progress in developing an enabling legal and regulatory framework. Countries such as **France** and **Portugal** have progressed further, incorporating regulatory sandboxes into their legal frameworks to implement innovative regulations and allow stakeholders to test new services and technologies. **Greece**, **Italy**, **Cyprus**, **Montenegro**, **Jordan**, **Albania**, **Turkey**, **Algeria**, and **Palestine** are among the countries that have taken specific initiatives to encourage innovation and incentives in the energy sector. **Morocco** and **Egypt**, for example, are still in the early stages of this process but are moving in the right direction. In this regard, more advanced countries' practices can serve as a model for other MEDREG members to emulate while improving and harmonizing their legal and regulatory framework.

1.2 Role of prosumers in the evolving market of renewable energy deployment

Two questions about energy consumers' involvement in the energy transformation process are included in the questionnaire created for the purpose of this report. As reported in the feedback from **Portugal**, **Albania**, and **Greece**, one way is for energy consumers to participate in public consultation processes and awareness raising activities, either as individuals or as members of non-governmental associations and organizations. The report's main focus is on their role as self-consumers, or prosumers. In this regard, all MEDREG members who responded said they had mechanisms in place that allowed energy consumers to participate in energy transformation.

In order to increase the share of self-consumption in the energy sector, all types of consumers must be equally involved and have equal opportunities. To that end, countries' policies and measures must target low-income consumers as well as consumers living in areas with limited energy resources by ensuring support for generation facilities as well as promoting and developing facilities that use various renewable energy sources.

The term "self-consumer" has been defined in EU legislation² as well as some MEDREG country legislation. However, the scope of renewable self-consumer activity varies by country, and may include non-household renewables self-consumers as well as those who may store or sell self-generated renewable electricity, in addition to electricity prosumers who produce part of their electricity needs from their own power plant and rely on the distribution network to be supplied with electricity when self-production is insufficient. Prosumers, self-producers, and self-consumers are all terms that are used in different countries' legislation.

Since 2013, **Cyprus** has had national policies⁴ in place to promote renewable energy. Incentives for the installation of net-metering, net-billing, and self-generation RES systems are available through the "Solar Energy for All" support scheme, which is currently operational for on-site production and consumption of RES for personal use. A decision made in 2020 reflects a revised method of calculating network usage fees for net-metering and net-billing participants, with the goal of eliminating the network usage fee on self-generated energy. Network usage fees are paid only for incoming energy, ensuring cost orientation because they are charged based on the actual interaction with the network and do not discriminate between consumers using net-metering and net-billing systems and all other consumers. In **Palestine**, the mechanisms in place to allow energy consumers to participate are part of renewable energy regulations, and PERC has developed the net metering regulation as a result.

By providing self-consumers with legal status, the mechanisms in place in **France** support and encourage the development of self-consumption. The government, on the other hand, has put in place a number of support mechanisms, such as feed-in tariffs and tenders. The CRE is responsible for setting network tariffs that reflect network user costs, as well as ensuring that these tariffs take into account the growth of self-consumption, the benefits it brings to the network, as well as the potential additional costs it may generate. Self-consumption has different effects on the network depending on whether it is individual or collective. Individual self-consumption consumes energy that does not travel through the public network, unlike collective self-consumption. Individual and collective self-consumers are assessed a management component that reflects the higher costs of their more complicated management. There is currently no economic justification for a specific extraction component that is different from that of other consumers for individual self-consumers. CRE's tariffs for the use of public electricity networks, like any other new type of network use, take into account the development of self-consumption. CRE ensures that tariffs are effective and robust, so that changes in behavior, and thus network costs, result in a consistent change in the bill, regardless of how much electricity is used. The main question for collective self-consumption is whether to value certain flows passing through low voltage. If properly sized and supervised, collective self-

² Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources;

consumption can be beneficial to the electricity system. CRE has therefore introduced a new tariff that is consistent with the network effects of consumption, resulting in different tariffs for flows transiting via low voltage and flows transiting via high voltage, whereas traditional consumers are charged based on average flow.

According to the legal framework in **Greece**, which is based on REA's opinion, autonomous producers, who include both self-consumers who are not connected to the network and self-consumers who are connected to the network, are referred to as self-producers. The latter injects any excess electricity produced into the grid.

Prosumers who produce electricity solely for self-consumption and whose generating capacity is limited to their connection capacity are regulated by **Montenegro's** legal framework. The energy law regulates in detail the production of electricity for personal use, stating that final consumers who produce electricity for personal use from renewable sources or highly efficient cogeneration with occasional deliveries of surplus electricity to the distribution system, in a plant with installed capacity not exceeding the value of the final customer's connection capacity, have the right to consume, store, and sell the produced electricity.

Energy consumers' participation is mentioned in the context of energy efficiency in **Portugal**. The Consumption Efficiency Promotion Plan (PPEC) is a competitive mechanism managed by ERSE that promotes demand management measures. The measures are applied through a competitive selection tender to consumers from various market segments, including industry and commerce, agriculture, service sectors, and households, and are based on the criteria set forth in the Rules for the Consumption Efficiency Promotion Plan. This competitive tender allows the above-mentioned promoters to choose the best energy efficiency measures to implement, considering the amount available in the PPEC annual budget. The PPEC rules were revised and published in March 2021, and they were expanded to include EE measures for gas consumers, promoting energy efficiency in an integrated manner in the electricity and gas sectors, which necessitated the adaptation of measurement and assessment methodologies as well as the inclusion of new promoters. In terms of self-consumption regulations, ERSE has adopted a revised Code of Self-consumption, which establishes a more comprehensive and clear set of rules, with a focus on the inclusion of energy storage activity in the context of self-consumption and the possibility of pilot projects.

In **Spain**, Royal Decree 244/2019 updated the regulatory framework for active consumers. Several types of active consumers were established as a result of this regulation:

- i) Self consumption, not accounting self-generation surplus (a device prevents energy injections to the grid). Type i) can only act as a consumer with their corresponding rights and obligations.
- ii) Self consumption, accounting self-generation surplus. The generation facilities are enabled to inject energy to the grid. Type ii) can also act as a generator with their generation surplus, applying their corresponding rights and obligations, and can thus participate in energy markets as a generator.

These two options also distinguish between facilities with capacities of less than 100kW and those with capacities of more than 100kW.

All generation technologies are permitted, but network charges are waived for self-consumption via renewables, cogeneration, and waste (provided the distribution network is not used).

In **Turkey**, energy consumers are involved in the generation of unlicensed electricity. Consumers can build unlicensed renewable power plants to meet their electricity needs and sell the excess electricity to the grid under the Unlicensed Electricity Generation legislation. Both their consumption and production are subject to a special tariff mechanism. The current regulatory framework governing self-consumption is EMRA's Procedures and Principles Regarding the Construction of Solar Power Plants with Rooftop and Facade Applications, as well as the by-law for Unlicensed Electricity Generation.

In some of the countries that responded, new developments and regulations are in the works. **Italy** has put in place a mechanism that allows consumers to participate by operating small-scale renewable production/consumption facilities, primarily distributed solar photovoltaic systems. The development of a new regulation promoting energy communities and allowing consumers to collectively contribute to the energy transition is underway in accordance with the EU Energy for All Strategy.

In **Egypt**, there are no legislative barriers to allowing self-consumption, but implementing regulations are currently being developed. However, for small projects up to 500KW and medium projects up to 20MW, net metering regulations are in place.

Similarly, **Jordan** has mechanisms in place, such as support schemes for renewable energy and energy conservation, but more adjustments and development are required, and **Morocco** has an enabling legal framework that is currently being amended to provide more clarity for self-consumers.

In **Algeria**, some initiatives for self-consumption and energy conservation are underway, and the regulatory authority is working to develop self-consumption regulations.

Smart meter deployment contributes significantly to real-time pricing and smart grid developments. Real-time prices paid for electricity consumed or generated at a given transmission node are becoming more important, as they will enable interactive prosumer behavior toward innovative smart prosumer activities.

France, Egypt, Albania, Cyprus, Greece, Italy, Jordan, Montenegro, and Palestine are among the countries that have reported having a smart meter strategy in place. In 2020, **Spain's** smart meter rollout will have reached 98%. In **Turkey**, such a document is being developed, but **Algeria, Morocco, and Portugal** have no such strategy in place. France is further ahead in terms of smart meter deployment, having installed 7 million in the gas sector and 30 million in the electricity sector, whereas Greece has yet to implement any.

2

VIEW ON REGULATORY PRINCIPLES IN THE MEDITERRANEAN REGION

This chapter examines the regulatory principles of NRAs in relation to the energy transformation process. The analysis is based on responses from 13 MEDREG respondent members, as listed in Annex 1 of this report and in the Mediterranean Regulatory Outlook 2020³.

The MEDREG Good Regulatory Principles, which were identified in the Regulatory Outlook 2014/2017/2020, describe energy regulatory frameworks in terms of the following aspects:

Principle	Description
Independence	Independence from national and regional government and the industry guarantees regulatory stability and neutrality and avoids situations in which the decisions of the regulator are constantly modified or influenced.
Competences	Duties and powers should constitute a minimum set of competences, defining the specific responsibilities of a regulator to promote competition and empower consumers.
Internal organization	Effective organization means to have clear decision-making processes and an operative internal structure, with distinction of roles and responsibilities.
Enforcement	Enforcement is to ensure compliance with rules by market participants and regulated entities, to obtain the public benefit that regulation provides.
Transparency	Transparency in the regulatory process helps others understand the regulator's work and is beneficial for a proactive stakeholder engagement.
Accountability	Accountability means that the regulator takes on responsibility and can demonstrate outcomes and results from its regulatory action.

Table 1. MEDREG's regulatory outlook and energy regulatory frameworks aspects

Energy transformation necessitates the participation and contribution of NRAs in strategic solutions to ensure the energy sector's stability, security, and effectiveness, as well as short-term interventions. The increasing trend of renewables deployment forces short-term decisions. On the other hand, the energy transformation necessitates visionary solutions' that incorporate innovative market instruments and smart technologies aimed at improving energy efficiency and security, as well as lessons learned from today's fragmented initiatives.

The regulatory authorities' responsibilities are diverse, encompassing not only administrative but also legislative and judicial tasks. From the perspective of the energy transformation process, independence is an important regulatory principle of NRA's functioning and position. The integrity of NRA's decisions and acts, as well as their stability and neutrality, are linked to their independence from governments and commercial interests in the energy sector.

³ Available at <https://www.euneighbours.eu/en/south/stay-informed/publications/medreg-mediterranean-energy-regulatory-outlook-2020>

Financial independence is linked to institutional independence in some ways. Several NRAs in respondent countries, such as CRE (**France**), PERC (**Palestine**), and CNMC (**Spain**)⁴, are solely funded by national state budgets. Other NRAs rely on their own funds, which come from license fees, market participation fees, and fines. Fees for participation in scientific programs, as in the case of RAE (**Greece**), profits from the sale of publications and studies, as in the case of ERSE (**Portugal**) and EMRA (**Turkey**), incomes from end-consumers, as in the case of CREG (**Algeria**), as well as donations and grants from international organizations, as in the case of EgyptERA.

Except for PERC (**Palestine**) and EMRC (**Jordan**), which are considered partially independent, the NRAs in the respondent countries operate independently from other public and private entities. This is because PERC receives formal or informal instructions from other government agencies, and its decisions can be appealed to the ministry for review, and EMRC decisions can sometimes be influenced by the Prime Minister.

However, depending on each country's constitutional and legal arrangements, the government may be in charge of determining the policy framework for renewables, energy efficiency targets, and supply security, among other things, within which the NRAs operate independently or autonomously. CRE (**France**) is an example of a situation in which the ministries of economy and sustainable development may issue instructions, for example, on tendering procedures for RES capacity, while remaining independent of the ministry of economy and sustainable development.

On the other hand, by interacting with other public entities and contributing to strategic changes and developments in the energy sector, NRAs must be seen as promoters of change and innovation. NRAs serve as advisers to responsible ministries or the government in many countries on specific topics such as national energy plans, supply security, and tariff methodology.

Decarbonization of the energy sector must be accompanied by measures that ensure supply security, which is critical for social stability and economic growth, as well as consumer protection in terms of energy price affordability. Such processes necessitate dynamic regulations, which are regulations that adapt to a rapidly changing and evolving market as a result of decarbonization, renewable energy deployment, and digitalization while ensuring consumer protection. The regulations governing the transformation, on the other hand, must provide market flexibility while also ensuring market stability. The NRA has a critical role to play in balancing the interests of governments, energy suppliers, and, most importantly, customers.

The ability of NRAs to transform energy is one of the most important regulatory principles, not only for NRA decisions and acts, but also for the development of analysis and orientation of policies and regulatory frameworks under the responsibility of other state stakeholders, such as ministries and governments. Market design and opening are usually regulated at the legislative level. The NRA can help in this regard because it not only has technical expertise, but it also has access to up-to-date and diverse information from energy market participants, including technical, financial, and commercial data.

All NRAs are responsible for monitoring and reporting in regards to supply security and quality. According to EU legislation, the NRAs of **Italy, Portugal, France, Greece, and Cyprus** are responsible for analyzing the

⁴ CNMC has a hybrid budget mainly composed by National State Budget, plus some market participation fees.

consistency of network development plans and approving the plans submitted by market operators. These types of analyses provide indicators for projected production capacities and demand forecasts. The responsible authority may start the tendering process if there are any gaps. In **France**, the minister of energy initiates tendering, while the CRE is in charge of implementing it. CRE also has the authority to introduce appropriate short and long-term incentives aimed at improving operator performance, which is linked to the integration of the gas market for supply security. Other NRAs are involved in the implementation of measures to address supplier shortages during peak times, including last-resort suppliers.

One obvious and important criterion for categorizing NRAs into clusters is EU membership, as in the case of **France, Italy, Greece, Portugal**, and **Cyprus**, or being a contracting party of the Energy Community, as in the case of Albania and Montenegro. Following through on the green deal initiative, EU members have aligned legislation and function as part of an integrated internal energy market, not only in terms of regulation, but also in terms of funding.

2.1 Tools of dynamic regulation in the energy sector in the Mediterranean

Dynamic regulation refers to an adaptive regulatory framework that encourages regulators to be enablers of energy regulatory framework adaptation in response to the societal trend of digitalization, smart technologies, decarbonization policies, and decentralization of energy generation⁵.

MEDREG members believe that dynamic regulation should encourage innovation while achieving regulatory objectives. Given the dynamics of the energy sector, as well as the rapid advancement of innovation and technology, there is no single solution that can meet all of the sector's needs and developments. However, even within the energy sector, different stakeholders adapt at different rates throughout the energy transformation process, and the legal and regulatory framework cannot provide tailor-made solutions for all stakeholders. As a result, flexible legislative provisions, such as the sandbox regulations being introduced and implemented in **France** and **Portugal**, may be used to test innovative solutions and projects.

2.2 Grouping the MEDREG members with similarities on dynamic regulation

The MEDREG members are grouped into clusters with similar characteristics projects on energy transformation in the table below, based on their similarities in dynamic regulations. Only 10 of the 13 NRA respondents, according to the responses, are using dynamic regulation based on characteristics like pilot projects, pilot regulations, and regulatory sandboxes. The main goal of the NRA is to support renewable energy projects, smart grids/systems, and electric vehicles.

⁵ CEER Approach to More Dynamic Regulation, Ref: C21-RBM-28-04;

MEDREG Member	Similarities
Albania	The Supervisory Control and Data Acquisition (SCADA) system was launched by the Transmission System Operator. The SCADA system is also provisioned and regulated by the Transmission Code. Another example of a tool of dynamic regulation is the DAMAS platform for nomination, capacity allocation, balancing, and market rules implementation.
Algeria	Smart meter projects include the pilot project of the photovoltaic sector (Ghardaia). Modernization of distribution (call-center, online bill payment, and so on) and modification of the tariff structure have been made to reflect the real costs incurred by customers.
Cyprus	The tariff regulation and the deployment of flexibility products have been the main means. This includes an incentive-based tariff methodology that provides, among others, incentives to regulated entities to operate efficiently, exemption from license concerning projects involving innovative technology for the production of electricity from RES, with total installed electrical capacity up to 200kW, and the implementation of a binding timetable for the mass installation and operation of smart metering systems by the DSO.
Egypt-EgyptERA	Currently, since it is a transitional phase until market opening and until fulfilling the RE targets, all regulations are dynamic, including smart grids and smart meters, FIT Regulations, and Net Metering Regulations.
France	<p>The legal framework introduced a regulatory sandbox that can be used to implement innovative regulation. In fact, CRE can temporarily adapt the regulatory framework so that stakeholders can test innovative services and technologies.</p> <p>From 2014–2019, CRE implemented roadmaps to monitor DSOs and TSOs' actions in favor of smart grids development in France. In yearly reports, CRE used to identify the opportunities attached to smart grids and the obstacles to their deployment and to publish a number of recommendations in favor of smart grids development. To follow-up on the implementation of these recommendations, each DSO and TSO with over 100 000 clients was asked to provide a “smart grids roadmap” every year. The roadmaps will be replaced by feedback from smart grids demonstrators. As of 2015, some schemes were invented to promote experimentation and innovation in specific areas such as smart grids. As an example, CRE took an active part in the implementation and follow-up of large-scale experiments of smart grids technologies as part of a national state-funded industrial plan to develop smart grids.</p>

MEDREG Member	Similarities
Greece	<p>Case study: Agios Efstratios island where a special licensing procedure, in derogation of the existing provisions, are to be followed concerning the island of Agios Efstratios on which a hybrid RES-based power generation system, together with a district heating infrastructure, will be installed. The goal of this system is to cover 85% of the island's demand (the remaining 15% will be covered by the existing diesel-based power generation unit).</p> <p>Any power surplus can</p> <ul style="list-style-type: none"> • be converted to thermal energy (storage in water tanks and distribution to households); • be stored in order to charge electric vehicles and bikes; • be used by municipal buildings in order to increase their energy efficiency.
Morocco	<ul style="list-style-type: none"> • Auto-production law for self-generation and sale of the generation surplus to the TSO. • Introduction of super peak tariffs for THT/HT clients. • Pilot sites for smart metering.
Portugal	<p>In the last few years, ERSE has approved several pilot projects.</p> <ul style="list-style-type: none"> • Pilot Project 2020 “use of technical quality of service data from smart meters” • Pilot Project 2020 “vehicle to grid (V2G) in the Azores” – The Electric Mobility Code, approved by ERSE, establishes pilot projects to allow and stimulate innovation in a recent sector. The vehicle to grid pilot project in the Azores is part of this strategy, which is reinforced, as it is a pilot project in an isolated network, where the contribution of V2G may be more relevant to the management of the system. • Pilot Project 2019 “participation of the demand Response in the Portuguese “balancing market” – It aimed to ensure equal treatment in the participation of qualified consumers, or their representatives, in the replacement reserve market. • Pilot Project 2018/2019 on “Dynamic Access Tariffs” – The objective was to promote flexibility on the demand side, having regard to the lower supply-side flexibility from renewable energy sources.

MEDREG Member	Similarities
Turkey	<p>EMRA has started to work on a smart grid system and introduced a support scheme for R&D projects in an electricity distribution system, including smart grid projects. One of the main projects performed in this area is “Turkey Smart Grid Vision and Strategy Determining Project”, which is coordinated by Association of Electricity Distribution System Operators (ELDER) with the support of EMRA and handled by all 21 electricity distribution companies. Within the scope of these studies, issues related to smart grid are gathered under the following technical component:</p> <ul style="list-style-type: none"> • Advanced network monitoring, control, and management systems • Distributed energy integration and storage • Electric vehicles • Smart meter infrastructure and customers (demand-side management)

Table 2. MEDREG members with similarities in dynamic regulation

2.3 Cluster on existing tools of dynamic regulation in another sector

In nine MEDREG member countries, dynamic regulation is not applicable, but there is a cluster of four members who have clearly shown that this can be implemented in other sectors.

MEDREG Member	Similarities
Albania	<p>Examples coming from other sectors include the e-Albania Portal, which is a very important tool of dynamic regulation in Albania. E-Albania is a multi-functional governmental portal oriented toward users’ needs (individual or business). It is conceptualized as a one-stop office, where users obtain electronically updated and easily accessible information and services provided by public institutions in Albania, according to their needs.</p>
Algeria	<p>The biomass project (waste management for the production of electricity, heat, and fuel) is an ongoing project initiated by the Ministry of Environment.</p>

MEDREG Member	Similarities
France	A regulatory sandbox already exists for the telecommunications industry. ARCEP (the regulator of the telecommunication industry) oversees the sandbox introduced by a law in 2016. As the perimeter of sandbox is relatively small, the sandbox has not been used so far, as far as we know. Barriers faced by innovators are not within the perimeter of the sandbox.
Morocco	The Moroccan National Railways Office (ONCF) features flat rate pricing as a sort of dynamic regulation such as plane flight prices.

Table 3. Cluster on existing tools of dynamic regulation in another sector

3

ENERGY TRANSFORMATION CHALLENGES AND OPPORTUNITIES TO OVERCOME THE BARRIERS

Even though climate change necessitates visionary approaches that encourage innovation in the renewable energy sector, various countries commit varying levels of support to promote R&D in the energy sector. Some of the questions in the questionnaire are designed to gather data on the level of support and the types of mechanisms in place by MEDREG member countries to promote R&D in the energy sector, because such mechanisms, as well as measures that incentivize innovation, will have a long-term impact on knowledge accumulation and, ultimately, technological progress.

According to the responses, **Albania, Greece, Montenegro, and Palestine**, 4 out of 13 respondent countries, do not have any mechanism in place to support R&D. The regulator in Montenegro, on the other hand, can approve investment plans that include investments that will lead to the development of R&D activities, and the regulator in Albania has measures in place to encourage regulated entities to conduct or develop R&D activities, which are primarily focused on network losses, consumption, and production.

In 6 out of the 13 countries that responded, the regulatory authority has no measures in place to encourage regulated entities to conduct or develop R&D activities, such as in **Palestine, Morocco, Algeria, Egypt, Cyprus, and Greece**. It appears that 2 out of 13 countries lack mechanisms and policies for promoting and incentivizing the R&D sector.

EU member countries benefit from additional assistance that other countries may not receive.

Greece, for example, reports that Fit lacks a national mechanism for promoting R&D. The European Commission, on the other hand, has launched the Horizon Europe Program, which covers a wide range of economic sectors. Horizon Europe's goal is to combat climate change while improving the energy and transportation sectors' competitiveness, as well as the quality of services they provide to European society.

In the case of **Portugal**, it is reported that there is a mechanism to encourage electricity DSOs to innovate, despite the fact that no projects have been presented or completed through that mechanism to date. ERSE, on the other hand, has been implementing TOTEX regulation, which allows regulated entities to manage costs and engage in R&D to the extent that potential gains can be identified. The underlying cost of developing such activities, however, is not guaranteed in terms of acceptance into the regulator's allowed revenues.

France is one of the most advanced countries in the world when it comes to promoting R&D in the energy sector. In the field of renewable energies, the state primarily supports R&D activities through the Ecological Transition Agency's "Investments for the Future" program, also known as "ADEME" (demonstrator funds), or the National Research Agency (Institutes for Energy Transition). Dedicated project calls can also help to speed up the development of renewable energy by providing specific support to project leaders. As a result, since 2009, ADEME has launched a series of calls for expressions of interest or calls for projects, allowing it to fund a number of projects in the fields of electricity and renewable heat production through the Investments for the Future program's "Demonstrators and technological platforms for the ecological and energy transition" action". In addition, CRE has implemented an incentive regulation for the TSO and DSO to encourage research and development.

The regulator of **Italy** encourages R&D in the energy sector by monitoring and approving the plans and activities proposed by Ricerca del Sistema Energetico (RSE), a publicly-owned company that conducts

research for the entire energy sector. The company is supported by economic resources provided by the regulator through regulated electricity and gas tariffs. In addition, as discussed in **Chapter 1.1**, Italy has a regulatory framework in place that encourages innovation.

The Centre for the Development of Renewable Energies (CDER) in **Algeria** is a research institute tasked with developing and implementing scientific and technological research and development program for energy systems that use solar, wind, geothermal, and biomass energy. The National Research Programs on Energy, which include more than 200 projects in the sub-programs Renewable Energies, Hydrocarbons, and Nuclear Techniques, are managed, followed up on, and expertly managed by CDER. The national projects chosen for this program are focused on economic and social priorities in order to meet the most pressing economic development needs. In addition, the government is establishing a new energy transition school, UDS (Bousmail). The Research Institute in Solar Energy and New Energies (IRESEN) and Masen's R&D platform are two national organizations dedicated solely to R&D in the energy sector in **Morocco**.

CERA encourages research and development in the generation, transmission, distribution, and use of electricity, according to the law that governs the electricity market in **Cyprus**. **Egypt** claims to have several programs in place with the EU to share their knowledge and experiences. In the electricity sector, they collaborate with national universities and research centers, as well as the Extra High-Voltage Research Center.

According to **Turkey**, electricity and gas distribution and transmission companies receive a dedicated R&D budget equal to a certain percentage of their operating expenses. The Procedures and Principles Concerning R&D regulate the development and implementation of innovation/incentive regulations. In addition, there are provisions in the legislation and regulations to encourage R&D activities for innovation. Within EMRA, an R&D commission has been established to assess the R&D projects proposed by distribution companies. Additionally, distribution companies are permitted to sell patent rights in order to generate additional revenue. The remaining percentage is included in the tariff mechanism to benefit final consumers. The transmission tariff, as well as the R&D budget, are included in the OPEX structure for the single state-owned transmission company.

The National Energy Research Center (NERC) was established in **Jordan** for the purpose of conducting research, development, and training in the fields of new and renewable energy, as well as raising energy use standards in various sectors and promoting the use of renewable energy. NERC has trained many private and public sector professionals in Jordan and the Middle East to promote energy efficiency and conservation practices. NERC is actively involved in EU-funded projects that focus on the development of new energy efficiency technologies and techniques, as well as the transfer of knowledge. NERC performs techno-economic feasibility studies, building energy design studies, energy audits, monitoring and measurements, as well as performance measurements and certification of buildings and products for third parties.

In addition to sector participants, the energy transformation process necessitates interdisciplinary participation and research contributions from a variety of stakeholders. This is also linked to the process' transparency, which should be ensured by involving and consulting all stakeholders, including citizens. Interaction with a wide range of stakeholders, including academia, non-governmental organizations, and

even individuals, will help to safeguard not only the technical aspects of the energy transformation process, but also the social and economic development. The challenges of the energy transition will necessitate behavioral change and adaptation, and students and young people can help to promote and support these changes. When MEDREG countries were asked if they have or use consultative platforms involving actors who might contribute to transformation challenges, new technologies, new market structures, and the associated economic and societal impact, only 2 out of 13 respondent countries said no. In **Jordan**, such platforms are still lacking, whereas **Morocco** has stated that it intends to hold a consultation workshop with energy sector stakeholders, including developers, investors, and consumers.

Albania has reported having operational communication and interaction platforms involving a variety of stakeholders, each with their own responsibilities and contributions to the 'sector's operation and development. The existing consultative interaction among sector participants has aided in the identification of sector-wide challenges and has had a significant impact on guiding decision-makers and other stakeholders in addressing these issues. However, it has already been identified that there is a need to strengthen cooperation and communication with all relevant actors in order to ensure the exchange of up-to-date information about the energy sector's evolution, as well as involving individual stakeholders to ensure that the challenges they face are clearly communicated and collectively addressed. The law on public participation and consultation makes it mandatory to consult on relevant legislation and policies.

In **Egypt**, there is already a relationship with the stakeholders. EgyptEra has begun signing protocols and memorandums of understanding with NGOs and other national regulators in the gas and water sectors.

Similarly, ERSE (**Portugal**) has signed a number of Memorandums of Understanding with a diverse range of academic institutions, with the goal of promoting knowledge exchange and the development of academic thinking on energy-related issues. ERSE launched CONVERSE, a series of debates for ERSE colleagues and key partners in Portugal to examine developments, innovations, and timely topics in the energy sector from a variety of perspectives.

In **Turkey**, EMRA holds regular consultation meetings with representatives from the public and private sectors on a variety of topics as needed. Draft regulations are posted on the website for public comment and are finalized after taking into account stakeholder input.

Palestine has reported working with consumer advocacy groups, universities, chambers of commerce, and labor unions, as well as the media and other government institutions.

Before making major decisions in **Italy**, the regulatory body conducts ongoing consultations. Apart from the legally mandated formal consultation process, the regulatory promotes seminars, attends conferences, and maintains a constant dialogue with stakeholders. It also organizes and manages a regular stakeholders meeting with specialized groups. Energy conferences, such as CIGRE, are used by **Montenegro** to bring together government and non-government organizations, regulators, energy companies, and other stakeholders to exchange ideas and discuss issues relating to the energy sector.

Even in terms of stakeholder involvement, **France** is a leader. There are currently ongoing consultations relating to the incentive regulation framework. Furthermore, the NRA has established a Foresight Committee to develop innovative market approaches as well as assess how regulators can meet future

challenges. This Committee brings together all stakeholders in the energy value chain, including private and alternative energy suppliers, consumer representatives, environmental agencies, renewable energy companies or unions, the mobility sector, elected local officials, members of the Parliament, and so on. The goal of this project is to provide expertise to the NRA and other stakeholders, as well as to identify common paths for implementing a successful energy transition as a result of innovation. The Foresight Committee is divided into different working groups organized around upstream (energy mix), grids (flexibility, storage), and downstream (consumer) issues in order to anticipate, identify, and understand the major challenges in the energy sector in the medium and long term, from 10 to 30 years. Industrialists, scientists, academics, sociologists, elected officials, and experts have been participating in these discussions for the past three years. This Committee is not bound by the NRA's decisions or positions; rather, it is a self-contained entity that oversees the industry's future challenges.

The energy transformation has already begun and will pick up speed in the coming years in order to meet energy supply and climate change mitigation goals while ensuring long-term growth and development. It is a complex process by its very nature, affecting each country and posing significant technical, financial, social, political, and legal challenges. One of the most difficult aspects of the energy transition is overcoming legal, policy, economic, behavioral, cultural, and territorial barriers.

According to the MEDREG respondent members' feedback, these countries face similar challenges in terms of energy sector evolution and innovation. Costly investments in technology and infrastructure, available financial resources, a lack of efficient cooperation among energy market actors, an inadequate regulatory framework lacking incentives to promote market participation, limited consumer involvement and awareness of market participation, and sometimes a lack of competition, lack of law enforcement, and unstable socio-economic conditions are all barriers to market participation. Extensive cross-border cooperation and established interconnections will result from the energy transformation, posing additional regulatory and investment challenges.

Despite the common challenges associated with energy transformation, different countries approach the challenges and barriers associated with energy transition at different rates. Barriers exist even in more advanced countries, such as **France**. Multi-energy coupling is not encouraged by the French legal framework's specialty principle. One of the major impediments to energy sector evolution in **Greece** is the lack of incentives for market participants, as well as the lack of necessary financial resources and a skilled workforce. According to **Italy**, a lack of competition in the energy sector is a significant barrier to innovation. Furthermore, national and regional energy markets are not connected or coordinated. Single markets' relatively small dimensions stymie technological advancements that necessitate large-scale investments. In the case of **Portugal**, there is also a lack of competition.

Energy sector innovation in **Albania** is hampered by a variety of obstacles, including the need for technology and infrastructure development. This may result in additional challenges, such as regulatory challenges, complexity arising from multiple stakeholders' coordination, and/or possible changes in the roles of the main actors, in addition to the challenges posed by local and international political situations. In order to make informed or reasoned energy decisions, decision-makers must have information about the performance of their energy system options. The energy sector's long-term viability depends on sustained

public investment and leadership from public government institutions to ensure adequate provision of needed energy infrastructure. The main obstacles in **Cyprus** are managing the tension between regulatory goals and innovation, creating spaces for innovation, raising consumer awareness of the benefits of market participation, and improving cooperation between NRAs, TSOs, and DSOs. In **Egypt**, there is no framework in place for incentive-based regulations.

Renewables are supported by the Renewable Energy Support Mechanism (YEKDEM) feed-in tariffs, and there is already a sizable renewable installed capacity in **Turkey**, equivalent to approximately 48% of last year's electricity production. The Turkish Parliament's ratification of the Paris Agreement in October 2021 is a significant step forward in this regard, following the agreement's signing in 2016. The creation of the Climate Change Ministry and the Energy Transition department within EMRA, as a result of an amendment to the Electricity Market Law, which is currently in the final stages of approval, is expected to speed up the implementation of necessary regulations.

In **Jordan**, the lack of market competition 'does not encourage network operators to innovate in a disruptive manner, beyond the type of innovation that leads to economic efficiency, which is already encouraged by incentive regulation. To encourage innovation, regulatory tools must be improved. Another barrier is TSO constraints imposed by long-term contracts with generators with high purchasing prices. **Morocco's** lack of long-term investments stifles innovation and evolution in the industry. In addition, TSO and DSO's conservative nature is a stumbling block. Palestine, on the other hand, is currently confronted with political and technical barriers that are impeding the energy sector's evolution.

Algeria's situation appears to be more difficult due to the lack of an electricity and gas market, a lack of competition and private investors, a low level of law enforcement due to the law's organizational scheme not being implemented, operators' regulatory capacities being inadequate, and a general lack of regulatory culture.

CONCLUSION AND RECOMMENDATIONS

The entire world is entering a new era of decarbonization, combating climate change, and achieving climate goals, with a particular focus on the Paris Agreement on CO₂ emissions reductions. Energy regulators must play a significant role in this regard and work closely with policymakers. MEDREG members, on the other hand, will have to act as change agents in the areas of innovation and energy transition. Vanguard country examples, such as regulatory sandboxes or other innovative solutions, should be shared and promoted. The EU's upcoming climate initiatives will require EU countries in the Mediterranean, in particular to achieve climate neutrality by 2050 for their respective economies. Climate change and a faster energy transition were a main topic of discussion among G20 world leaders in Rome and were discussed again at the Conference of the Parties (COP26) in Glasgow (UK). Recent developments in the energy sector show that energy transformation is a no-return path; therefore, innovation should be encouraged to help diversify energy sources.

To achieve net-zero emissions in this critical context, the energy sector will need to undergo a major transformation. Energy regulators will have to see themselves as a critical tool in the system's transition to a low-carbon energy sector, using their powers to encourage renewable energy investment and support innovation and digitalization, with a particular focus on consumers. Based on these developments, MEDREG members will be required to play a key role in promoting the digitalization of their energy markets, including raising consumer awareness, data management, digitalization, and cybersecurity.

In the case of electric vehicles, charging point regulation appears to be crucial, and regulatory issues should include business model competition, nondiscriminatory network tariffs, connection procedures, and the integration of EV recharge in power system transformation. The e-mobility sector is undergoing significant changes at a time when the world must respond to climate change. E-mobility models must interact with network energy markets, and energy regulators must act in a transparent manner, following proper rules and procedures, to ensure the sector's proper function and system integration⁶.

More than a year has passed since the COVID-19 outbreak in Europe and the Mediterranean basin was first reported. Following a first wave of COVID-19 cases in the first half of 2020, several MEDREG countries have seen a second or even third wave of COVID-19 cases by the end of the year. Some of the effects are still unknown and may not manifest themselves until later this year or even later.

The negative effects of COVID-19 on the global economy and energy market demonstrated that energy regulation must adapt quickly to market and 'consumer needs. This pandemic situation has demonstrated that a strong social system can mitigate negative consequences such as those caused by the pandemic. Energy markets that work properly increase the overall resilience of the energy system, which has remained operational throughout the pandemic to the time of writing. However, MEDREG members' experiences from the 2020 crisis year showed that in order to overcome the pandemic situation, collaboration with the government is required in order to maintain a well-functioning energy market⁷.

⁶ MEDREG Smart grid report;

⁷ MEDREG Covid-19 Report;

In general, and particularly in competitive markets, the development of smart grids facilitates the transition from consumers to prosumers by increasing consumer awareness. Decentralized options and individual behaviors, on the other hand, require a certain level of coordination to be effective. In other words, it should be ensured that consumers make consistent choices as much as possible; technological options can undoubtedly provide a significant benefit in this regard. Aggregators and retailers, for example, play a critical role in demand side management. They can, assuming that specific signals are sent, organize a coordinated reaction of consumers based on the state of the system. In addition, energy poverty must be addressed without jeopardizing cost effectiveness.

The recent global energy price crisis is a serious concern for MEDREG members, and given the challenges that their energy sector has faced as a result of the pandemic and economies that have only recently begun to recover, NRAs must implement a proper regulation to protect vulnerable consumers and support energy market participants. Most Mediterranean countries still rely on fossil fuels to meet all of their power needs, and the final price of electricity is frequently determined by the price of coal or natural gas. In this regard, as gas prices rise, electricity bills will inevitably rise, even if clean, less expensive sources contribute to total energy supply.

Energy poverty is a growing issue that must be carefully considered if we are not to create significant barriers to the energy transition. While there is widespread agreement that the energy transition will provide households and businesses with cleaner and cheaper energy, current global developments in the energy market, as well as general economic concerns, point to rising prices. If this trend continues, fewer and fewer households and businesses will be able to afford energy, which will obstruct the development of social consensus on the energy transition. The electricity and gas prices require accountable, competent, and independent NRAs to influence policy framework and market instruments, as well as to monitor market performance. Regulators are then committed to analyzing, discussing, and identifying solutions and tools that allow the greatest number of households to access high-quality, reasonably priced, and transition-oriented energy services. MEDREG members will work together and share information on these critical issues, as well as take immediate action to reduce the impact on households and market operators this winter. They will, on the other hand, work on medium-term measures to protect the energy system/market and to weather any future unpredictability during the transition.

ANNEXES

Annex 1: Replies to the questionnaire

Country	National Regulatory Authority	Replies
Albania	Albanian Electricity Regulatory Authority (ERE)	Received
Albania	Albanian Electricity Regulatory Authority (ERE)	Received
Algeria	Electricity and Gas Regulation Commission (CREG)	Received
Algeria	Autorité de Régulation des Hydrocarbures	Not received
Bosnia and Herzegovina	State Electricity Regulation Commission (SERC)	Not received
Croatia	Croatian Energy Regulatory Agency (HERA)	Not received
Cyprus	Cyprus Energy Regulatory Authority (CERA)	Received
Egypt	Egyptian Electricity Utility and Consumer Protection Regulatory Agency (EgyptERA)	Received
Egypt	Gas Regulatory Authority (GASREG)	Not received
France	Regulatory Commission of Energy (CRE)	Received
Greece	Regulatory Authority for Energy (RAE)	Received
Israel	Public Utilities Authority – Electricity (PUA)	Not received
Israel	Natural Gas Authority (NGA)	Not received
Italy	Italian Regulatory Authority for Energy, Networks and Environment (ARERA)	Received
Jordan	Energy and Mineral Regulatory Commission (EMRC)	Received
Lebanon	Lebanese Center for Energy Conservation (LCEC)	Not received
Lybia	Ministry of Energy	Not received
Malta	Regulator for Energy and Water Services (REWS)	Not received
Montenegro	Energy Regulatory Agency (REGAGEN)	Received
Morocco	National Electricity Regulatory Authority (ANRE)	Received
Palestine	Palestine Electricity Regulatory Council (PERC)	Received
Portugal	Energy Services Regulatory Authority (ERSE)	Received
Slovenia	Energy Agency for the Republic of Slovenia (AGEN-RS)	Not received
Spain	National Commission on Markets and Competition (CNMC)	Not received
Tunisia	Ministry of Energy, Mines and Renewables (MIT)	Not received
Turkey	Energy Market Regulatory Authority (EMRA)	Received

Annex 2: CRE's case study – Regulatory sandboxes in practice

Derogations to network and facility access in France, for example, have been used to set up, on a trial basis, technologies or innovative services to promote energy transition, smart grids, and infrastructures.

Introduction

The energy sector has a great need for innovation, so it's critical that the current regulatory framework doesn't stifle it, but rather encourages it. To that end, a regulatory sandbox has been established. The regulatory sandbox in France is a dynamic regulatory tool. This system is seen as particularly effective in stimulating growth and innovation in the areas of decarbonization and digitalization of the economy.

The integration of renewable energy and clean mobility requires flexibility, which is offered by the network digitalization that includes: smart meters digital revolution and new technologies such as storage with more intelligent and flexible electricity and gas networks; new services and innovative.

To keep up with these changes in the energy sector, the legal framework must be able to evolve in accordance with societal and economic needs. Traditional methods of establishing relevant regulations or regulatory decisions are becoming increasingly difficult due to the increasing speed of change and innovation. These temporary exemptions are part of a framework that allows for the deployment of innovative experiments while also ensuring network safety, security, and quality, as well as network and facility operation. These experiments must contribute to the achievement of the Energy Code's Article L. 100-1's energy policy objectives.

a. Legal framework and principles of the regulatory sandbox

The Energy-Climate Law of 8 November 2019 (hereinafter referred to as the Energy-Climate Law) establishes a regulatory experimentation mechanism in the energy sector (also known as a "regulatory sandbox"). This system enables the testing of new technologies or services in support of the energy transition. It allows the administrative authority, or the Energy Regulation Commission (CRE), to grant project developers temporary exemptions from certain provisions of the Energy Code under certain conditions. **It's important to note that this exception only applies in a limited and controlled context. The Energy Code is only concerned with a small number of provisions.**

In this regard, Article 61 of the law on energy and climate states that the CRE and administrative authority **may grant derogations to network and facility access and use conditions in order to test innovative technologies or services.** This system establishes a legal framework tailored to projects that allow for the testing of innovations that would eventually necessitate changes to the relevant legislative and regulatory framework. Such derogations, on the other hand, may not be granted if (i) they are likely to interfere with the proper performance of the system operators' **public service obligations**, or to affect the **security and safety** of the networks or the quality of their operation, or (ii) they are in violation of **EU law** or **national public order provisions**.

b. Implementation method of the regulatory sandbox by CRE

CRE adopted a deliberation on the 4th of June 2020⁸ to specify the framework provided by the legislator in order to fully implement the regulatory sandbox. CRE gathered stakeholder feedback by holding a public consultation from 30 January to 2 March 2020, during which 35 submissions were received. The majority of the observations and comments concerned the following: eligibility criteria, procedure, application file' content, CRE's plan for monitoring the experiments, and any other implementation modalities that needed to be specified.

The June 2020 deliberation establishes several conditions concerning i) eligibility criteria and ii) the procedure. To be eligible, a project must: contribute to the **objectives of the energy policy** defined in Article L. 100-1 of the Energy Code; have an **innovative dimension**; face a clearly identified **legislative or regulatory obstacle**; have the **potential for further deployment** if the experimentation meets its objectives; and have a **community benefit** if the solution is eventually deployed. Within a 3-month application window, projects must be submitted. It will be followed by a 1-month preliminary eligibility analysis phase, a 3-month in-depth analysis phase, the experimentation phase, and the conclusion of the experimentation. In the meantime, CRE must decide on the project's eligibility, and the Ministry can still object. CRE will have to reconsider applications for additional exemptions after the in-depth analysis is completed. CRE will publish feedback on the experiments each year during the Experimentation phase, which can last up to 4 years, as well as an evaluation when the experiments are completed. The experiment can be ended, renewed, or a proposal for regulatory or legislative change can be submitted after CRE has assessed the project.

c. Examples and projects of the regulatory sandbox

CRE received 41 requests for exemptions during the submission period, covering roughly twenty different themes (electricity storage, electric vehicles, metering monopoly, renewable gases, and so on), of which 19 were eligible. CRE, the Ministry of Energy, or both are then responsible for granting the exemption. In November 2020⁹, the CRE held a deliberation to determine eligibility. **Eligible applications within 'CRE's jurisdiction were subjected to a thorough examination** by the departments, in collaboration with the Ministry, operators, and project leaders, which could result in an exemption and the start of experiments. CRE decided on the attribution of the exemptions in a **deliberation in March 2021**¹⁰ after the in-depth analysis phase. CRE granted exemptions to 9 projects aimed at facilitating the following among the 10 applications in its competences:

⁸ **Délibération N°2020-125** de la Commission de régulation de l'énergie en date du 4 juin 2020 portant décision sur la mise en œuvre du dispositif d'expérimentation réglementaire prévu par la loi relative à l'énergie et au climat

⁹ **Délibération N°2020-269** de la Commission de régulation de l'énergie du 5 novembre 2020 portant décision sur l'éligibilité des dossiers soumis à la CRE dans le cadre du premier guichet du dispositif d'expérimentation réglementaire prévu par la loi relative à l'énergie et au climat

¹⁰ **Délibération N°2021-59** de la Commission de régulation de l'énergie du 11 mars 2021 portant décision sur l'octroi des dérogations des dossiers soumis à la CRE dans le cadre du premier guichet du dispositif d'expérimentation réglementaire prévu par la loi relative à l'énergie et au climat

- the participation of storage to markets (balancing services);
- the development of local flexibility, thanks to innovative network tariffs;
- the injection of synthetic gas into the networks (7 projects).

The Ministry of Energy attributed exemptions to 3 projects, with the aim to optimize the connection of renewable electricity producers.

d. Participation of storage in the market

Among the actors, EDF SA submitted a demand for a derogation to facilitate the participation of storage facilities in system services. Its project is to optimize the use of a battery. EDF wishes (i) to hybridize the battery to provide reserves within an initial reserve perimeter and (ii) to aggregate this same battery, to provide more reserves within a second reserve perimeter. Finally, it would be able (iii) to switch from one reserve perimeter to another dynamically.

e. Development of local flexibility thanks to innovative network tariffs

ENGIE wishes to incite consumers to be more flexible and reduce consumption during energy peaks on the network thanks to innovative networks tariffs. To this end, ENGIE wants to test the use of innovative network tariffs with customers connected in low voltage grids, to provide flexibility to the DSO. This kind of option is not feasible for now; hence, there is a need to create such an option for the project.

f. Injection of synthetic gas into the network

Finally, six actors demanded to benefit from the same legal framework as biomethane with regard to the injection of synthetic methane into networks.

First feedback and the next steps of the regulatory sandbox

CRE is **taking notes from the first window and has already begun to consider several of the issues raised**. Six of the selected projects, for example, requested the same exemption. This could indicate that market participants have a genuine need. Then CRE must balance the desire **to support innovation by treating all actors fairly** with the need to ensure that the sandbox does not **become a foreshadowed generalization**. Finally, as previously demonstrated, the French NRA and the Ministry of Energy share expertise. To improve efficiency, both parties should work on a better way to coordinate their actions.

The regulatory sandbox appears to be a collaborative process involving all parties involved, including the French National Research Agency, the Ministry of Energy, applicants, and market stakeholders. In fact, some project leaders **did not clearly identify the regulatory provision** from which they wished to derogate in their applications (which is a mandatory condition to fulfil). **CRE's services were occasionally required to assist project leaders in identifying these provisions** so that they could amend their application. This emphasizes the importance of accompanying participants throughout the procedure and establishing a clear path. The analysis phase, on the other hand, provided an opportunity for CRE to learn from participants while interacting with various stakeholders. In a maximum of 4 years, the results of the experiments will be known. CRE, on the other hand, has extended the deadline until December 2021. In January 2022, instruction will begin.



Co-funded by
the European Union

MEDREG – Association of Mediterranean Energy Regulators
Via Fieno 3, 20123 Milan, Italy –Tel: +39 3402938023
info@medreg-regulators.org www.medreg-regulators.org