REGULATION AS A TOOL FOR THE INTEGRATION OF RENEWABLE ENERGY SOURCES

The fight against climate change calls for a green energy transition

Countries in the Euro-Mediterranean region are taking measures to respond to climate change and tackle the adverse environmental impact of greenhouse gas emissions. In December 2010, the **European Union** (EU) announced the **Green Deal**, a set of policy initiatives through which it aims to become **climate-neutral by 2050**. Southern-shore countries are setting ambitious objectives as well; for instance, **Morocco** recently announced a **CO2 emissions reduction target of 45.5% by 2030**.

The **energy usage** across economic sectors and energy production account for a **large part of greenhouse gas emissions** (75% in the EU).

The European Green Deal

The decarbonisation of the energy sector intended in the EU's Green Deal requires the following:

- Smart infrastructure along with cross-border and regional cooperation
- Innovative technologies and infrastructure such as energy storage, smart grids, hydrogen, etc.
- Reviewed and updated European regulatory frameworks for energy infrastructure to ensure consistency with the objectives of the Green Deal

To achieve their climate objectives

Mediterranean countries must:

- Introduce large shares of renewable energy into the energy system
- Phase out the use of coal and other fuels that cause greenhouse gas emissions
- Develop integrated, interconnected and digitised Euro-Mediterranean energy markets that are technology neutral

Recommendations on how energy regulators can prepare for the energy transition

Focus on customers and enable them to choose suppliers as well as seize the opportunities arising from the energy transition.

Increase digitalisation to give stakeholders **full access to data** and encourage them to engage in the system operation.

Strengthen the coordination between Transmission System Operators (TSOs) and Distribution System Operators (DSOs) for effective, flexible and secure power system operations.

Re-evaluate infrastructure investment in long-distance transmission grids when decentralise energy resources prevail.

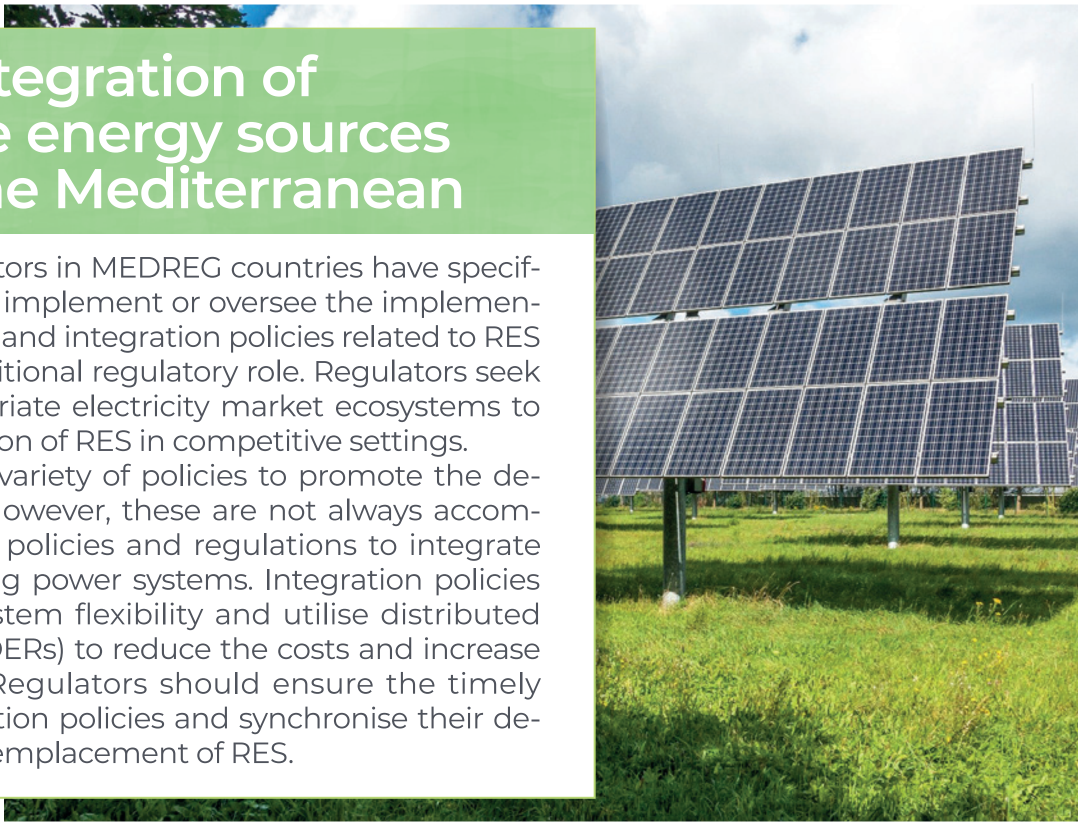
Upgrade the electricity market model by integrating supranational markets together with local markets in both real-time and long-term time horizons.

Upgrade the grid access tariff structure to adapt the cost allocation to conventional consumers, prosumers or owners of distributed energy resources.

Encourage the development of smart grids that effectively integrate information and communication technology into every aspect of the electricity supply chain.

Adopt an integrative approach of regulation which applies simultaneously to large and decentralised generation and to all energy system actors, such as heat, mobility and the power sector.

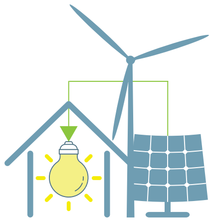
System integration of renewable energy sources (RES) in the Mediterranean



Most energy regulators in MEDREG countries have specific responsibilities to implement or oversee the implementation of promotion and integration policies related to RES alongside their traditional regulatory role. Regulators seek to establish appropriate electricity market ecosystems to enable the integration of RES in competitive settings.

In fact, there are a variety of policies to promote the deployment of RES. However, these are not always accompanied by rigorous policies and regulations to integrate RES into the existing power systems. Integration policies should increase system flexibility and utilise distributed energy resources (DERs) to reduce the costs and increase system reliability. Regulators should ensure the timely adoption of integration policies and synchronise their deployment with the emplacement of RES.

New regulatory options to increase RES

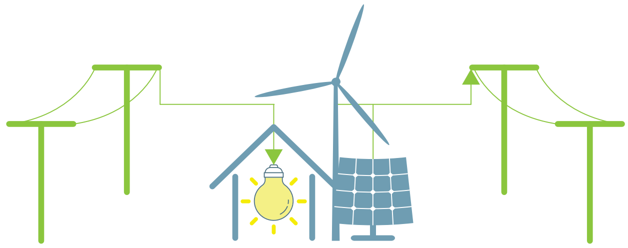


1 Self-consumption

Self-consumption is the **use of power generated on site by an energy consumer** to reduce, at least in part, the purchase of electricity from the grid. It can take three different forms:

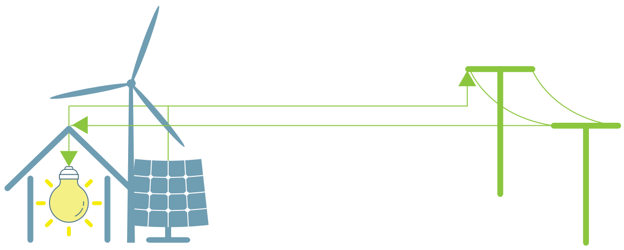
Buy-all, sell-all model:

All the **self-generated power is sold to the system** according to an agreement between the generator (prosumer) and the utility at a fixed tariff for a fixed duration. The **self-generator consumes all the electricity from the grid**, which is why their activity as a generator is separated from that as a consumer. Two meters are required for this approach.



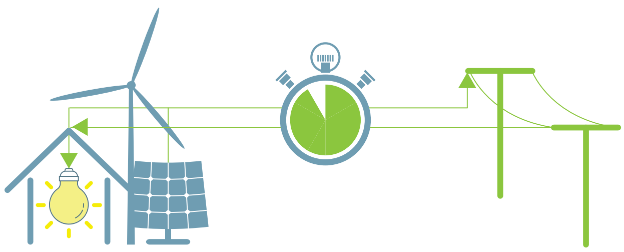
Net metering model:

Self-generators consume all the electricity they produce and reduce their consumption from the grid. The **excess energy produced is delivered to the utility for an energy credit**, which can be used as a reduction of the bill owed for the electricity consumed from the grid. The process of net metering provides system owners the opportunity to gain extra revenue by selling their excess power to the grid while making up for shortfalls via the grid. This system requires a bidirectional meter.



Real-time self-consumption model:

This involves the generation and self-consumption of power by selling excess electricity to the grid. However, unlike the net metering scheme, the accounting of the metering for the **sold and consumed electricity is calculated in a short time window** with a very short time interval (which can be less than a one-hour span). This system requires a bidirectional meter as well.



Two example cases

LEBANON

In Lebanon, two main technologies fall under the self-consumption scheme: solar photovoltaic and private diesel generator.

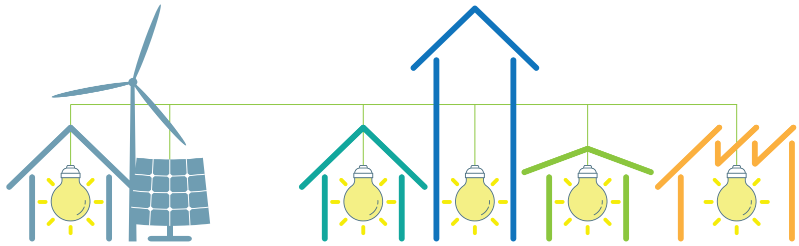
Due to power shortage problems such as electricity outages and blackouts, consumers rely on private diesel generators for self-consumption.

Consumers can feed the electricity generated by the distributed solar photovoltaic.

PORTUGAL

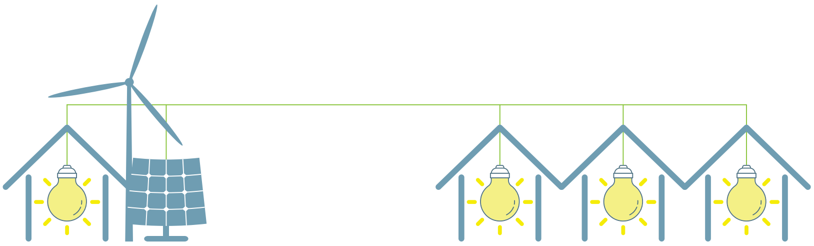
In Portugal, consumers may generate electricity within their installations for self-consumption. Prosumers can also share renewable energy generation with other consumers nearby. The main policy goal is to promote small-scale renewable generation and enable community-scale projects for the same. Self-consumption is an important means for the country to meet its national targets regarding greenhouse gas emissions reduction. By the end of 2019, the installed power in self-consumption units was around 30,000 self-consumers, with a capacity of 216 MW and an annual renewable generation of 270 GWh.

2 Risks and limitations of energy support schemes



Support mechanism	Risks and limitations
Quotas and obligation	Risk of failure if the monitoring and compliance measures are weak or not implemented. They must be tied to other mechanisms at times (e.g. tradable certificate).
Feed In Tariff	Market integration is complex when the share of variable renewable energy is high. Challenges of setting and adjusting the tariff arise when the cost structure changes.
Feed In Premium	There are windfall profits for generators when the market price is high but it is risky for the generator when the market price is low. Additional costs such as transaction, balancing and forecasting costs might be imposed on the producer.
Competitive auctions and tenders	These may involve the risk of underbidding, collateral, bad auction design, etc., which may drive small and new players out of the market.
Tradable certificate	A robust enforcement and compliance mechanisms must be in force.
Financial incentives	In some cases, it does not relate to the quantity of electricity produced. Political priorities can heavily influence the level of support according to political needs.
Net metering	If the distributed generation levels are high, there is a risk of cross-subsidisation between participating customers and non-participating customers. Moreover, the retail tariff may not reflect the actual value of electricity in each location and period.
Net billing	In some cases, there is a risk of uncertainty regarding when net billing payments would be made and the frequency and form of payment.
Targets for the medium and/or long term	This is not effective on its own and requires the support of another policy. It can be changed, altered or even cancelled depending on the political commitment.

3 Peer-to-Peer (P2P) electricity trading



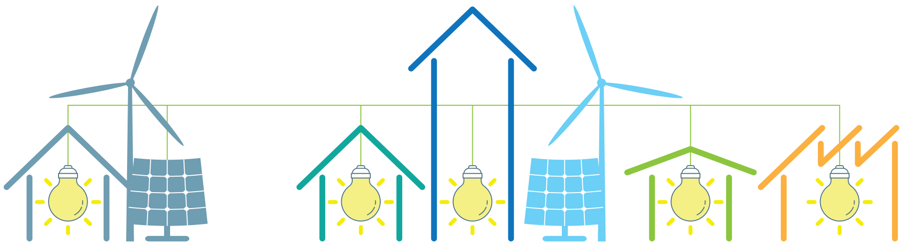
P2P is a business model based on an **inter-connected platform** that functions as an online marketplace where **producers and consumers can meet to buy or sell electricity** without the need for an intermediary.

A P2P setup can be **among neighbours** within a single local community as well as among several communities. In the latter case, a mini-grid can facilitate electricity trading. Alternatively, trading can be enabled through **interconnected networks owned by the distribution system operator**, who needs to be remunerated accordingly.

A P2P model can significantly contribute to the energy transition due to the following characteristics:

- Increases RES deployment and flexibility for prosumer and consumer empowerment
- Aids in grid balancing and congestion management with efficient operation
- Provides ancillary services to the main power grid
- Improves electricity access for the consumer

4 Best practices: Three phases of energy transformation



	Phase I	Phase II	Phase III
Description	Grid-based and centralised system with small shares of RES and Distributed Energy Resources (DERs).	Larger shares of RES and DERs and partial autonomous solutions.	DERs are the dominant players with fully autonomous solutions.
Triggers	Incentives to promote RES.	Adding flexibility to supply and demand – different technologies are in competition without incentives or subsidies.	
Governance	Centralised system: policies to promote renewables.	Performance-based regulations to evaluate DER generation costs versus network costs, integrating customers and increasing flexibility.	Consumer-focused and ambition-driven regulations where users can choose the level and methods of their security of supply and co-existence of centralised and decentralised systems and regulations.
Regulatory framework	Top-down approach (utility scale RES deployment, TSO and DSO driven).	Share of renewables endanger security of supply; regulatory incentives are reduced.	Bottom-up approach (active customer/prosumer, distributed market facilitator).
Risks		Risk of stranded investment in fossil assets.	Risk of stranded investment in transmission grids.
Business models	Asset ownership evolves from central to crowdfunding (communities)	Asset ownership evolves from central to crowdfunding (communities)	Asset ownership evolves from central to crowdfunding (communities)

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