

## Leading practices in RES integration - a global perspective

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**The determination of policy makers is indispensable for the energy transition. This includes establishing clear targets for renewables integration, supporting grid infrastructure deployment and phasing out fossil fuels.**

The transition from fossil fuels to clean renewables is key to [limiting global warming](#) and avoiding a dangerous climate change. We need to move fast in order to achieve climate and energy targets. There are many challenges to this transition, including IT, staffing and operational. We must be aware of these challenges so they can be bridged. Educating decision makers is vital, particularly so the necessary policy support can be provided. Targeted policy measures will be needed for:

- New renewable developments
- Network integration
- Technology hybridization, and
- Managing flexibility and demand side management.

Additionally, a trusting and constructive relationship between TSOs, NGOs and also amongst regulators will help in addressing many challenges, thereby better supporting a smooth energy transition. There is no silver bullet for continued renewables integration, but many actors in the transition have knowledge and experiences to share – harnessing this will be important.

The world needs swift and far-reaching reforms in the short and long term to mitigate climatic change, however [according to Europe's current aims, carbon neutrality will not be reached until 2050](#). This gap needs to be recognized and bridged. California has adopted a more inline target, with a 60 per cent RES target by 2030 – aiming for net-zero emissions by 2045. Ultimately, to achieve climate and energy targets, more ambitious RES targets are needed in many parts of the world.

**The stability and quality of our future electricity supply is crucial. Technologies that provide this and also support the increased integration of renewables, already exist and are continually evolving.**

The energy transition is already happening, with much innovation taking place - not only in locations such as Germany and France, but in many places across Europe. One example is the 'Control Center for Renewable Energies (CECRE)' in Spain, which provides real time monitoring and controlling services for renewables. The CECRE facility supports the integration of renewables into the energy system as well as flexibility and balancing services/markets for renewables. Additionally, many countries such as Italy have high ambitions for the transition to a renewables-based system. Continued innovation is important to unlock flexibility across the whole power system, including for technical and market elements. In California, utilizing technological diversity from other parts of the state and/or the United States as a whole is important for CAISO.



Additionally, the energy transition will involve managing a huge amount of information, particularly data. We already have the capability to manage much of this. Data can be used to better inform decision making, by providing probabilistic forecasts of climate and extreme event variabilities. Supercomputing can help in providing this modelling.

Many transmission systems are, however, stressed from the phase out of fossil fuels. As such, there remain challenges which will need to be addressed in order to permit an energy system based on a higher-share of RES:

- The continued integration of energy storage
- Further integrating very large-scale distributed generation
- Congestion – balancing services and flexibility of the system are important
- Access to data (and managing fluctuations in data) - data hubs could address this
- Sector coupling and electrification of the economy – including electromobility
- The diversity of actors in the energy transition, particularly when undertaking strategic/spatial planning and permitting activities. Coordination/collaboration amongst all actors is important
- Land use – particularly for concentrated solar PV
- Incentivizing development – through regulatory and market-based mechanisms. Location and time-price signals will be important.

Governments currently have many tools to address the above challenges. These need to be shared to support achievement of the energy transition.

**Further understanding on the role of local society is needed.**

Energy should not be seen just as a commodity, however as a right – i.e. something that society cannot live without. The principle of subsidiarity in power grid planning and - more generally - in the attitude of energy transition actors (decision makers, TSOs, DSOs, parliamentarians, and others) – should be considered. This principle is an imperative to solve problems on the lowest level possible.

Major drivers of citizen participation in the energy debate include

- Guaranteeing only renewable generation sources
- A fair price for electricity, and
- No revolving doors – i.e. abuse of energy. We need to work on social and institutional intelligence to better empower citizens in the energy debate.



The following key points were also raised:

- Consumers may need to think about changing electricity consumption habits
- Overconsumption is an issue
- Transformation is going to take place at many levels of the electricity system – not just at generation
- Intermediaries are needed to support conversation/dialogue in the strategic process – for public and other similar parties
- Decentralisation is not just about generation, however also financing, regulation etc.
- Energy literacy is important for informing the debate.

**There are four key trends in the energy transition ( i.e. the “4Ds”). These are decarbonisation, decentralisation, digitalisation and democratisation – and will become increasingly important as part of the energy transition.**

Decarbonisation: reducing the carbon footprint (i.e. emissions) from energy intensive sectors, including power and some other sectors such as heating and transportation. There are generally considered that there are four pillars to decarbonisation by 2030:

- Energy efficiency
- Maximising RES at large scale
- Raising the proportion of decentralized energy in the overall energy system
- The mass electrification of other sectors.

Decentralisation: generally refers to energy that is generated off the main grid, including micro-renewables, heating and cooling. It includes energy from waste plants, combined heat and power, district heating and cooling, as well as geothermal, biomass or solar/other renewable energy.

Centralised and decentralised approaches to the energy transition should not exclude or compete against each other. These approaches must and ultimately will, co-exist together.

Digitalisation: allows two-way communication between the utility and the network, including its customer. This enables insight, automation and control across the utilities' operations, empowering utilities to improve reliability, availability and efficiency of the grid.

Democratisation: a concept where the technological energy transition is coupled with a strengthened democratic and public participation approach – leading to increased local energy ownership. With new decentralised generation technologies available, this transition is possible and involves many actors: prosumers, renewable energy co-operatives/ municipalities and community-owned power stations which co-exist together with centralised power.

Moving forward, the energy transition should be seen as a democratic process. Many people (including non-energy experts) want an active role in the energy transition and it will be important to provide them with this.



**Our seas will play an important role in the energy transition. Protecting marine nature is, however, vital.**

There will be large volumes of offshore renewables and supporting grid infrastructure deployed over the coming decades. This deployment is vital to enable the energy transition. According to ENTSO-E's 2016 TYNDP, over a third of future grid deployment will take place in the marine environment.

The Mediterranean is an important region as part of this transition. For example, it is envisaged that there will be an increased generation capacity of 250 GW to 400 GW. 40% to 60% of this is expected to come from renewables. Energy cooperation across the

Mediterranean region will be crucial for enabling the energy transition of the entire region. This means for grid planning and also deployment. The following aspects should be followed across the Mediterranean region (and are supported by the EU):

- Common technical rules
- Coordinated planning, and
- Capacity building.

The Med-TSO is an important organisation to facilitate much of the exchange needed – and a closer collaboration is needed to share knowledge, experiences and practices.

The marine environment must, however, be protected. Presently, we do not comprehensively understand the scale and location of many impacts resulting from this deployment. We need to better understand this. The number of parties involved in offshore efforts is also an issue - the ocean is ultimately, a finite resource. Many TSOs, including Red Eléctrica, are trialling new innovative approaches to marine nature protection.

In support of proper marine environmental protection and the energy transition, RGI recently developed the Marine Grid Declaration (see link [here](#)). The Declaration itself has two broad objectives:

1. First and foremost, ensure protection of the marine environment resulting from marine grid ‘activities’ (i.e. from deployment through to decommissioning)
2. In doing so, it intends to support the sustainable deployment of grids in the marine environment – needed to support integration of renewables (thereby helping reach ambitious climate targets).

Next steps will involve understanding how the Declaration can be implemented. These include:

- Improve knowledge (including data) sharing amongst marine stakeholders – particularly TSOs and NGOs:
  - Possibly establish a forum where all actors can exchange information and perspectives
  - Involve scientists/experts in planning considerations
  - Better/earlier collaboration amongst energy transition actors, particularly in data sharing exercises
  - Possibly create of a platform for data sharing.
- Improve transparency between TSOs and civil society, ensuring civil society is properly involved in planning considerations from an early stage.