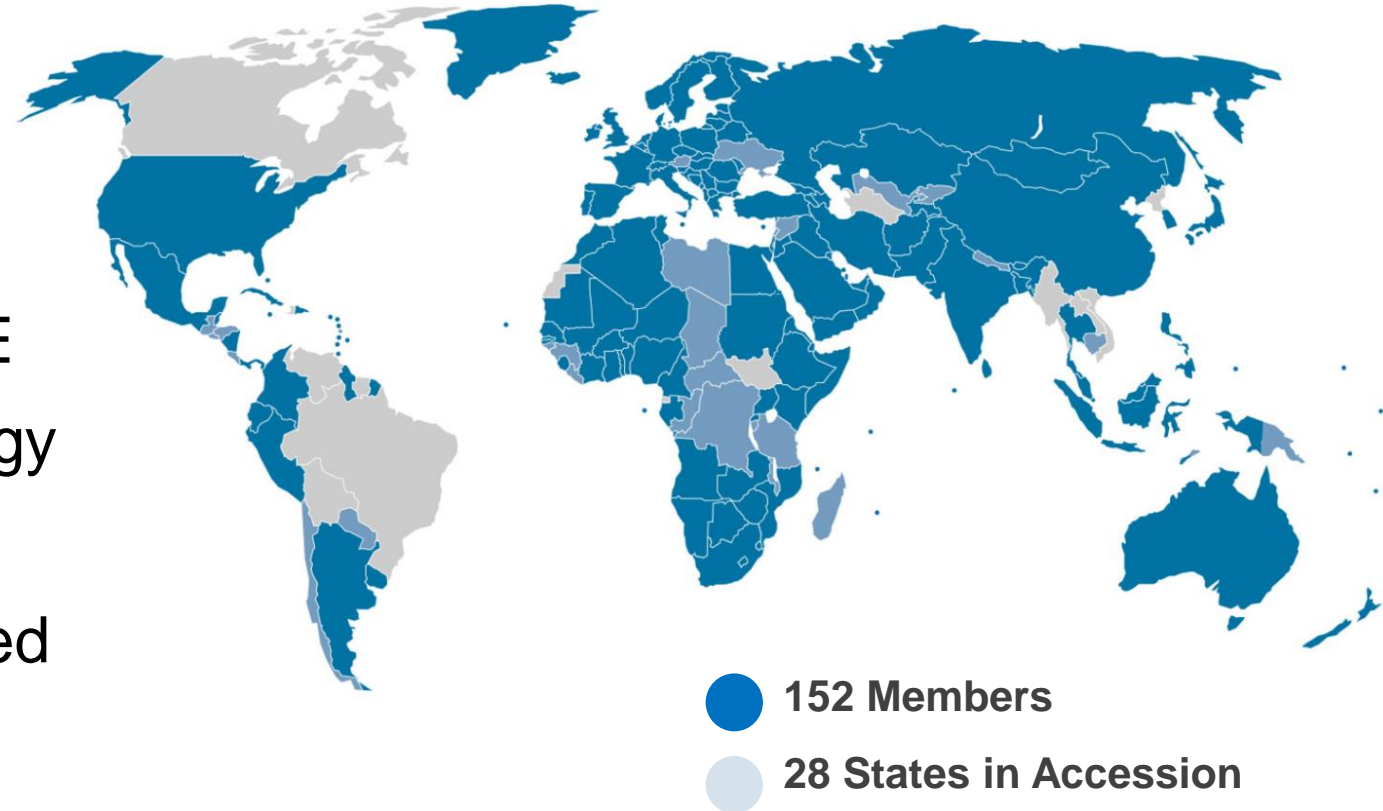


The increasing role of consumers in the transformation of the power sector: innovations leading the way

Brussels, 24 October 2017

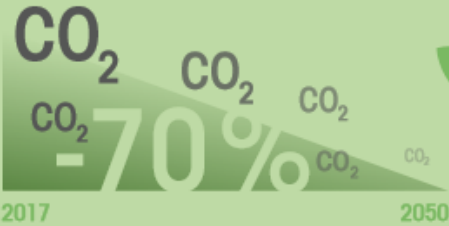
- Inter-governmental agency established in 2011
- Headquarters in Abu Dhabi, UAE
- IRENA Innovation and Technology Centre – Bonn, Germany
- Permanent Observer to the United Nations – New York



Mandate: Assist countries to accelerate renewable energy deployment

Innovation to Decarbonise the Energy Sector

Goals



- Reduce energy-related CO_2 emissions by nearly 70% by 2050
- **Keep global temperature rise well below 2 degrees**

1 Drive renewable energy cost reduction



- Innovation progress since 2010
 - **Solar photovoltaic (PV) module costs** – reduced by 80%
 - **Wind turbine costs** – reduced by 30–40%



2 Enhance technology performance

• Today's renewable energy technologies:

- Need to grow renewable energy share 1.2% yearly to reach 2050 climate goals
- Could provide 2/3 of the world's primary energy supply



• What about the remaining 1/3?

3 Integrate high shares of renewable energy in power systems

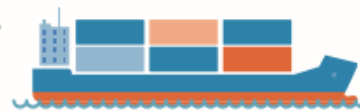


- **Enabling technologies**
- New ways to **operate** systems
- Innovative **business models** + **market designs**

4 Create new breakthroughs for end-use sectors

• Find affordable, scalable solutions

- **Develop low-carbon technologies for:**
 - aviation
 - heavy industry
 - road transport
 - shipping

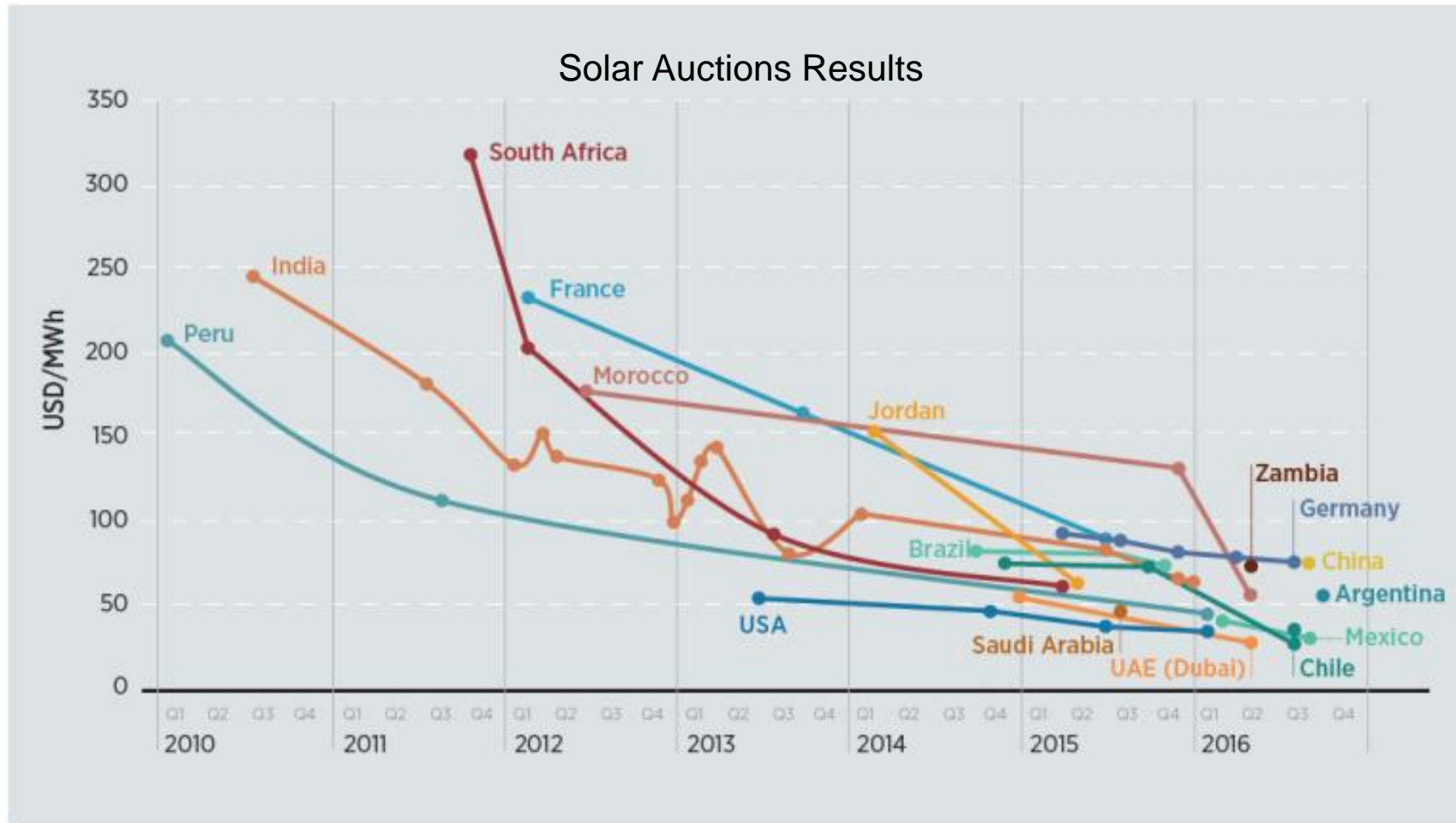


Action needed now:



- **Governments**
 - encourage private sector innovation
- **Developing new technologies**
 - requires decades
 - **R&D → demonstration → market**
- **Innovation goes beyond technology**
 - creating new businesses; system integration; wealth creation

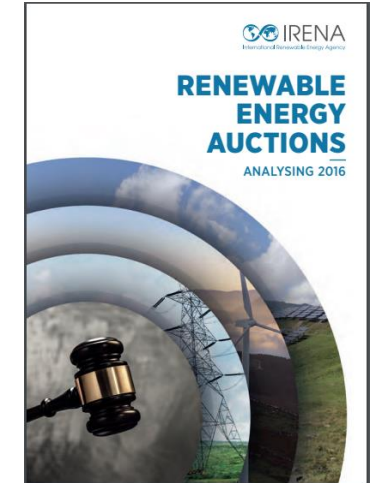
Renewable power already has a strong business case...



Wind Turbines
-30-40%

Solar module
-80%

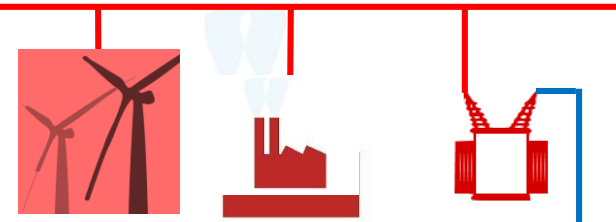
Renewable Energy Auctions Analyzing 2016



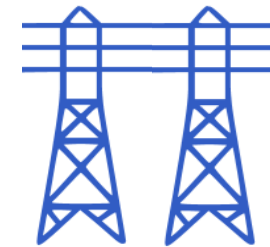
...but materialising its potential require additional efforts in system integration

The power sector paradigm changes, creating challenges to integrate high share of variable renewable energy in the system

The traditional base-load generation concept disappears



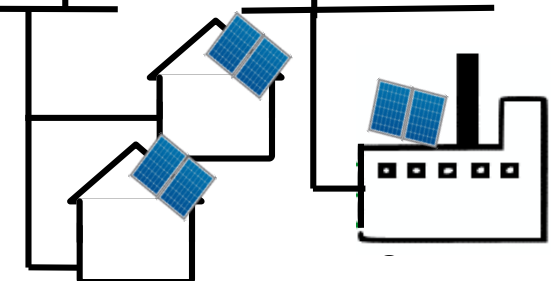
The system requires flexibility



The flow of electricity becomes bi-directional at certain moments in time

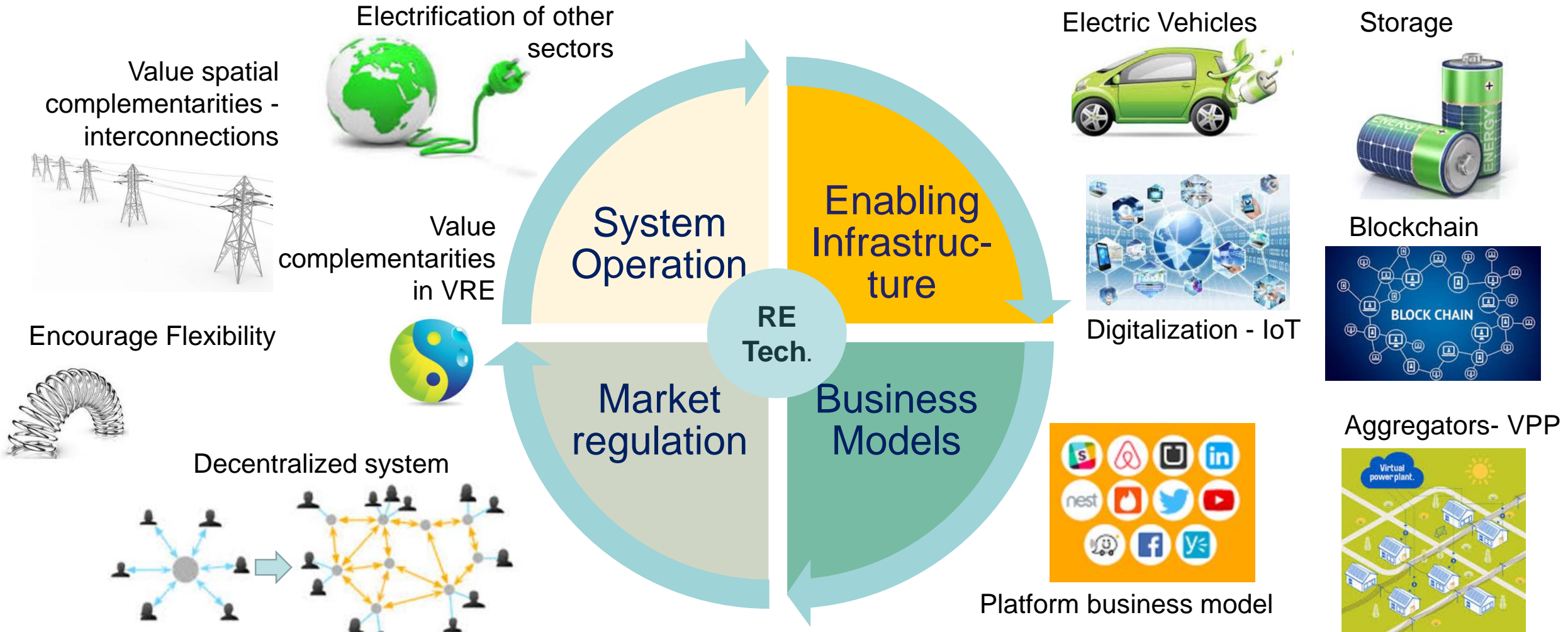


Generation becomes more decentralized



No lack of innovations – but what is relevant for the local context?

We need to map and understand the implications of these innovations for the power sector



The increasing role of consumer

The new consumer is also producing, storing, trading energy and managing own load



Distributed generation



Behind the meter storage



Electric vehicles



Smart meters



Digitalisation - Internet of things



Artificial intelligence

IoT and Artificial Intelligence will support the consumer's participation in the energy market

IoT and smart houses and Artificial Intelligence

- ❖ Thermostats, lighting and energy monitoring and controls are increasingly enabled with smart devices that connect with the Internet and can be controlled remotely by smart phones. Adding communication capabilities and remote controls to existing sensors and diagnostics can turn them into an energy management system.
- ❖ Artificial intelligence identifies patterns and controls the load, the same way humans would do

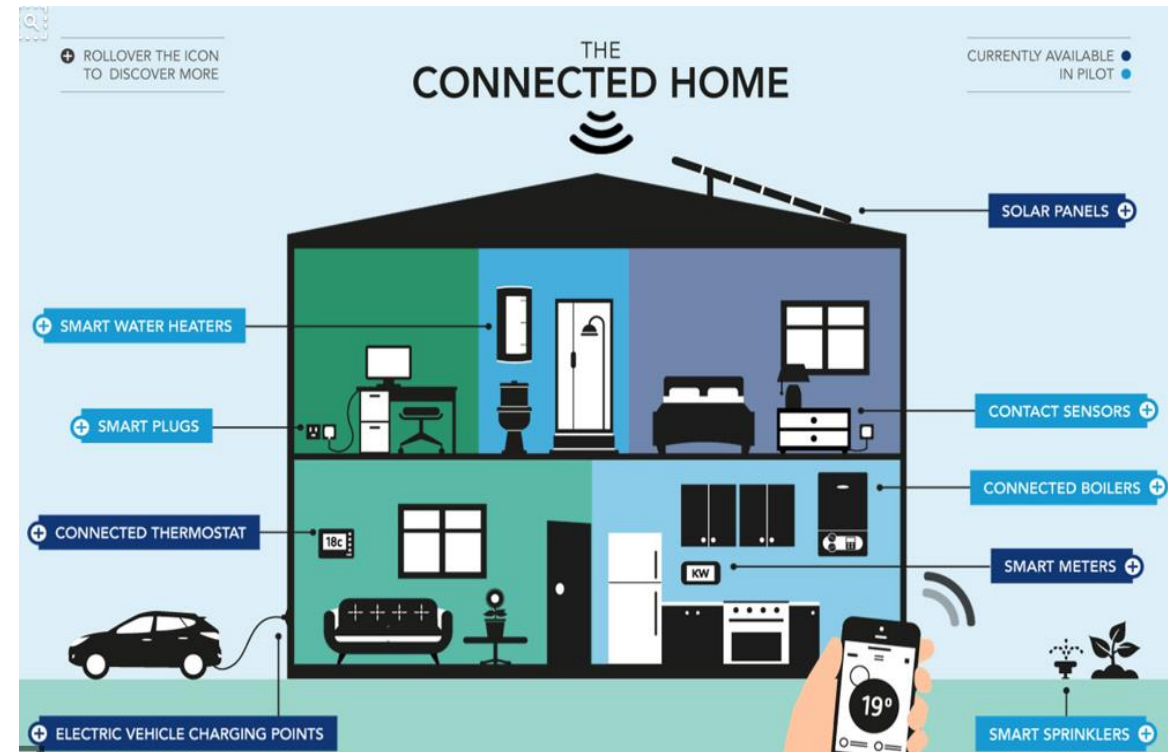


Photo source: <https://www.centrica.com/>

IoT and AI enable demand side management, decreasing consumers' costs by improving energy efficiency and preventing energy waste

IoT and smart houses – how to implement?

Hardware

- Smart meters
- Sensors
- Supercomputers
- Other digital technology to convert the electricity grid from servo mechanical to digital connectivity to manage multiple sources of energy flowing to the grid from local generators

Software

- Optimization tools

Communication protocol:

- Agree and develop common interoperable standards (both at physical and ICT layers)



Regulation is key for demand-side management

Retail market

- Efficient, real-time price signals that reflect the cost of the participation of each agent to the electricity market

Distribution

- Incentivise distribution system operators to invest in smart grids and other digital solutions

Other policies

- To ensure cybersecurity, data security, avoid misuse of data

RE aggregator: Virtual Power Plant (VPP)

- ❖ VPPs supports distributed RE sources to leverage on the synergies between them and maximize their remuneration
- ❖ Virtual power plants allow coordinating previously uncoordinated renewable generation sources. It can provide the much needed flexibility in the system

Aggregators enable distributed technologies (RE plants, storage) to participate in the energy market

Relatively easy to implement, but regulation is key

Hardware

- Smart meters

Software

- Cloud platform
- VPP control software

Key requirements

- DSO should play the role of market facilitator, to bridge the gap between consumer's side and system operators and markets (both energy and ancillary services)

Platform based models

- ❖ Also known as Uber or Airbnb of energy, the platform allows local generators of distributed energy to sell their excess energy at the desired price.
- ❖ With increasing number of smart devices, digitalization and increasing distributed generation, platform based models should see a huge potential in terms of market size and demand in the near future.

Relatively easy to implement

Hardware

- Good interconnection between the local generators
- Smart meters (at points of consumption)

Software

- Platform/website for peer to peer trading
- Energy forecasting and data analysis tools

Key requirements

- Identification of geography of operation
- Trust (regarding the prices offered) among consumers
- Open retail market that allows P2P trading

Platform based model promote Peer to Peer trading, offering a market place for distributed generation

Continuous approach to build an innovation network for energy transition



Three days conference:

- 200+ experts from public and private sector
- Discussions across the complete innovation life cycle, from R&D to commercialization

Based on 'real-life' case studies on emerging non-technology innovations

- Identification of replicable and implementable innovations
- Analysis of case studies, lessons learnt

Track the energy transformation, monitor the progress, map new innovations

We invite you to engage!

The increasing role of consumers in the transformation of the power sector

Today's session objective:

Better understand the promising innovations that aid the power sector transformation and the new role of consumer that come along with these innovations.

How these innovations can be replicated and scaled up in other geographical regions in order to accelerate the energy transition?





We invite you to engage!

Dolf Gielen: dgielen@irena.org

Francisco Boshell: fboshell@irena.org

Arina Anisie: aanisie@irena.org



www.irena.org