The Proposed Electricity Directive and Regulation: Market Design for a Low-Carbon Electricity Sector

Mediterranean Forum on Electricity and Climate Change

The ‘Clean Energy for All Europeans’ Package & Mediterranean Electricity Market integration Workshop

Brussels April 11, 2018

Matti Supponen

DG ENER unit B2: Wholesale markets
Content

- Short introduction to the current EU electricity market design
- New market design features in the Clean Energy Package
- Possible future market design topics
European electricity market basics

- Liberalisation at the European level started in 1999
- Third internal energy market package from 2009 provides the current legal framework
- National Regulatory Authorities (NRAs)
- Agency for Co-operation of Energy Regulators (ACER)
- Ownership unbundling of Transmission System Operators (TSOs), with some exceptions
- Electricity market is based on zonal pricing
- System size is about 1000 GW and 3000TWh
- One main synchronous system in the Central and Southern Europe (former UCTE)
- Other synchronous systems: Nordic, Great-Britain, Ireland, Baltic states (with Russia), numerous islands
Synchronous zones in Europe
Selected electricity markets in the world

- **North America**
  - Main synchronous systems are Eastern interconnection (including PJM), Western interconnection (including California) and Texas.
  - Some parts of Canada are interconnected with the United States
  - Mixture of open markets with competition and non-liberalised fully regulated markets.
  - Where markets are open, nodal pricing widely used.

- **Australia**
  - Zonal pricing like in Europe
  - Gross pool (central dispatch of all generators)

- **Europe**
  - Zonal pricing
  - Mainly self-dispatch by generators, some countries have central dispatch (Poland, Italy, Hungary, Ireland)
Target Model

- Coordination of ATCs (Flow Based and/or NTC)
- Explicit Auctions
  - Physical and/or Financial Transmission Rights
- Futures on Y+1
- "Forward" market

Flow Based where more efficient

Day-Ahead Implicit Allocation Price Coupling

Flow Based where more efficient

Harmonised GCT

- Intraday Allocation
  - Implicit Continuous Trading and/or Implicit Auction

"Physical" market

"Forward" market

- Day-Ahead Implicit Allocation
Merit order

Merit Order Austria/Germany 2014

35 €/MWh

Renewables | Atom | Lignite 1153° | Coal 882° | Gas 440° g CO₂/kWh | Oil

Load

Not producing

Source: Verbund
Day-ahead market coupling status in April 2018

<table>
<thead>
<tr>
<th>REGIONAL DAY AHEAD IMPLICIT AUCTIONS</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>North West Europe (NWE)</td>
<td>Price coupling</td>
</tr>
<tr>
<td>Poland</td>
<td>Poland coupled within NWE through SwePol- and LitPol-link</td>
</tr>
<tr>
<td>Ireland and Northern Ireland</td>
<td>All Island market, single price zone</td>
</tr>
<tr>
<td>Czech – Slovak – Hungary-Romania</td>
<td>Price coupling</td>
</tr>
</tbody>
</table>

Source: APX, updated by Matti Supponen
Average spot prices (€) and electricity cross-border trade in Europe (2016)

Main commercial flow direction

Source: ENTSO-E Transparency platform
"In essence the new package is about tapping our green growth potential across the board"

Commissioner Miguel Arias Cañete (2016)
Electricity markets in the Winter package

1. Consumers
2. Energy services
3. Distribution system operators
4. Data management
5. Network tariffs
6. Capacity mechanisms
7. Risk preparedness
8. Renewable energy
9. ACER
10. NEDSO
11. ENTSO-E
12. Regional operational centres
13. Bidding zone decisions
14. Priority dispatch
15. Ancillary services
16. Balancing

Flexibility

TSO cooperation

Governance
End customer focus
New sources of flexibility

- Steam Pressure Storage
- Water Pressure Storage
- Chemical Energy Storage
- Kinetic Energy

Frequency:
- 50 Hz
- 50.1 Hz
- 50.2 Hz
- 49.9 Hz
- 49.8 Hz
New relations between players

Data for public purposes (monitoring, research, planning, etc.)

DSO
Right to measurement data on the own network

TSO balancing and DSO congestion management coordination system

Independent Data Manager
Obligation to collect measurement data and give access to it

Supplier
Right to customer data on own clients

Service provider
Right to serve customer
Right to aggregate
Right to customer data on own clients

End customer systems (generators, industrial customers, home automation systems)

End customer
Right to consume, produce and store electricity

Smart meter

Measurement data
Private data
Control signals

Energy
Aggregators

- Commercially active
- Partial opening
- Preliminary development
- Closed
- Not assessed

Source: SEDC 2017
Future issues regarding electricity markets

- Design issues
  - Capacity mechanisms
  - New forms of trading (for example peer-to-peer)
  - Local markets (including DSO congestion management)
  - Role of DSOs vs. TSOs
  - Concepts for demand response
- Digitalisation
  - Cybersecurity, Internet of Things, Big data
  - Who will manage data platforms?
  - More active control of assets for balancing
- Sector coupling
  - Power to gas, power to liquids, interplay between electricity and heat, electrification of transport, etc.)
Capacity mechanisms
Digitalisation and energy

- System level
- Local level
- Consumer level

Business concepts and markets

Customer engagement

Data management including cybersecurity

Regulation

Modelling

Systems integration

Technologies

Telecommunication
# Regulation versus market

## Regulation
- Grid tariffs
- Regulated prices
- Capacity mechanisms
- RES targets
- Subsidies
- Energy efficiency targets
- Mandatory ancillary services
- Priority dispatch
- Emission standards

## Regulation/Market
- Emissions trading
- Trading of green certificates
- Auctions for generation capacity

## Market
- Competition
- Free price formation
- Liquidity
- Markets for ancillary services
- Right to self-produce/-consume and store electricity
- Right to be aggregated
Thank you for your Attention!