Role of national system operators in the construction of a Regional power market

Rabat Energy Forum – Rabat, Morocco
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Content

Elia Group in a nutshell

Stages of the power system and market construction in Europe

Challenges and opportunities for a TSO in the Regional consolidation

What are the steps for TSO’s to build a sustainable regional power market?
Elia Group
A top-5 TSO in Europe

<table>
<thead>
<tr>
<th>Elia Group</th>
<th>50Hertz</th>
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<tbody>
<tr>
<td>110 to 380 kV lines &amp; cables</td>
<td>13,398km</td>
</tr>
<tr>
<td>30 to 70 kV lines &amp; cables</td>
<td>4,760km</td>
</tr>
<tr>
<td>Number of substations</td>
<td>872</td>
</tr>
<tr>
<td>Area covered (km²)</td>
<td>c.143,000</td>
</tr>
<tr>
<td>Direct customers</td>
<td>c.130</td>
</tr>
<tr>
<td>Residents covered</td>
<td>&gt;29 million</td>
</tr>
<tr>
<td>Employees (FTE)</td>
<td>c.1,800</td>
</tr>
<tr>
<td>Regulated Asset Base (RAB)</td>
<td>€5,097m</td>
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TOP-5 position with critical mass to play a leading role in the electricity market

Elia Group
The role of Elia as a TSO

Our 4 core activities:

1. Transmission grid operator (On- and Offshore)
2. System operator (balancing)
3. Market facilitator
4. 'Trustee' for Renewable Energy Sources (RES) integration

Elia + 50Hertz play a key role aligned with EU directives
Elia Group
A European frontrunner going global

Beyond the ownership and operation of the Belgian and German Grid systems, Elia Group offers expert advisory services to the power industry worldwide.

Elia, a maker of the EU Power Market
A decade of steps towards market integration

EU directives

- Electricity Directive 96/92/EC
- 3rd legislative package for internal electricity market
- Directive for Renewable Energy Sources (RES)

- EU power market
- Security of Supply
- Capacity building
- More EU interconnections
- Massive RES integration
- 50H2T Baltic
- BEL-NL intraday

- Bel Engineering
- IPO
- Euribor

- Electrabel
- TenneT
- TenneT
- Amprion
- Transnet
- Energinet.dk
- PL
- CZ
- A
- CH
- F
- PL
- CZ
- A
- CH
- F
1st challenge: infrastructure development and management

Reminder: framework is a prerequisite

- National and supranational regulations must be designed and enforced to provide a stable and efficient system for public and private players to invest and operate
- TSO’s must form associations and elaborate discussions to promote a regional coordination of investments and operations

At TSO level: operators must look out of their own grid

- **Investments:** develop innovative ways to look for funding (PPP’s, private operating licences, partial privatisation, IPO, regional project bonds)
- **Operations:**
  1. optimize the operations of the existing system with new technologies and methods
  2. hire and train the best engineers by offering more than just the operation and the maintenance of the national grid
- **Technologies:** develop and implement cutting-edge technologies that can help not only to transport energy further but also to operate the existing networks in a more efficient way (cost and operations)

In a nutshell: develop regional partnership and collaborations

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Developing and interconnecting grid systems

Priority electricity corridors

**Specific objectives:**
- Reduce duration of permit granting procedures
- Facilitate regulatory treatment
- Provide necessary market-based and direct EU financial support

**Content:**
- Regulation on guidelines for trans-European energy infrastructure
- Europe 2020 Project Bond Initiative

Elia Group members are passage points to all priority corridors
Illustrative case: CORESO

Business:
• Coordination of Electricity System Operators
• Second concrete step towards creation of Europe’s largest regional electricity market
• Centre develops forecasts of electricity transits within the CWE region and monitors those flows in real time around the clock

Governance:
• Joint venture between RTE and Elia, based on equal shareholdership
• Incorporated in Brussels on Dec 19th, 2008
• May 15th, 2009: National Grid has joined as full member
• November 26th, 2010: Terna & 50Hertz Transmission join as well (50Hertz has a stake of c.10% while the four others have a stake of c.22.5%)

Evolution
• Start of operations on Feb 16th, 2009
• CORESO significantly helped the CWE TSO’s to deal with the demand peak that struck France in January 2012 due to an exceptionally cold weather

2nd challenge: Power Market Construction

The national TSO is best positioned to create the ideal toolbox

- Power Exchange (PX) platforms:
  • 1st at national level: grid code, market mechanisms, definition of market participants’ roles (Belpex)
  • Then in collaboration with other TSO’s to improve efficiency, foster competition and increase regional welfare by reducing the consumer’s bill (APX, Nordpool…)

- Supra-TSO entities:
  • Interconnection capacity allocation services (Auction office) – CASC.eu
  • Interconnection monitoring center – CORESO
  • Regional association of TSO’s – ENTSO-E

- Market coupling:
  • Cross border transmission capacity is made available on PX on each side of the border, rather than via explicit auctioning
  • It guarantees optimal use of transmission capacity, benefits to all market players and encourages liquid and robust spot markets

Neighbouring TSO’s can mutually benefit from such platforms
Consolidation of power exchanges

- 2009: Powernext + EEX = EPEX
- 2010: APX + Belpex

Illustrative case: BELPEX

Business
- Belpex is the short term, physical Electricity Exchange on the Belgian hub
- Belpex represented the first European trilateral market coupling between France, the Netherlands and Belgium

Governance
- In 2005, Elia held 60% of Belpex together with the French RTE + Powernext and the Dutch TenneT + APX
- In 2010, APX bought 100% of Belpex with Elia retaining a 20% stake in the company
- Licensed to operate from January 11, 2006

Evolution
- On November 20, 2006, the trilateral coupling between France, the Netherlands and Belgium started operating with success
- On January 17, 2011, the APX-ENDEX, EPEX Spot FR, EPEX Spot DE and EMCC coupling was further extended to a pentalateral coupling with NorNed
- Note that 50HzT, the German subsidiary of Elia Group owns 20% of EMCC
**Illustrative case: CASC.eu**

**Business**
- Capacity Allocation Service Company for Central-West Europe (BNL, France, Germany), possibility to open to others
- First concrete step towards creation of Europe’s largest regional electricity market
- Joint cross-border service company acting as a single auction office

**Governance**
- Equal shareholdership between 12 TSOs in 10 countries
  - RTE, Elia, Austrian Power Grid, Creos Luxembourg, 50Hertz Transmission, EnBW Transportnetze, Tenet TSO, Amprion, Swissgrid, Slovenija, Hellenic TSO & Terna
- Incorporated in Luxembourg on 9-9-2008

**Evolution**
- First joint auctioning of year and month capacities on the common borders between the five countries was held on Nov 28th, 2008
- From Autumn 2009, also execution of auctions of daily capacities for borders without market coupling

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**Market integration and Coupling**

- **April 2011**
  - Undersea cable UK & NL

- **9 November 2010**
  - Central West & Nordic Markets

- **2012/2013**
  - South-West Market

- **2013**
  - Baltic market

- **2013**
  - Central South market

**Fast evolution towards regional electricity markets at a European level**
3rd challenge: Integration of RES

The TSO must get ready to integrate and manage RES

- **Offshore Wind Energy:**
  Most European TSO’s including Elia and 50HzT have a mandate to connect offshore wind farms that are granted a permit
  Major challenges: financing, permitting and engineering

- **All Renewable Sources:**
  **Access:** the TSO is responsible to give non-discriminatory access to IPP
  **Grid development:** is now driven by power flows from RES locations to demand centers whereas former developments were driven by local demand
  **Operations:**
  Distributed generation transform consumers into prosumers
  Tools must be developed to enable demand side monitoring and management

**Storage**
The integration of massive renewable energy sources will require the development of storage solutions to cope with their intermittency

Integrating RES comes with challenges that TSO’s must prepare to cope with

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Integrating RES
50Hertz, one of the greenest grids in the world

Wind installed capacity as % of total installed capacity on the corresponding grid
*Source: Alstom Grid/U.S. DoE 2011*

Solar installed capacity as % of total installed capacity
*Source: ITC, IEA, GTZ, Platts, Q-Cells 2010*
Developing and interconnecting grid systems
Power flow based system

Connection of renewable resources to demand centres

- Production and network used to be designed at a National level
  - Solar: Southern Europe
  - Wind: North. Europe and Mediterranean rims
  - Hydro: around the alps and Scandinavia

Flow driven versus Demand driven

Elia Group
AWC – Preparing for offshore wind connections
Elia Group going West
This 500+km offshore high voltage backbone will enable the connection of up to 7,000W of wind farms off the US East Coast.

Key features of the project
- Permitting process through 4 US states: New Jersey, Delaware, Maryland and Virginia
- State-of-the-art multi-terminal DC and Sourced Voltage Converters (SVC) technologies
- Connected to the regulated zone of PJM
- Attractive IRR
Conclusions

- TSO’s at the heart of their Regional power system: more than just witnesses, they must act as facilitators of the construction of a Regional power system
- TSO’s are facing 3 main challenges: infrastructure building, power market design and RES integration
- TSO’s can only tackle those challenges by enhancing collaboration with neighbouring TSO’s

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Merci, Thank you

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