Electricity market design – market opening

Péter Kaderják – László Szabó

Podgorica RES training
15-17 November 2016
Overview

• SEERMAP project introduction
• Agenda of the RES training
• Electricity value chain and the vertically integrated market structure
• Promises of competitive electricity markets
• Policy cook-book for electricity markets
• Market design alternatives
## Basic SEERMAP project data

<table>
<thead>
<tr>
<th>Project title</th>
<th>South East European Electricity Roadmap</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country/region of implementation</td>
<td>Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, Macedonia, Serbia, Romania, Bulgaria, Greece</td>
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<tr>
<td>Project cycle:</td>
<td>July 2016</td>
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<tr>
<td>Donors:</td>
<td>Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management</td>
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<tr>
<td></td>
<td>European Climate Foundation</td>
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<tr>
<td>Web:</td>
<td><a href="http://www.seermap.rekk.hu">www.seermap.rekk.hu</a></td>
</tr>
</tbody>
</table>
Goals of the project

**Modelling**

- Analyse the impact of the transition to a low carbon and energy secure pathway the electricity sector until 2050 in line with EU 2050 Roadmap (*Long Term Electricity Roadmap for the SEE region*) that highlights the potential synergies beyond the limited confines of national assessments
- Application of state of the art energy sector models of the participating consortia partners (electricity and gas sector market models of REKK, Green-X of Technical University of Vienna and the regional electricity network model of EKC)

**Dialogue and capacity building**

- Effectively distribute the findings of this roadmap to the high level decision-makers in the energy administration of the countries
- Build up capacities – in the form of training courses - amongst policy makers, TSO members, energy regulators and local think tanks in the field of renewable energy deployment and transmission network planning issues
- Build up a network of regional think tanks capable of contributing to the debate on the long term decarbonisation pathways in the SEE region
- Trigger discussions on electricity scenarios at a national level
## Consortia and Local Partners

### Consortium partners

<table>
<thead>
<tr>
<th>Consortium partners</th>
<th>Task</th>
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</thead>
<tbody>
<tr>
<td>Regional Centre for Energy Policy Research (REKK) Budapest, Hungary</td>
<td>Overall coordination, electricity and gas sector modelling</td>
</tr>
<tr>
<td>Technical University (TU Wien) Vienna, Austria</td>
<td>Renewable deployment modelling with GREEN-X model</td>
</tr>
<tr>
<td>Electricity Coordinating Centre (EKC) Belgrade, Serbia</td>
<td>Network modelling</td>
</tr>
<tr>
<td>OG Research (Czech Republic)</td>
<td>Macroeconomic assessment</td>
</tr>
<tr>
<td>Energy Regulators Regional Association (ERRA)</td>
<td>Trainings</td>
</tr>
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</table>

### Country - Local partner organisation

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<tbody>
<tr>
<td>Serbia</td>
<td>RES Foundation</td>
</tr>
<tr>
<td>Albania</td>
<td>POLIS University</td>
</tr>
<tr>
<td>Macedonia</td>
<td>MACEF – Macedonian Center for Energy Efficiency</td>
</tr>
<tr>
<td>Montenegro</td>
<td>IPER - Institute for Entrepreneurship and Economic Development</td>
</tr>
<tr>
<td>Kosovo*</td>
<td>INDEP – Institute for Development Policy</td>
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<tr>
<td>Bosnia</td>
<td>Enova</td>
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<tr>
<td>Romania</td>
<td>Energy Policy Group</td>
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<tr>
<td>Bulgaria</td>
<td>Center for Democracy</td>
</tr>
<tr>
<td>Greece</td>
<td>FACETS</td>
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<tr>
<td>Day 1: Support schemes</td>
<td>Day 2: RES integration</td>
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<tr>
<td>9.00-10.30 Introduction to the operation of electricity markets (L.Szabó - REKK)</td>
<td>9.00-10.30 RES Integration - Connection, Congestion and Balancing needs (L. Szabó REKK)</td>
</tr>
<tr>
<td>Coffee break</td>
<td>Coffee break</td>
</tr>
<tr>
<td>11.00-12.30 Introduction to RES regulation (G.Resch- TUV)</td>
<td>11.00-12.30 RES HOT topics: country introduction (Serbia, Macedonia, Albania)</td>
</tr>
<tr>
<td>Lunch break</td>
<td>Lunch break</td>
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<tr>
<td>13.30-15.00 Good and 'avoidable’ RES support practices New EU support policy (Zs.Pató -REKK)</td>
<td>13.30-15.00 RES HOT topics: country introduction (3 countries: BiH, Kosovo*, Montenegro)</td>
</tr>
<tr>
<td>Coffee break</td>
<td>Coffee break</td>
</tr>
<tr>
<td>15.30-17.00 Investment Exercise 1 (P.Kotek- REKK)</td>
<td>15.30-17.00 LCOE calculation Exercise 2 (P.Kotek - REKK)</td>
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<tr>
<td>19.00 Joint dinner</td>
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Traditional electricity market structure: vertical integration

- Vertically integrated, privately / publicly owned, regulated monopolies
  - Generation
  - Transmission
  - Distribution
  - Supply
  - System operation

- Self-sufficient national systems
- Supply obligation

**Regulated end-customer price:** cost of generation + cost of transmission + cost of distribution & SO + taxes
Prices are set by the marginal plant
Price formation on competitive short-term electricity markets

Short run supply of electricity

Market price

Supply

Demand

Capacity

Marginal Cost

Coal

CCGT

GT

Lignite

Nuclear

Hydro
Transmission services

Traditionally owned and operated by vertically integrated companies (private or state-owned) within national boundaries.

Cross border electricity transactions served reliability purposes.
Complication 1: costly storage, supply-demand balance in each second

- How to manage daily load variation?
- Scarce and expensive storage options…
Complication 2: commercial transactions and physical flows are decoupled

Electricity flow is inversely related to the current!

Smaller current (shorter line) will receive more electricity flow!

G.R. Kirchhoff
1824-1887

Load: 300

Generation: 300

100

100

200
Central player: transmission system operator!

Takes care over system security and balance, otherwise…
Efficiency problems with traditional regulated monopolies

Regulated private monopoly:
- No motivation to reduce operating cost
- Motivation to over-invest – ‘gold plating’
- Increasing costs, increasing end-customer prices
- Loss of competitiveness for manufacturing

Regulated state owned monopoly:
- Often depressed prices and loss-making
- Lack of operating efficiency
- Lack of investment
The principal idea: unbundling

Resulting market segmentation

- Wholesale product market
- Balancing market
- Cross border capacity market
- Retail market
Electricity market reform a’la EU

From vertical integration... ... retail competition
Promises of competitive, integrated electricity markets

• Improving operating efficiency in generation (short run)
• Improving investment efficiency in generation (long run)
• Cost reflective, transparent market prices for consumers
• Least-cost supply security
• Technology and product innovation
• Integrated fuel, electricity and environmental markets
Efficient electricity market: the cook-book receipt

1. Unbundling of monopoly activities (network and system operation) from competitive activities (generation, trading, supply)
2. Regulated Third Party Access to the network
3. Free choice of supplier (demand side liberalization)
4. Free sale of electricity (supply side liberalization)
5. Removal of generation and end-customer price regulation (price liberalization)
6. Independent sector regulator
7. Cross-country market integration (= sufficiently low market concentration in generation)
1. Transmission unbundling

Ownership change

Legal or ownership unbundling
2. Regulated third party access to the network

- Transmission grid serves as a neutral ‘electricity highway’ to implement transactions
- Non-discriminatory and regulated access (including regulated access tariffs) is key
- Transmission capacity might be scarce: congestion
  - How to manage?
- Europe: congestion is typical at national borders
  - Main issue: cross-border trade and capacity allocation
- RTPA to the distribution grid
3. Free choice of supplier

Gradual market opening in Europe

Source: ERGEG National Reports
Intensity of competition is reflected by customer switching rates (EU)

Good and bad examples from the region:
- BG, RO, HU
- vs
- HR

Source: ACER MMR report 2015
4. Free sale of electricity

Generators can sell on bilateral contracts (OTC market) or at organised markets (power exchanges)

Power exchanges in Europe
5. Gradual removal of generation and end-customer price regulation
The Hungarian single buyer model in electricity, 1994 - 2003

Power Purchase Agreement (PPA) + Regulated price

MVM
Single buyer TSO
Nuclear + secondary reserve plants

Utility (DSO+supply) with regional monopoly
Customer

Utility (DSO+supply) with regional monopoly
Customer

Export/Import

PPA + Regulated price

No need for regulated access tariffs to the network!
The first phase of liberalization: the hybrid model in Hungary, 2003 - 2008

- Regulated access tariffs to the network!
Hybrid models – the Serbian example 2014

Dominant producer / wholesaler

TPA to transmission

Competing traders, suppliers

TPA to distribution network

Regulated and free priced markets, low cost switching
The present competitive electricity market model in Hungary (since 2008)

+ Regulated access tariffs to the network!
End-customer price formation under full retail competition

Forrás: EEX, IC

product (market determined)

system use charges (regulated)
Variations in retail electricity tariffs (EU)

Source: ACER MMR 2015
Structure of retail electricity tariffs in the EU

Major impacts of competition and regulation on retail tariffs
6. Independent sector regulator: like a good referee

- Knows the rules
- Main tasks are regulating network access, price setting and market monitoring
- Independent, responsible and credible decision making
- Transparent operation
- [http://www.iern.net](http://www.iern.net)

„The transparent and predictable behaviour of a regulator is a precondition of a sustainable energy market under privatized, unbundled and liberalized industry conditions” (1st WFER, Rome)
7. Cross-country market integration – the idea

**PRECONDITIONS:**

- G free to schedule
- Access to local grid
- Access to interconnection
- Trading service available
- L is free to contract
- Access to balancing
- No foreclosure on target market
- One-stop shop
Issues to consider

- The region is undergoing the market opening process and at the same time tries to increase RES deployment to meet its targets – a double challenge.
- Prices are kept low for end consumers – bringing further challenges to the region.
- The low price environment in Europe gives opportunities to the sector, but financing projects in generation and transmission remains difficult.
Thank you for your attention!

WWW.SEERMAP.REKK.HU