THE MARKET, EMISSIONS AND NETWORK IMPACTS OF SIGNIFICANT INCREASES IN RENEWABLES IN SOUTHEAST EUROPE

Approach, Findings and Recommendations

IAEE Online Conference, Concurrent Session 12, June 9, 2021
PRESENTATION CONTENTS

The EMI’s Broad Geographic Coverage and Interconnections

1. Study Objectives
2. Study Methodology
3. Key Findings

15 Companies (TSOs, MOs)
From 11 Countries in
Southeast Europe (SEE)
OVERALL OBJECTIVES OF THE ELECTRICITY MARKET INITIATIVE (EMI)

FORMED IN JULY 2018 FOR MULTIPLE PURPOSES:

• Lower Seams and Eliminate Barriers Between Markets
• Provide Practical Studies, Tools and Training to Accelerate Electricity Market Integration in SEE
• Advance the Social Welfare and Well Being of All Residents of SEE
• Expand Opportunities for Private Sector Investment and Innovation
• Stimulate Significant Growth of Renewables and a Substantial Reduction of GHG Emissions
• Respond to the EMI Members’ Interests
• Coordinate with European Organizations
• Support US Government Policy in the Region
OUR MULTI-FACETED STUDY METHODOLOGY

1. Gathering the necessary market data/network models
2. Development of SEE Antares database & market model
3. Simulation of market impacts
4. Transition of market model results into PSS/E network model and its analysis
5. Assessment of network impacts
6. Demonstration of the Benefits and Impacts of Market and Network Integration
7. Training of EMI members on the analytical tools
We have created a robust and verified a regional power system model consisting of:

- 8,578 buses
- 10,050 branches
- 3,360 loads
- 1,521 power plants
- 3,745 transformers
- 149 switched shunts
- 4 DC lines

This work requires an extensive, current set of data on the network and markets of Southeast Europe.
Market study results → the most critical patterns (as defined in the scenarios) → run selected cases for the network studies.

Market analyses (ANTARES)

Network analyses (PSS/E)
### Key Input - RES Capacities Could Grow 4x by 2030

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<th>EMI Member</th>
<th>SPP Installed Capacity (MW)</th>
<th>Installed Capacity (MW)</th>
<th>Total SPP Installed Capacity (MW) in 2030</th>
<th>Total WPP Installed Capacity (MW) in 2030</th>
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**Diagram:**
- **2018:** EMI, 16%
- **2030:** EMI, 34%

**Legend:**
- **Wind**
- **Solar**
KEY STUDY FINDINGS

1. THE OUTLOOK FOR LIGNITE GENERATION
2. THE EMISSIONS IMPACTS OF RES, GAS AND CO2 TAXES
3. BALANCE OF THE REGION AND INDIVIDUAL ZONES
4. WHOLESALE PRICE IMPACTS
5. ADDITIONAL GAS GENERATION IMPACTS
6. NETWORK RESILIENCY
7. POTENTIAL NEXT EMI STEPS
8. RECOMMENDATIONS AND IMPLICATIONS
RES capacities increase and hydrological circumstances have small impact on lignite and gas fired plants operation. But with increase in CO2 emission tax, lignite-fired plants economy is seriously endangered.
The emissions impact of analyzed scenarios is modest (6-12%).

This is largely because the model does not retire lignite plants.

To even come close to reaching the EU’s emissions targets, much more needs to be done than adding a lot of RES, given RES’ low capacity factors.
Lignite based zones become importers and gas-based zones become exporters ➔ significant change……to be considered by the authorities
HIGHER RES ➔ MODEST PRICE DECLINES, WHILE CO2 TAXES ➔ LARGE PRICE INCREASES

- More RES and more hydro ➔ lower prices: -2 EUR/MWh or -4%
- Higher CO2 tax ➔ higher prices: +18 EUR/MWh or +26%
THE IMPACTS OF ADDITIONAL GAS GENERATION ARE MODEST

New gas-fired TPPs replace existing gas-fired TPPs, substitute lignite, decrease pump storage activations, leads to additional export for approx. 10%, provide flexibility to the power system and support RES intermittency.
HIGH RES ➔ NEW NETWORK BOTTLENECKS IN 2030, BUT NO MAJOR CONCERNS

Just 22 detected critical network elements in all large RES scenarios ➔ clear evidence of robust and well-planned network
POTENTIAL FUTURE EMI WORK

- Support the substantial capital needs to be mobilized to realize the changes expected by 2030

Further study would be beneficial to assess:
1. The impacts of meeting high emissions targets, and lignite plant retirements;
2. The balancing and interconnection impacts of higher RES;
3. The impacts of new technologies, (e.g., battery storage and grid-enhancing devices);
4. The implementation of the MACZT (70%) rule; and
5. The implications of demand-side resources
Recommendations of the EMI RES Study for TSOs, NRAs and Policy Makers - 1

- Prioritize the expansion of cross-border trade and coupling to foster regional clean energy projects and balancing markets

- Assure adequate grid investment with enhanced tariffs and codes, and with regional planning

- Provide the proper incentives, interconnection and queueing policies, and sites for private sector renewables (with some common regional policies)
• Consider gas to support the transition to a clean energy future and ensure resource adequacy

• Strongly encourage bilateral and regional power exchanges and competitive markets for real-time, day-ahead, and longer-term markets

• Anticipate and incorporate distributed energy resources into these markets, on an equal basis with wholesale power generation
OTHER IMPLICATIONS

• **Policymakers and utilities** can use these models and analytic frameworks for further country- and project-specific analyses to inform their decisions;

• **Regulators** may leverage these tools to assess the impact of new rates and incentives; and

• **Economic leaders** can deploy these tools to better understand the impact of retiring older power generation facilities.
THANK YOU FOR YOUR ATTENTION

Elliot Roseman
Program Director, EMI
US Energy Association
eroseman@usea.org