Improving Energy Security & Enabling Private Investment

The Energy Technology & Governance Program, Electricity Market Initiative, and "Energy Diplomacy"

United States Agency for International Development
and
United States Energy Association

Energy Community Secretariat Meeting
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United States Energy Association

USEA

United States Energy Association

Overview

- Nonprofit voluntary membership association
- 150 members covering the breadth of the U.S. energy industry, founded in 1924
  - — Utilities, regulatory agencies, oil & gas, nuclear finance, research universities, consultancies
- U.S. member of the World Energy Council
- Energy educational dissemination mission
  - — Annual State of the Energy Industry; Energy Efficiency Forum, Energy Supply Forum; briefings
- 25 years of USAID cooperation; DOE funding as well

Mission: "To promote the sustainable supply and use of energy for the greatest benefit of all."

A Range of Programs Support ETAG's Objectives

- Black Sea Regional Transmission Planning Project (BSTP)
- Southeast Europe Cooperation Initiative Transmission Planning Project (SECI)
- Eastern Europe Natural Gas Partnership (NGP)
- Southeast Europe DSO Security of Supply Working Group (SEEDSO)
- Electricity Market Initiative (EMI)
- Utility Cyber Security Initiative (UCSI)

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- Support the development of cross border markets for power generated by clean and innovative energy technologies through a robust transmission system.
- Develop technical rules, guidelines and network infrastructure assessments to accelerate integration of these markets and technologies.
- Improve security of distribution supply by supporting: optimized planning; line loss education; better asset management; smart grids; and regional disaster and emergency response programs.
- Fortify the capability of electricity and gas utilities to defend against cyber-attacks and improve ability to restore service

Pillars of USEA's Working Groups

- Technically and solutions-driven
- Stakeholder needs – regional and domestic
- Collaboration
- Transparency
- Financial support for WG activities
- Information and best practices sharing, capacity building
- Complementary to other existing initiatives

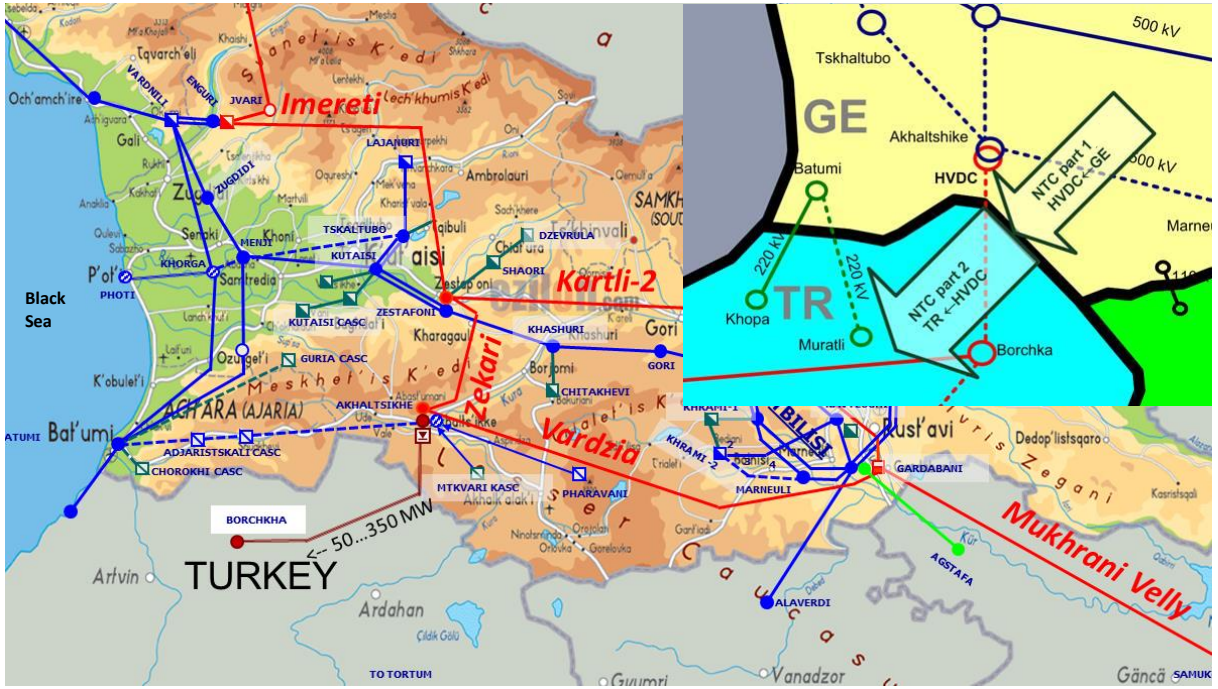
Black Sea Transmission Planning Project (BSTP)

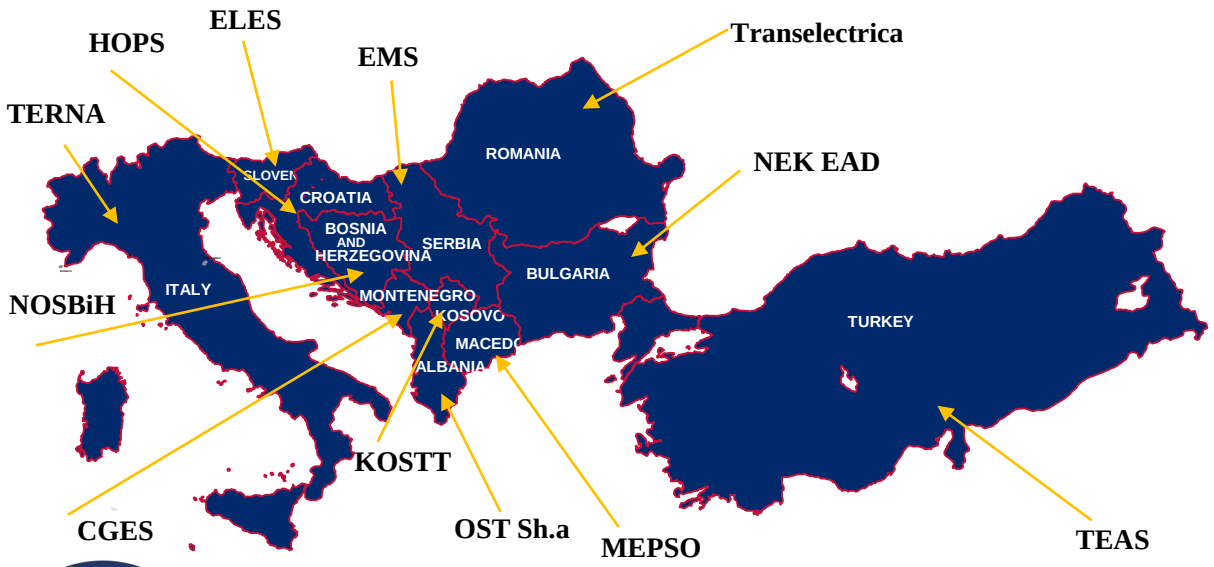
Objectives:

Develops and maintains regional electricity network planning models to support development of Black Sea infrastructure, regional electricity trade and electricity trade between the Black Sea region and Europe. Supports transfer and adoption of European network planning and operational practices to accelerate integration with ENTSO-E.

Progress

- Conceptualized the $300 million High Voltage Direct Current Back to Back (HVDC B2B) station connecting GE to Borcka TR, enabling export of Georgian hydropower to Turkey
- Currently improving BSTP members' capacity to conduct System Adequacy Assessments of their electricity grid, using ENTSO-E methodology





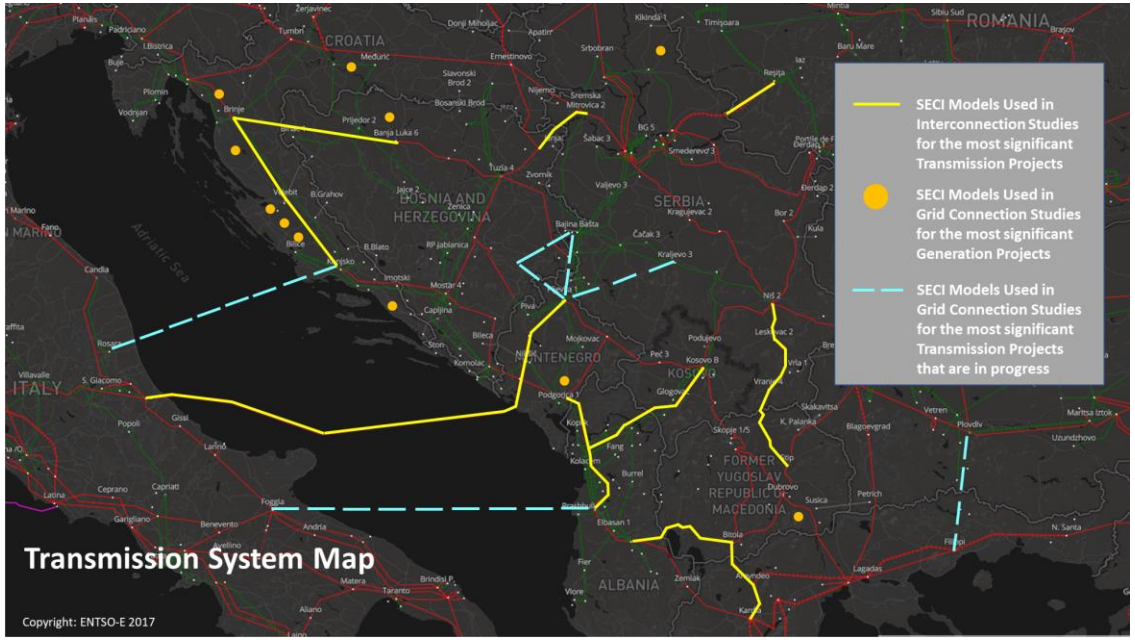
Southeast Europe Cooperation Initiative Transmission System Planning Project (SECI) (2001 – 2017)

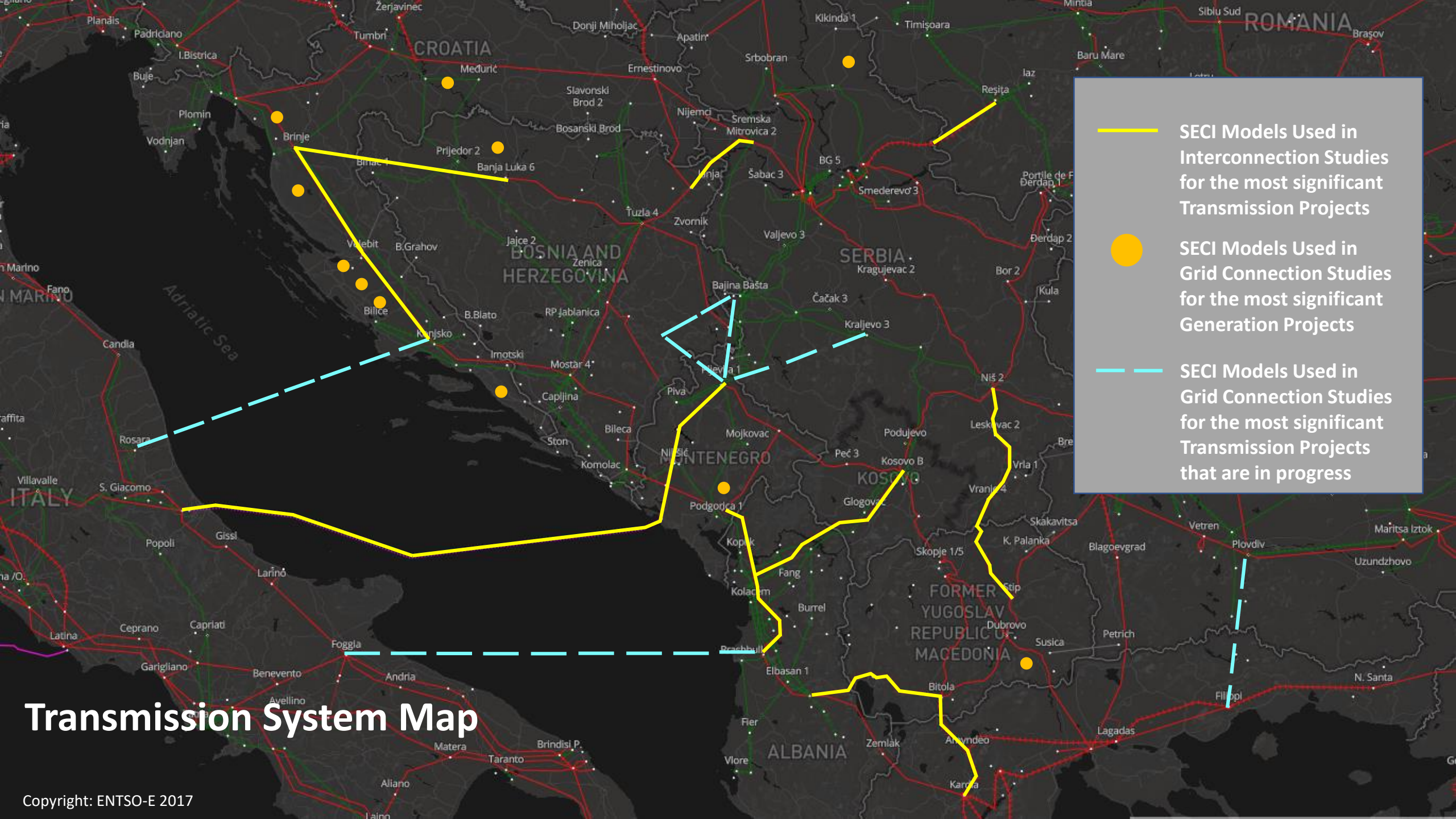
Objectives:

- Developed and maintained regional electricity network planning models to support development of Black Sea infrastructure, regional electricity trade and electricity trade between the Black Sea region and Europe.
- Supported transfer and adoption of European network planning and operational practices to accelerate integration with ENTSO-E.

Progress

- Models & forecasts are most detailed available in Europe
- $10 billion worth of transmission investments leveraged through the use of SECI & BSTP models for new internal & interconnection lines
- Sustainable program - graduated USAID assistance and adopted by ENTSO-E in 2017



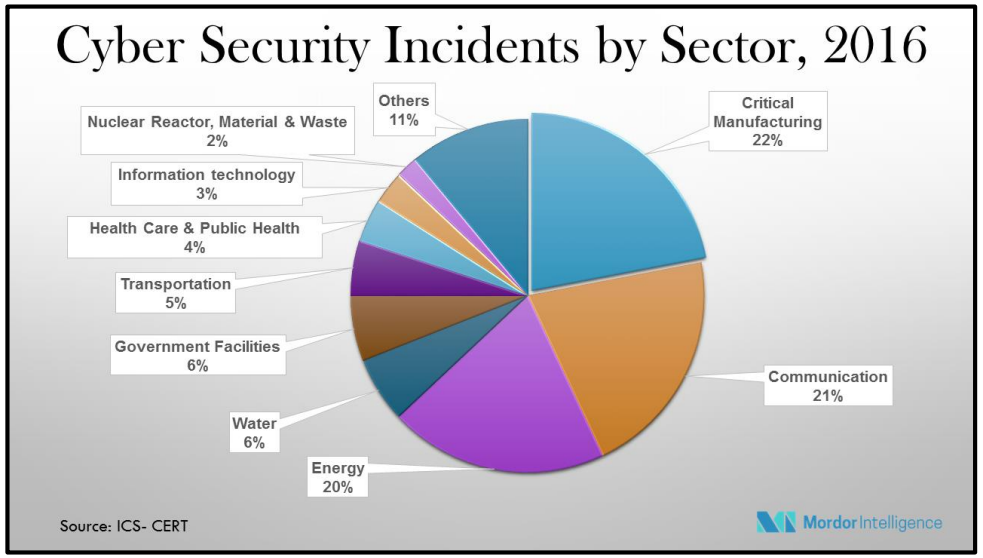


Utility Cyber Security Initiative (UCSI)

Objectives: improves cyber threat detection and management; strengthens defense against attack; and enhances network resiliency.

Progress

- Developing a cyber risk assessment methodology to identify the top threats to each member
- Developing cyber strategies for UCSI members to prioritize initial cyber security network investments
- Conducted a cyber security management audit of the Georgian State Electro System identifying management and cultural change priorities
- Supporting development of a virtual cyber Information Sharing and Analysis Center (ISAC)

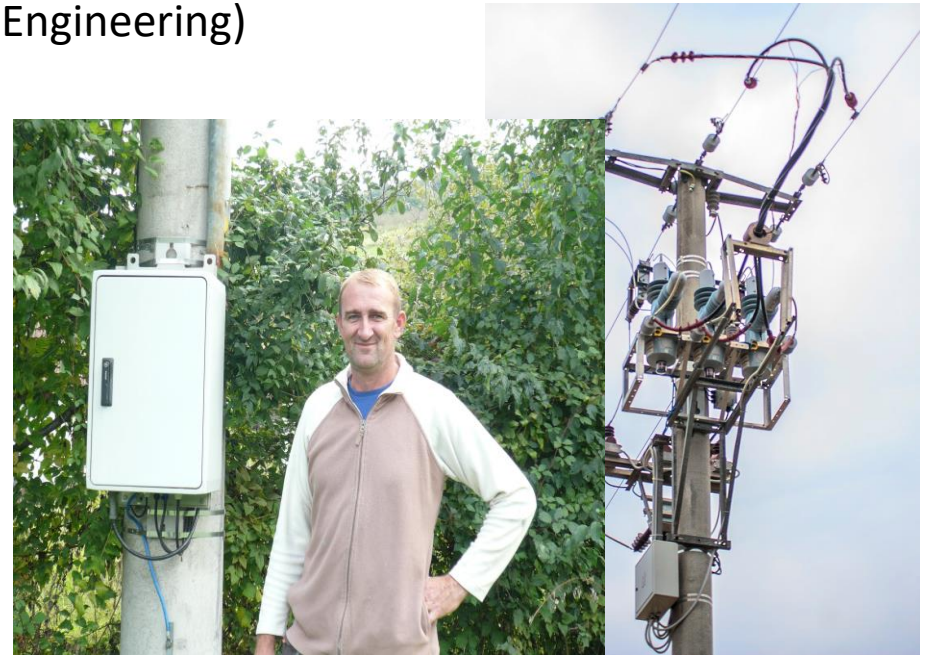


Southeast Europe Distribution System Operator Security of Supply Working Group

Objective: To assist the electric distribution companies in Southeast Europe to improve the security of supply on the "last mile of service."

Progress

- Benchmarking of 108 key operational and economic performance metrics in a continuous improvement process
- EVN Macedonia established emergency response program incorporating U.S. best practices from CenterPoint Energy and American Electric Power (AEP)
- Small demonstration project in district of Brcko, BiH demonstrating U.S. smart grid technology (Schweitzer Engineering)



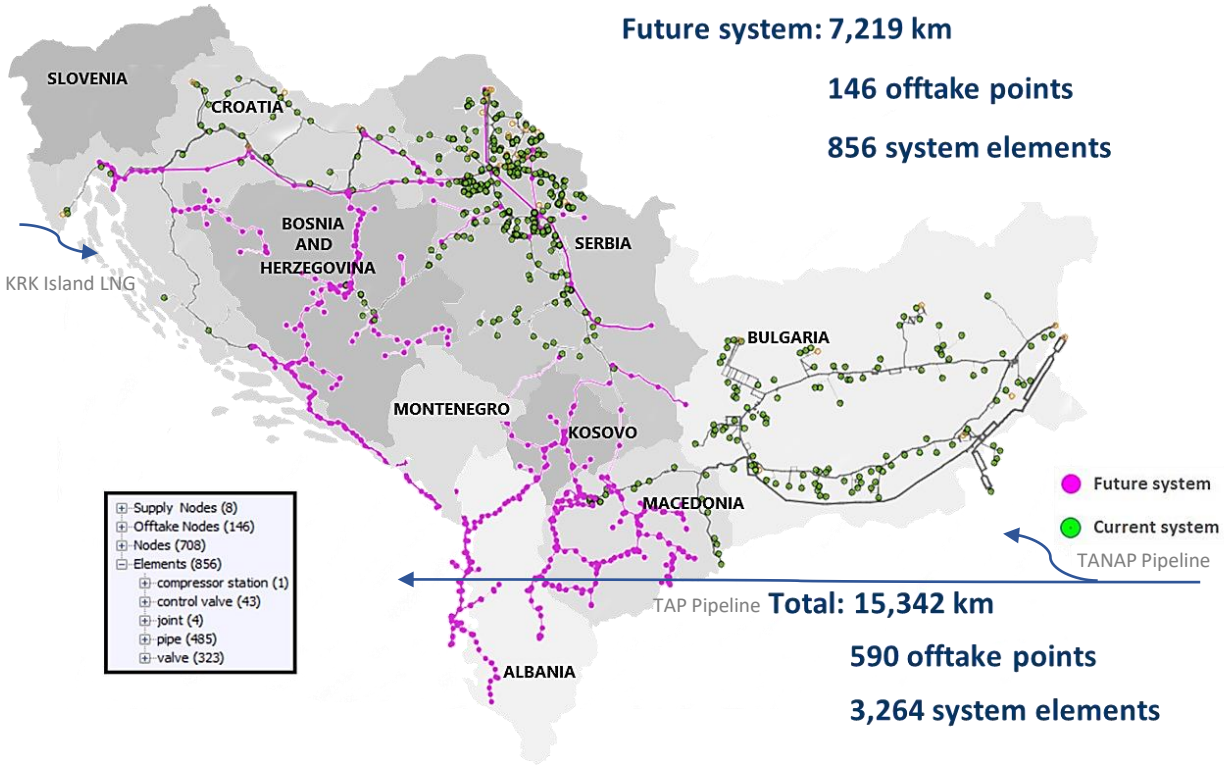
Eastern Europe Natural Gas Partnership (EE-NGP)

Objectives:

- Promotes regional cooperation in natural gas transmission network planning and supports regional harmonization of methodologies and operational principles.
- Identifies potential natural gas transmission network investments to expand natural gas markets and diversify supply.
- Enables the creation of a regional gas market with the potential for US gas supplies.

Progress

EE-NGP Max 2040 Model



Electricity Market Initiative (EMI)

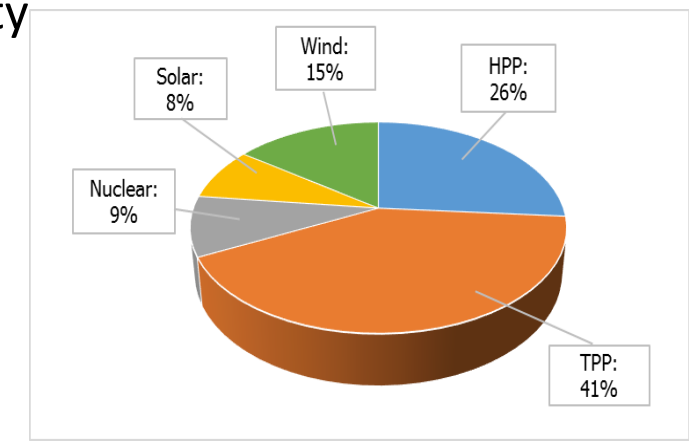
Objectives: Established in July 2018 to:

- Reduce "seams" between domestic power markets in Southeast Europe;
- Encourage deeper and more liquid wholesale electricity trade; and
- Accelerate development of clean and efficient generation.

Progress

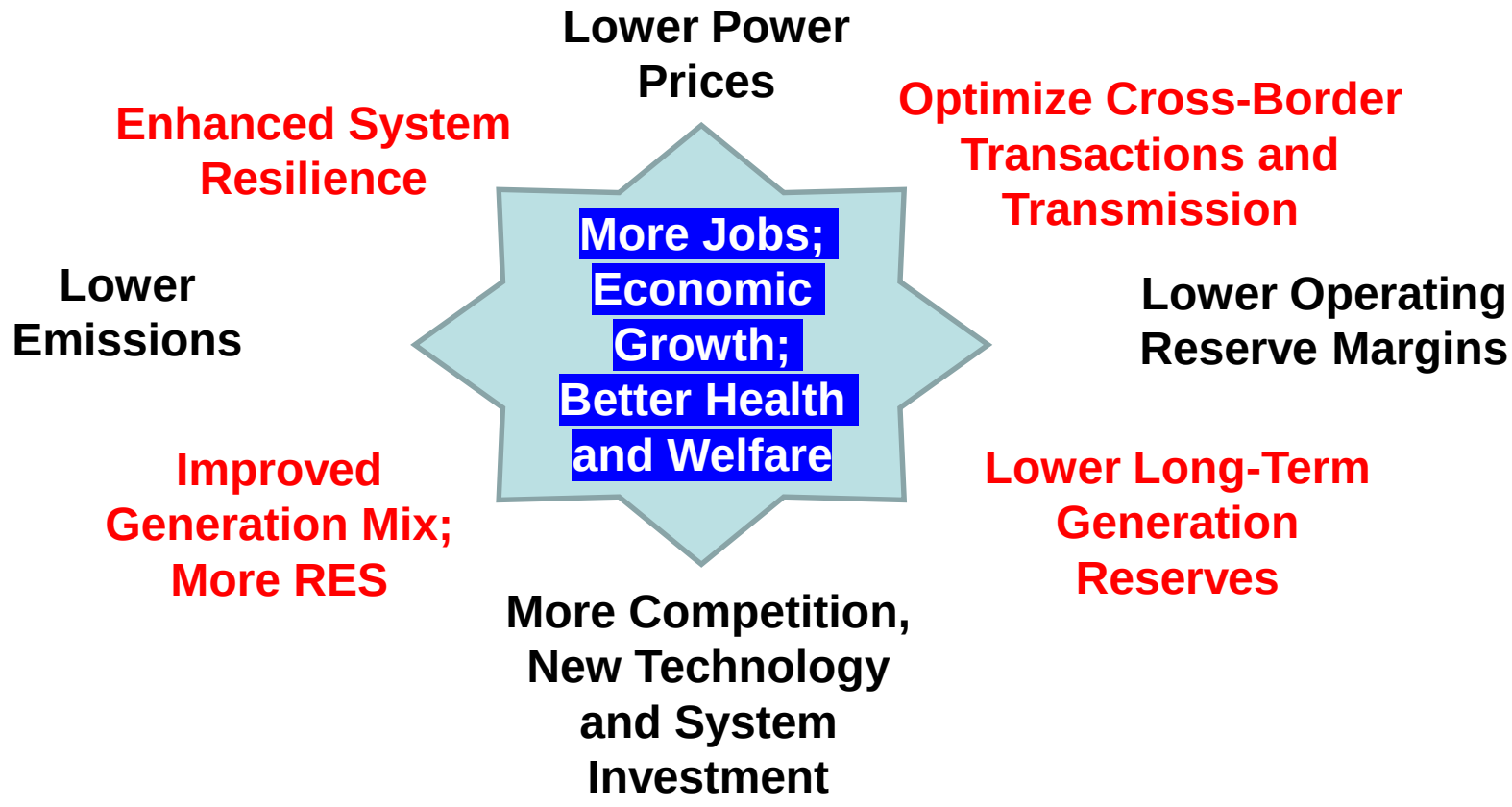
- Currently developing 2025 day-ahead regional electricity market analysis. Planning work to:
- Promote RES
- Ensure network stability, and
- Harmonize calculations of cross-border transmission capacity

EXPECTED SOUTHEAST EUROPE GENERATION CAPACITIES IN 2030



Installed capacity (GW)	Albania	Bosnia and Herz-egovina	Bulgaria	Greece	Croatia	Hungary	Kosovo	Monte-negro	Macedonia	Romania	Serbia	Slovenia	TOTAL
HPP	3.15	2.27	2.61	4.53	3.19	0.00	0.04	1.11	1.26	6.13	3.30	1.04	**28.62**
TPP	0.50	2.47	5.26	10.11	2.74	5.12	1.66	0.20	1.51	9.88	4.45	1.32	**45.21**
Nuclear	0.00	0.00	2.08	0.00	0.00	4.40	0.00	0.00	0.00	2.86	0.00	0.70	**10.03**
Solar	0.10	0.10	1.80	4.00	0.20	0.08	0.03	0.02	0.04	2.20	0.02	0.28	**8.86**
Wind	0.20	0.64	1.60	6.20	1.30	0.80	0.13	0.19	0.15	4.20	0.83	0.11	**16.35**
TOTAL	**3.95**	**5.48**	**13.35**	**24.84**	**7.43**	**10.39**	**1.85**	**1.52**	**2.95**	**25.26**	**8.60**	**3.44**	109.07

Potential Benefits from Greater SEE Market Integration, With EMI Support



Key EMI Accomplishments to Date

TSOs and MOs in 11 Countries Have Joined the EMI

- WB6 and Five Surrounding Countries
- MOU SIGNED JULY 2018; REGULATORS ARE OBSERVERS

Identified Priorities and Begun Work

- Market consolidation; RES integration; System operations
- CURRENTLY ANALYZING BENEFITS OF INTEGRATION

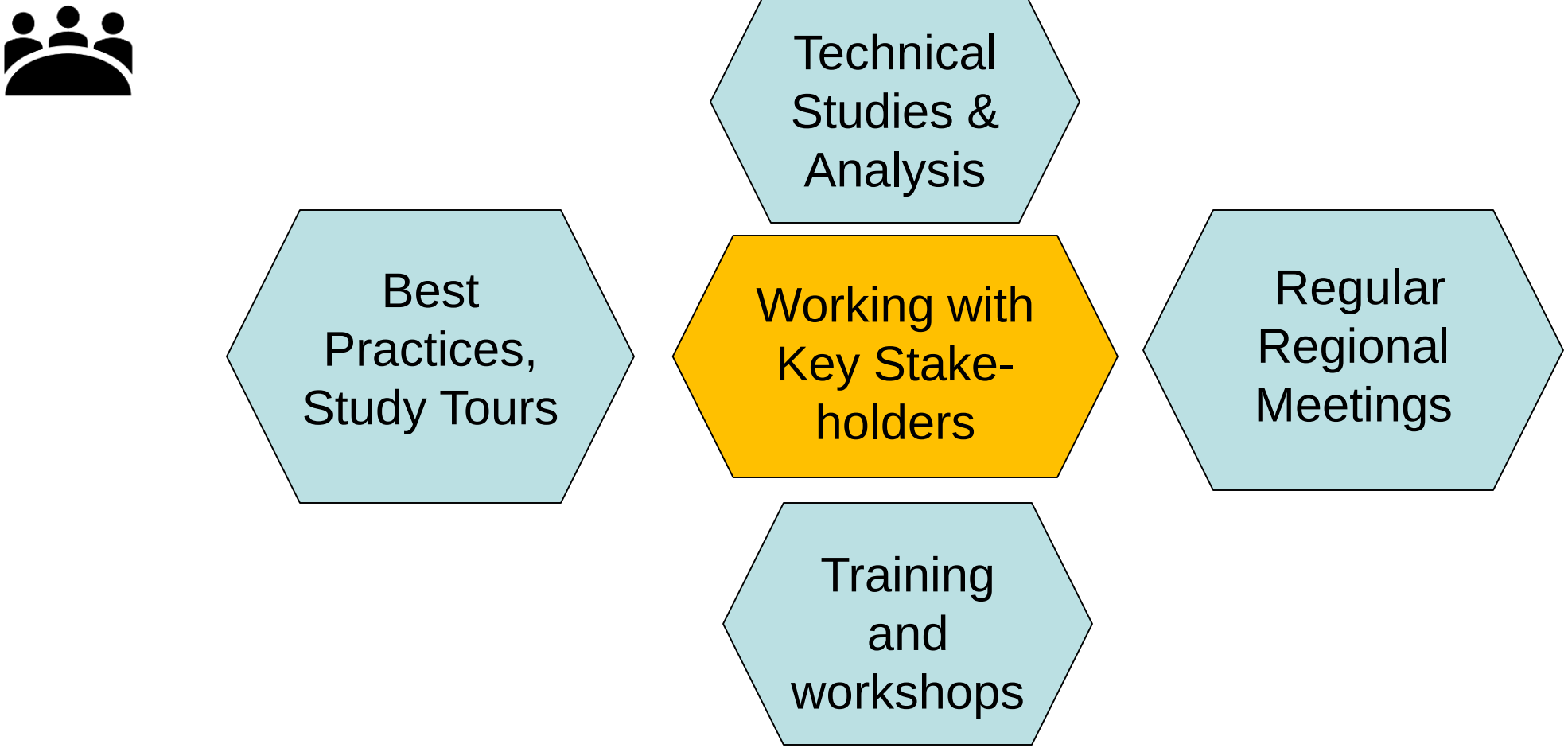
Developed Draft Work Plan; Selected Tasks

- Near-term and longer-term work – THREE KEY AREAS

Conducted Three Successful WG Meetings – 50-60 People – Just Completed One

- Country overviews; technical discussions; expert best practices; regulatory inputs; next steps on EMI Work Plan

How does the EMI Working Group Deliver Results?



Area of Opportunity #1: Capture the Benefits of Greater Regional Market Integration

Overall Objectives

- **Stimulate and capture the benefits realizable through the robust power markets in Southeast Europe; 2025 focus**
- **Demonstrate benefits to EMI members and regional stakeholders**
- **Foster regional markets that can trade competitive products, and that optimize the capacity and daily grid utilization. Begin with day-ahead markets.**
- **Support TSOs and MOs with the implications of these changes; make recommendations to regulators and policy makers**
- **Recognize ongoing market developments**

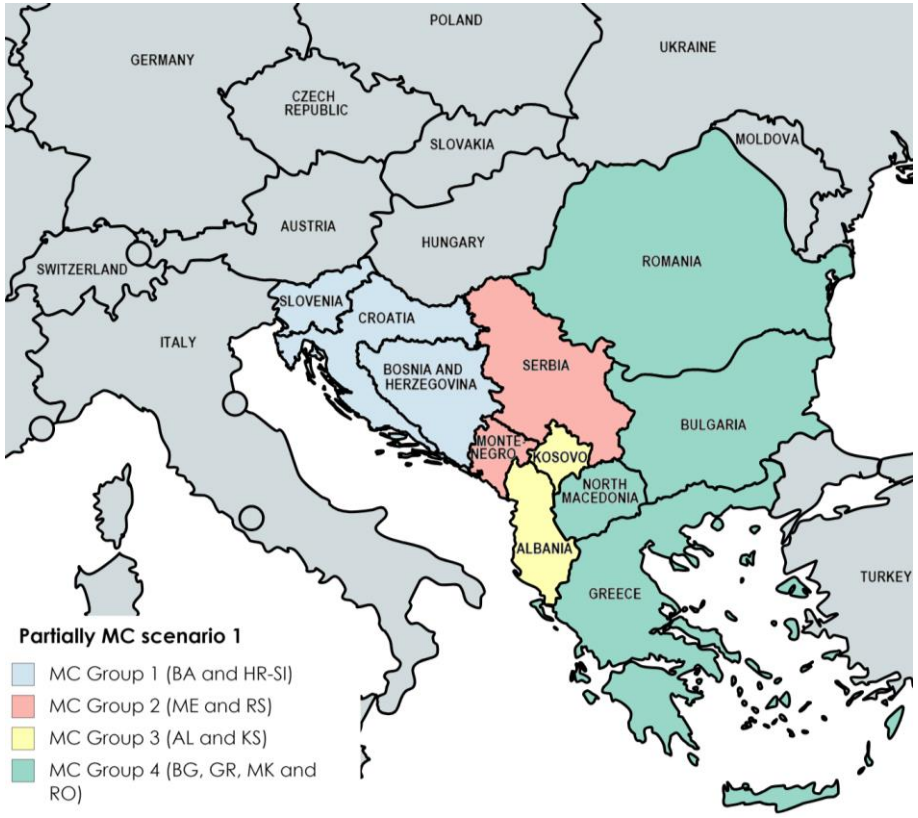
Expected Impacts of the Study (1)

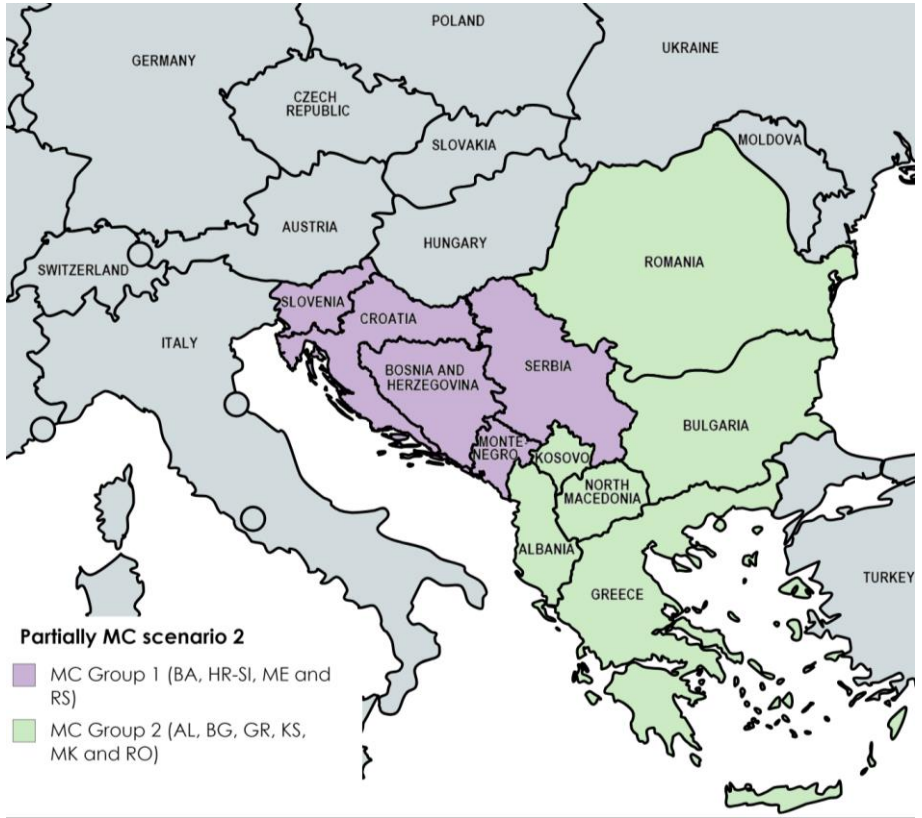
- Lower market prices: due to the more efficient allocation of generation and reducing cross-border bottlenecks and transaction costs, we would expect the level of daily/day-ahead wholesale market prices in the region to fall as the market becomes more integrated. However, better regional integration assumes harmonization of prices across the region, and in some countries with lower prices they may increase as they export more.
- Improved generation mix: Greater market integration will enable more efficient usage of generating capacities and certain changes in thermal generation may be expected. In addition, a number of countries expect significant increases in RES generation, and may have policies supporting such expansion.

Expected Impacts of the Study (2)

- Lower carbon emissions: Changes in thermal generation imply changes in total carbon emissions that are also determined by the price of emission allowances as part of total generation costs.
- Greater imports and exports: It may be expected that the total net export (difference between export and import) of the SEE region will increase due to market integration. However certain countries with less efficient and more costly power plants may experience increase in electricity import due to increased availability of cheaper electricity from abroad.
- Greater resilience: A more diverse system, over a wider geography, will be more resistant to disruptions of service in case of natural disasters, physical and cyber attacks, etc.

- Two possible partially market coupled scenarios
  - Partially MC scenario 1 (4 MC groups)
  - Partially MC scenario 2 (2 MC groups)





Proposed Base Case and Scenarios (2)

Scenarios	Market coupling	Hydrology	RES	Demand
Base Case	separated (non-coupled) markets	normal hydrology	base level of RES	base demand growth
Full market coupling	market coupling of all EMI countries	normal hydrology	base level of RES	base demand growth
High level of RES penetration without MC	separated (non-coupled) markets	normal hydrology	high level of RES (based on TYNDP 2018 for 2030 ST)	base demand growth
High level of RES penetration with MC	market coupling of all EMI countries	normal hydrology	high level of RES (based on TYNDP 2018 for 2030 ST)	base demand growth
Dry hydrological conditions without MC	separated (non-coupled) markets	dry hydrology	base level of RES	base demand growth
Dry hydrological conditions with MC	market coupling of all EMI countries	dry hydrology	base level of RES	base demand growth
Partial market coupling	partially coupled markets in 4 (or 2) groups	normal hydrology	base level of RES	base demand growth
High level of RES penetration and low demand without MC	separated (non-coupled) markets	normal hydrology	high level of RES (based on TYNDP 2018 for 2030 ST)	low demand growth (50% lower growth rate)
High level of RES penetration and low demand with MC	market coupling of all EMI countries	normal hydrology	high level of RES (based on TYNDP 2018 for 2030 ST)	low demand growth (50% lower growth rate)

Area of Opportunity #2: Best Practices for the Integration and Procurement of Alternative Generation/Renewable Energy Sources (RES)

Overall Objectives:

- **Enhance the ability of EMI countries to:**
  - **Optimize future development;**
  - **Minimize system impacts; and**
  - **Absorb growing amounts of alternative generation (especially intermittent sources and renewables/RES) onto the grid.**
- **Carry out this technical work in anticipation of procurements organized through regulatory channels.**

Area of Opportunity #3: Support to Foster Efficient Regional Day-Ahead Market and Operations, e.g., Common Cross-Border Capacity Calculations and Allocation Processes

Overall Objectives:

- **Improve TSO/MO institutional capacity to model and analyze network behavior in more competitive, day-ahead wholesale energy and balancing markets.**
- **Foster the development of a common regional approach to cross-border capacity calculations and the allocation of such capacity.**
- **Support EMI members with regulatory implications through changes in TYNDPs and generation mix.**

WHY DOES ALL THIS MATTER TO REGULATORS? (From NARUC Presentation – 10 February 2019)

- The findings of USEA's EMI work may well come before regulators in the next few years
  - Reviewing the benefits of coupling with other countries
  - Assessing the need for new or upgraded transmission
  - Considering possible wholesale and retail rate changes
  - Enabling TSOs to conduct special analyses in the TYNDPs
  - Fostering the introduction of more competitive generation
  - Achieving enhanced resilience
- Meet EU emissions standards; Support EU accession
- Enhance economic growth

ADVANCING ECS-EMI COLLABORATION

- Keep each other apprised of work plans and objectives
- Provide feedback from members that can benefit each others' efforts
- Share results of analysis; areas of greatest needs
- Support the members' needs at each step of their integration journey
- Conduct joint meetings with the ECS
- Question - Will we look back in several years, celebrate their success, and say that we made a difference?