SEERMAP

South-East Europe Electricity Roadmap

Introduction to transmission network characteristics - technical features

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MAIN ISSUES

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- The map shows the region that will be included in the network modelling
  - 9 electric power systems will be modelled and assessed in full capacity
  - Croatia , Hungary, Slovenia and Turkey will be modelled in full capacity
  - Italy and Austria will be modelled as equivalents
- Two analysed scenarios
  - Reference Case
  - New 400 kV OHL RO-BG
- Two target years
  - 2020
  - 2025
- Two analysed regimes
  - Winter max regime
  - Summer maximum regime

MAIN ISSUES

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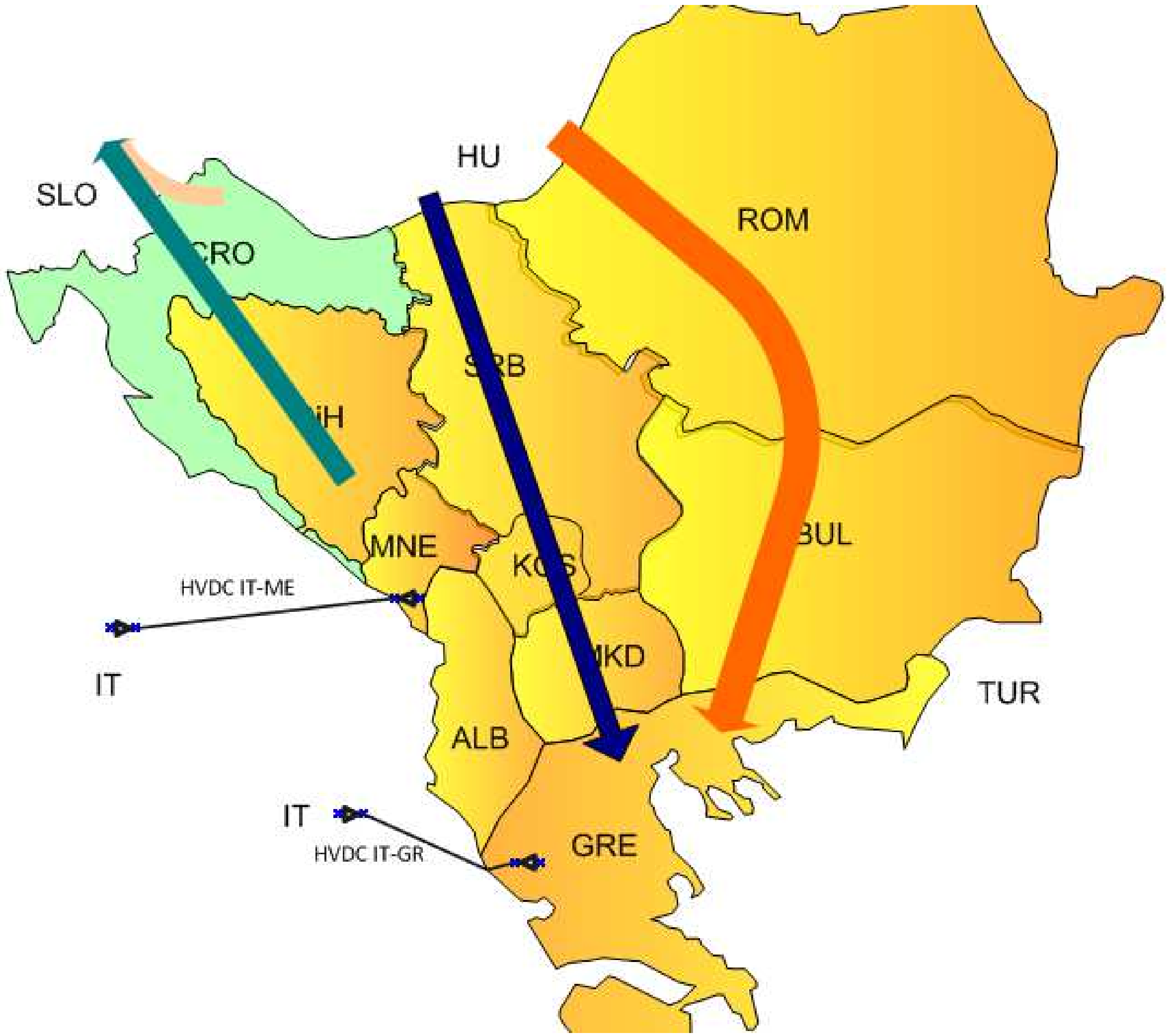

Cross-border trading

MAIN ISSUES

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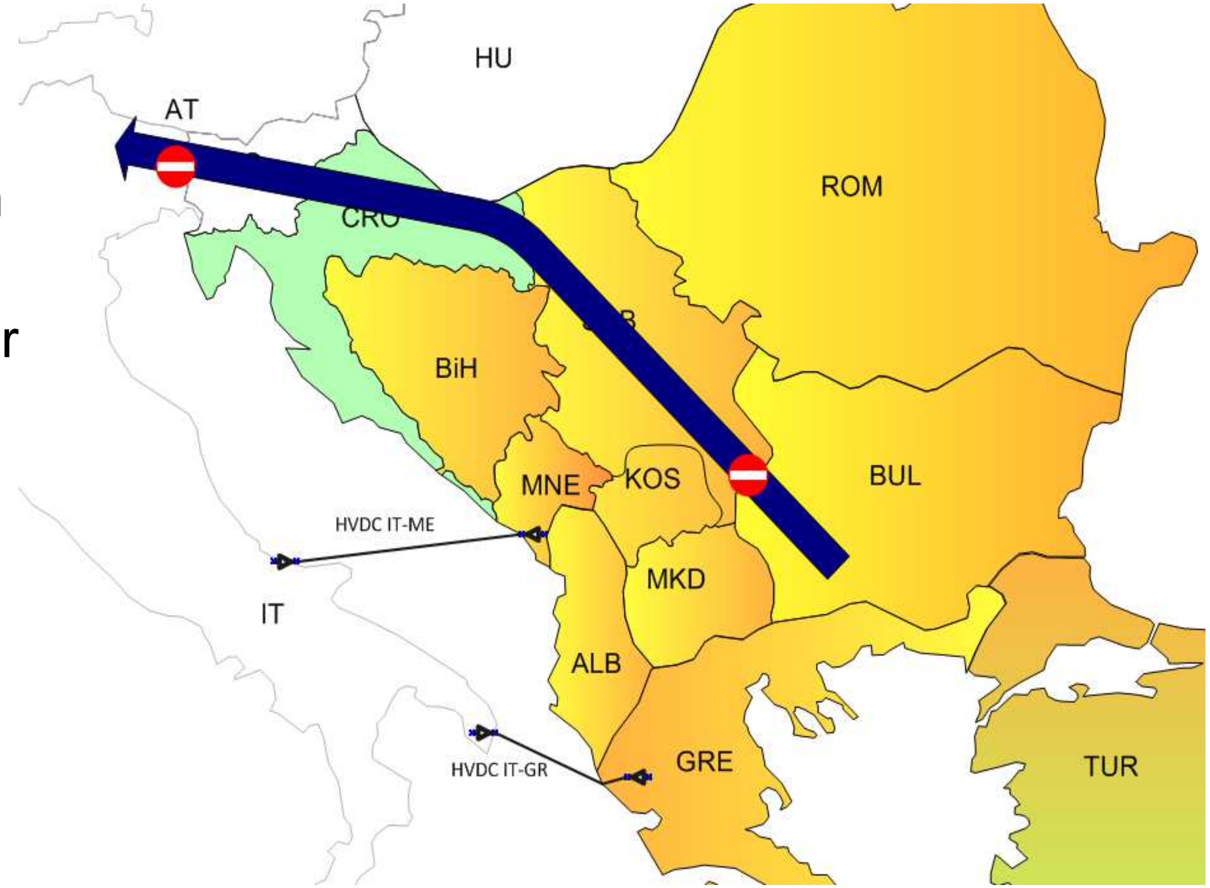
From the transmission systems point of view, the electricity is exchanged by:

1. Internal trading (within one TSO), or
2. External - cross border trading



MAIN ISSUES

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The main issues in transmission network utilisation can be classified as the problems with:

- Security of supply
- Variation in losses in the transmission grid
- Growing of the transits (related to the increase of the transactions between the producers and consumers)
- Congestions on the borders (between the TSOs)

Transmission Network Characteristics

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Main characteristics of the transmission network:

1. It is consisted of overhead lines (cables), underground cables (usually in densely populated areas), transformers and other equipment related to those transmission elements
2. The lines/transformers are designed to transmit large amounts of power from generation to load area points
3. Transmission networks are responsible for the bulk transmission of electric power on the main high voltage electric networks.
4. Transmission system operators (TSOs) are in charge of the development of the grid infrastructure, too. TSOs, in the European Union internal electricity market, are entities operating independently from the other electricity market players (unbundling)

Transmission Network Characteristics

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The assessment framework criteria are selected:

- To enable an appreciation of project benefits in terms of EU network objectives:
    - ensure the development of a single European grid to permit the EU climate policy and sustainability objectives (RES, energy efficiency, CO_2);
    - To guarantee security of supply complete the internal energy market, especially through a contribution to increased socio-economic welfare ;
    - To ensure technical resilience of the system

- To provide a measurement of project costs and feasibility

- The indicators used are as simple and robust as possible. This leads to simplified methodologies for some indicators.

Physical vs Commercial Flows

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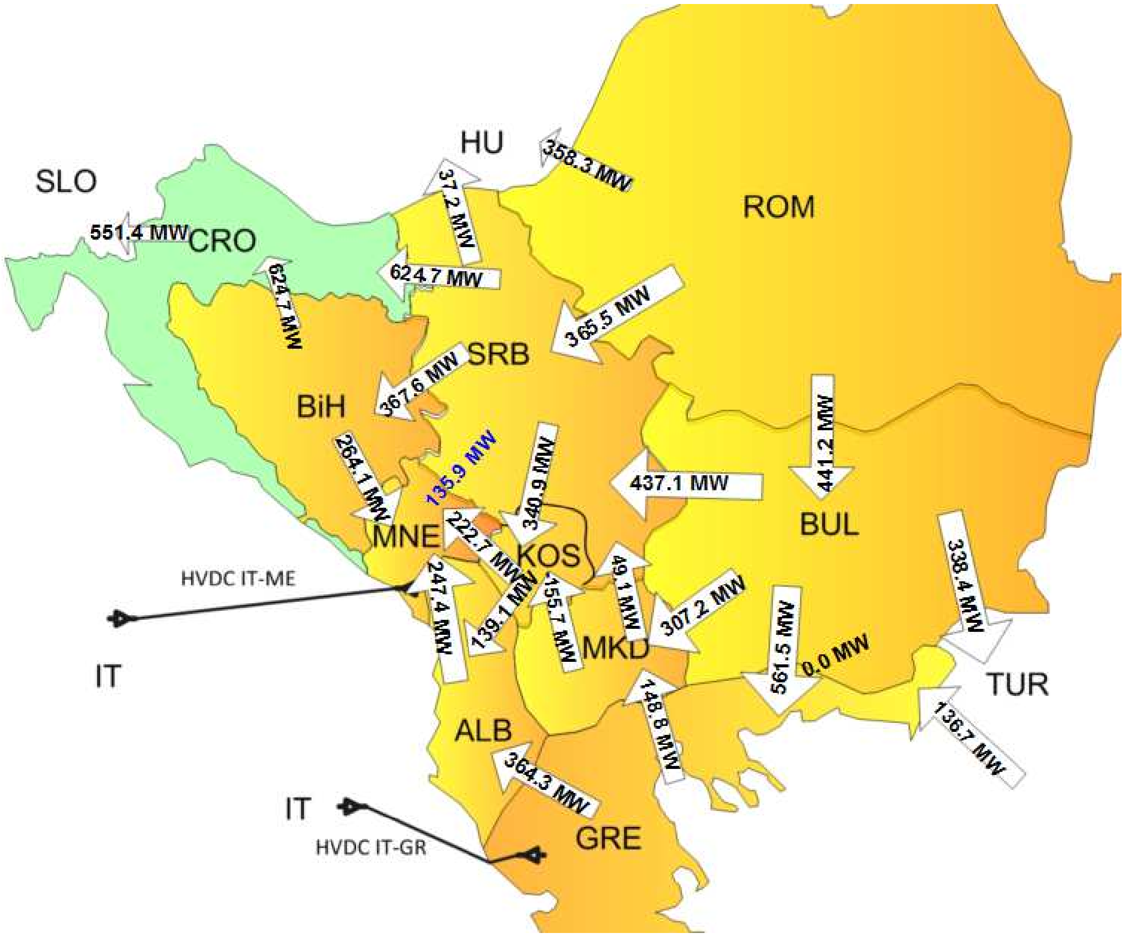
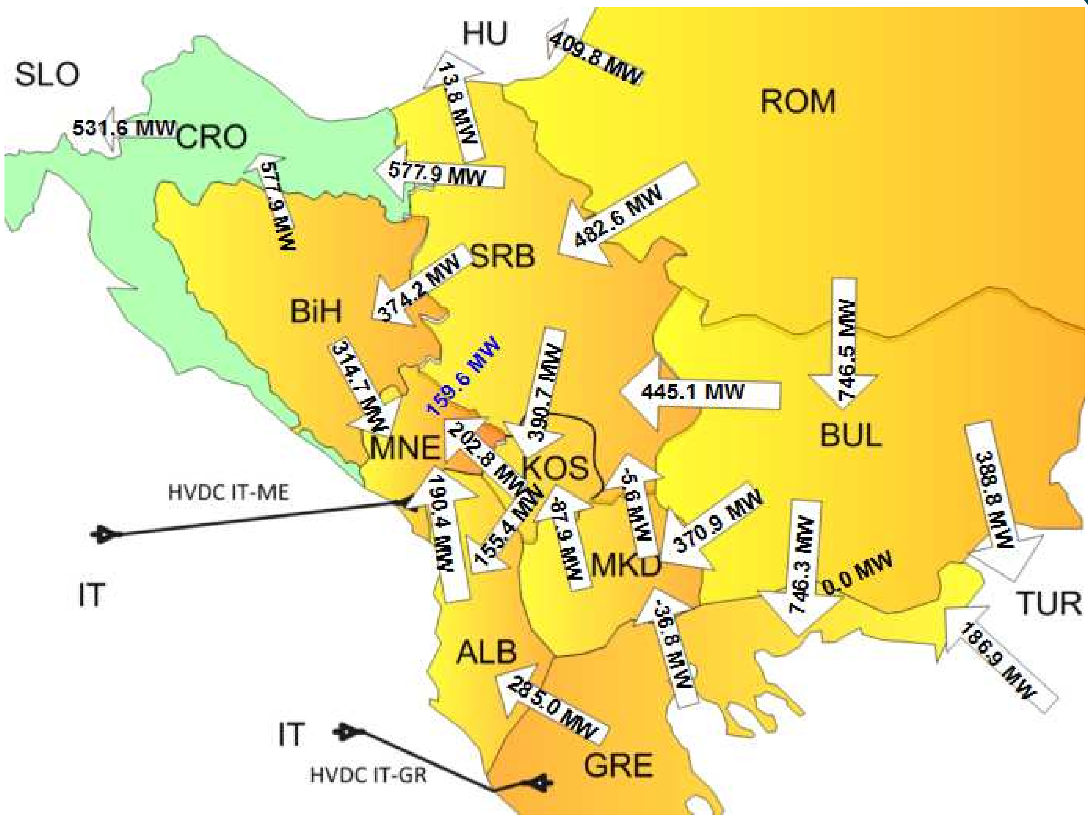


Desired Interchange (MW)	Area Name
-150	AL
-450	AT
600	BA
1200	BG
-900	HR
-800	GR
-1835	HU
-250	MK
150	ME
1100	RO
200	RS
1000	SK

Physical vs Commercial Flows



Sink

Source

Desired Interchange (MW)	Area Name
-150	AL
-450	AT
600	BA
1200	BG
-900	HR
-1300	GR
-1835	HU
-250	MK
150	ME
1600	RO
200	RS
1000	SK

Physical vs Commercial Flows

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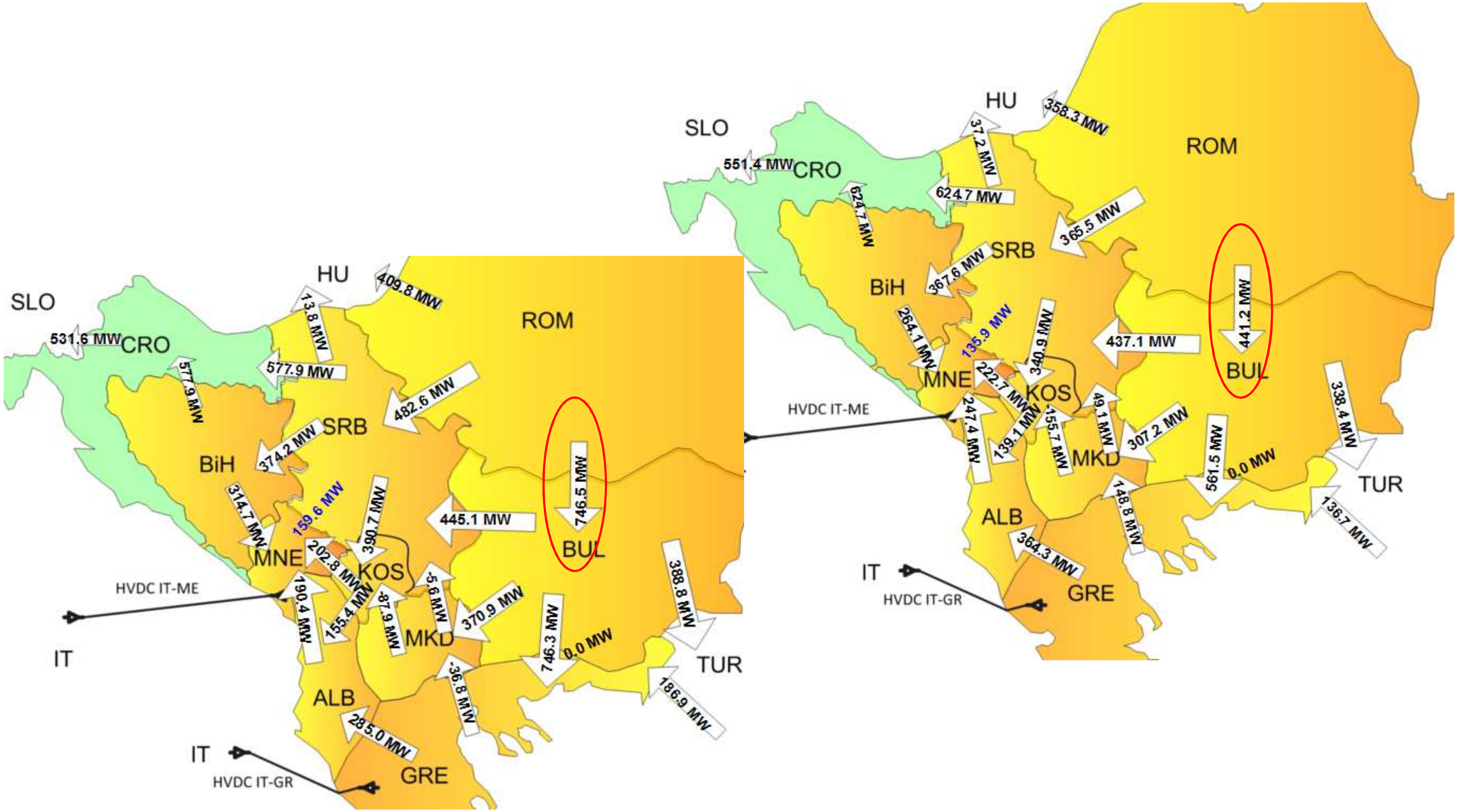
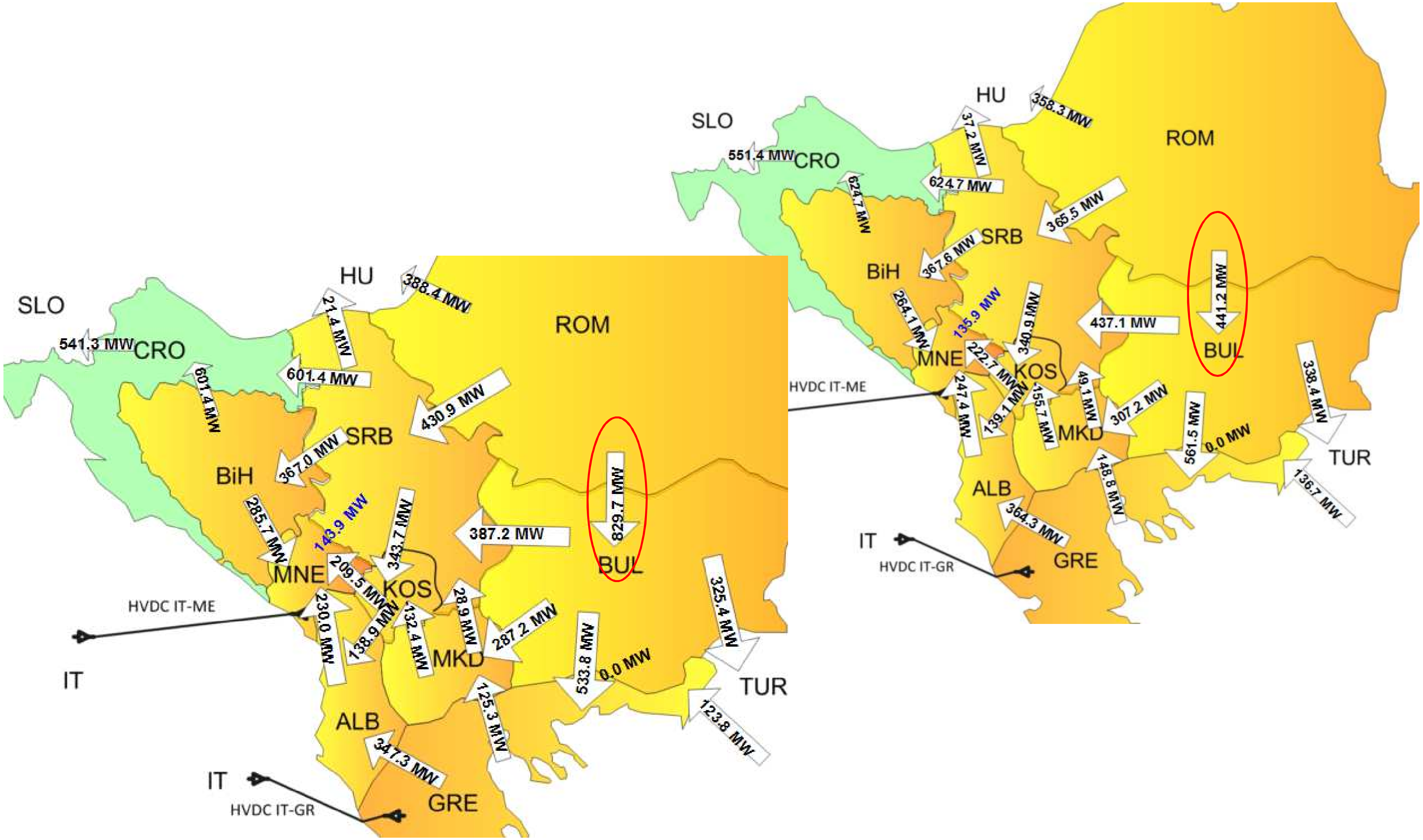


Physical vs Commercial Flows



Network Losses and System Quality

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Growing populations and industrializing countries create huge needs for electrical energy. Electricity is not always used in the same place that it is produced, meaning long-distance transmission lines and distribution systems are necessary.

- Electricity transmission and distribution networks are continuously evolving to cope with ever rising demand
- Companies were focused on adding more power lines, transformers and ancillary equipment
- Distribution electric grids are usually over 50 years old and not well-suited to integrate developing distributed generation systems, smart controllers, and advanced communication technologies.

Network Losses and System Quality

Background of the past and future planning:

- Upkeep of the aging transmission and distribution infrastructure is costly to both the operators and consumers, but with the existing grid infrastructure challenged to keep up with increasing consumer demand, innovative technologies offer new opportunities for consumers to save on their utility bills by managing their electricity usage with real-time information.

- The transmission and distribution systems must be updated with two-way communication capabilities between the end user and the distributor

- Today the technology of the systems is often able to substitute increased sophistication for physical growth

Network Losses and System Quality

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The Benefit Categories, for the planning activities are:

- Improved security of supply
- Socio-economic welfare, or market integration (characterised by the ability of a power system to reduce congestion and thus provide an adequate GTC so that electricity markets can trade power in an economically efficient manner).
- RES integration
- Variation in losses in the transmission grid
- Variation in CO_2 emissions
- Technical resilience/system safety margin
- Flexibility is the ability of the proposed reinforcement to be adequate in different possible future development paths or scenarios

Network Losses and System Quality

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Final achievements

- Enables safe grid operation;
- Enables a high level of security of supply;
- Contributes to a sustainable energy supply;
- Facilitates grid access to all market participants;
- Contributes to internal market integration, facilitates competition, and harmonisation;
- Contributes to energy efficiency of the system.
- Enables cross-country transmissions

Network Losses and System Quality

The main characteristics of the losses:

- Electricity losses can not be avoided and are an integral part of the operation of the power system
- In the energy balance of the country, the electricity losses have to be taken into the consideration, because, they are certainly one of the main factors of the power quality
- An adequate estimation of the yearly amount of the losses becomes an important factor in the network access fee determination
- In electricity supply to final consumers, losses refer to the amounts of electricity injected into the transmission and distribution grids that are not paid by users directly (network charges contains this component)

Network Losses and System Quality

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The main issues of the losses:

- Optimization of technical losses in electricity transmission and distribution grids is an engineering issue, involving classic tools of power systems planning and modelling
- The driving criterion is minimization of the net present value of the total investment cost of the transmission and distribution system plus the total cost of technical losses (valued at generation costs, but mostly, as it should be, bought on the open market)

Network Losses and System Quality

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Network losses can be split in to two categories:

- Induced by internal transits (from producer to consumer within one single TSOs) or

- Induced by cross border electricity exchanges (when the electricity is exported/imported from other TSOs-related only to transmission losses)
    - In Europe, it is covered by Inter TSO Compensation mechanism, so called ITC mechanism (it is designed to compensate parties for costs associated with losses resulting with hosting transits flows on networks and for the costs of hosting those flows)

Network Losses and System Quality

The losses Induced by internal exchanges depend on the following :

- System load
- Network configuration
- Setup of the transformer tap-changers
- Voltage conditions in the system

Contact Details

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