

A satellite view of Europe at night, showing city lights and the dark landmasses against the blue glow of the atmosphere. The image is used as a background for the top half of the slide.

Network Studies

Regional Project Assessment

V1 and V4 Scenarios and Provisional Results

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RG CCE Subgroup Network Study

ENTSO-E RG CCE stakeholder external workshop
26 March 2014, Bratislava, Slovakia

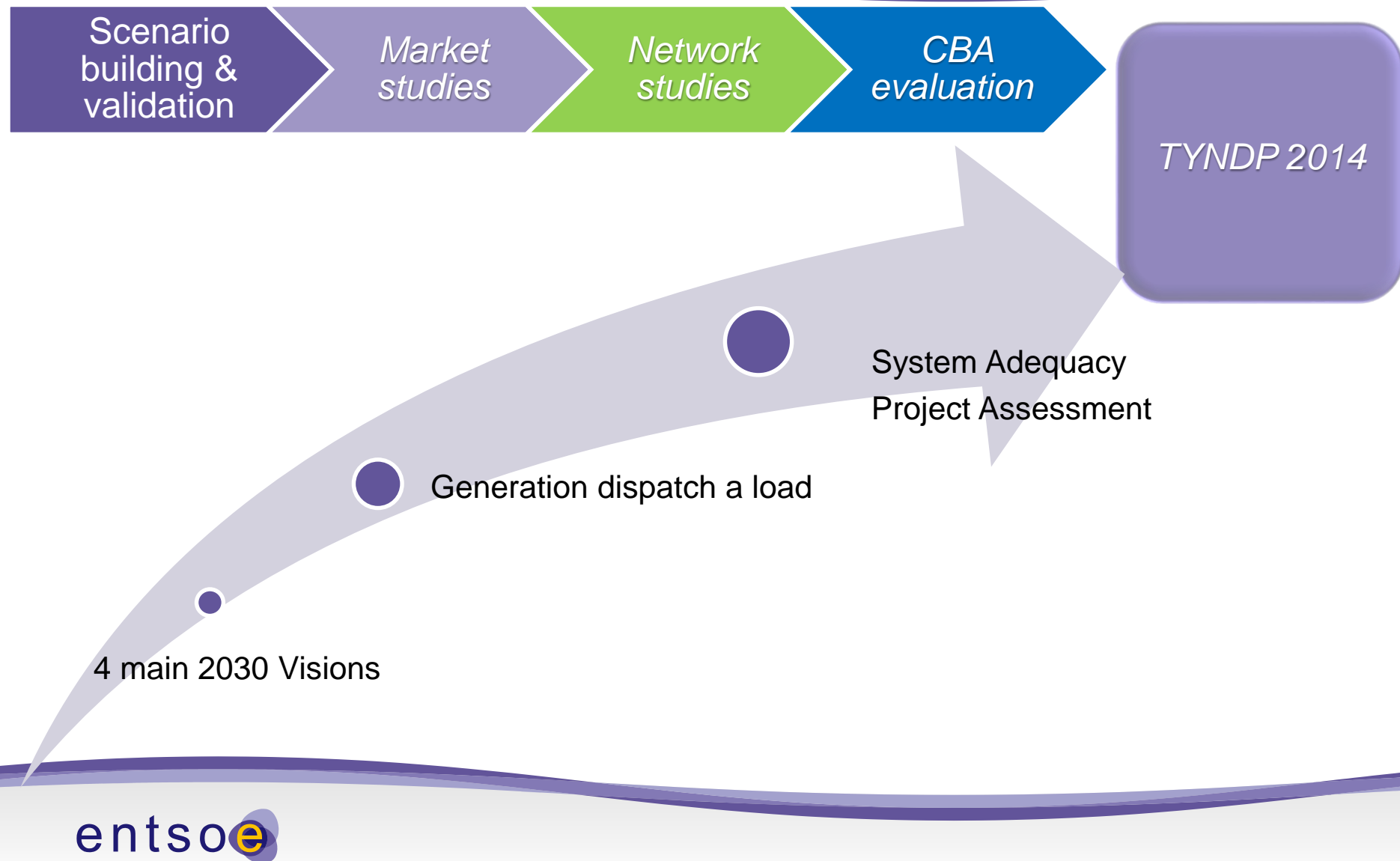
Content

1. Network modelling process
2. Project Assessment based on Network Studies
3. Project Assessment Examples

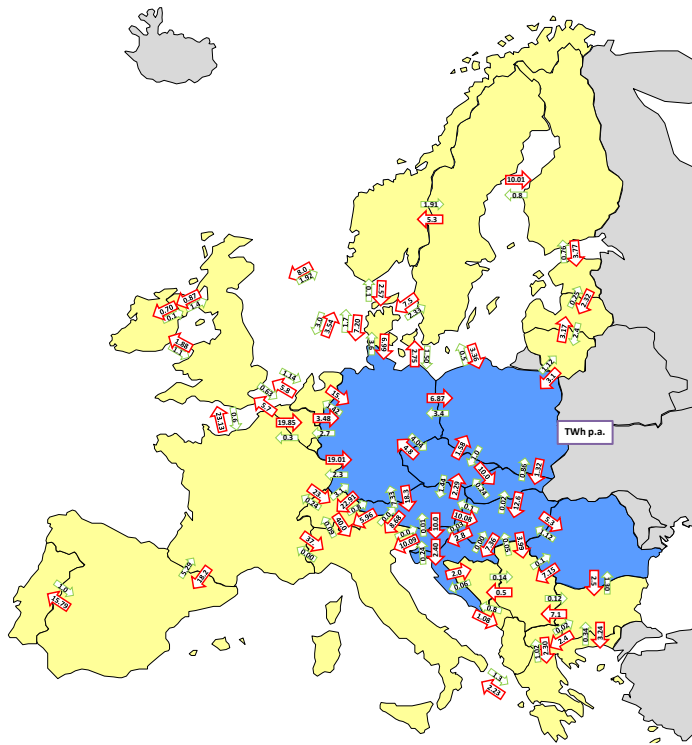


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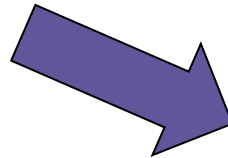
Network Studies as a part of TYNDP 2014 process



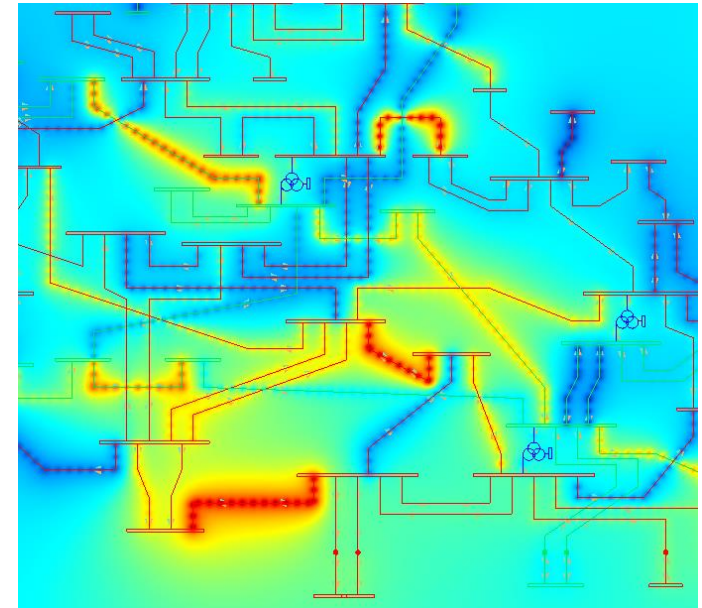
From Visions to Network



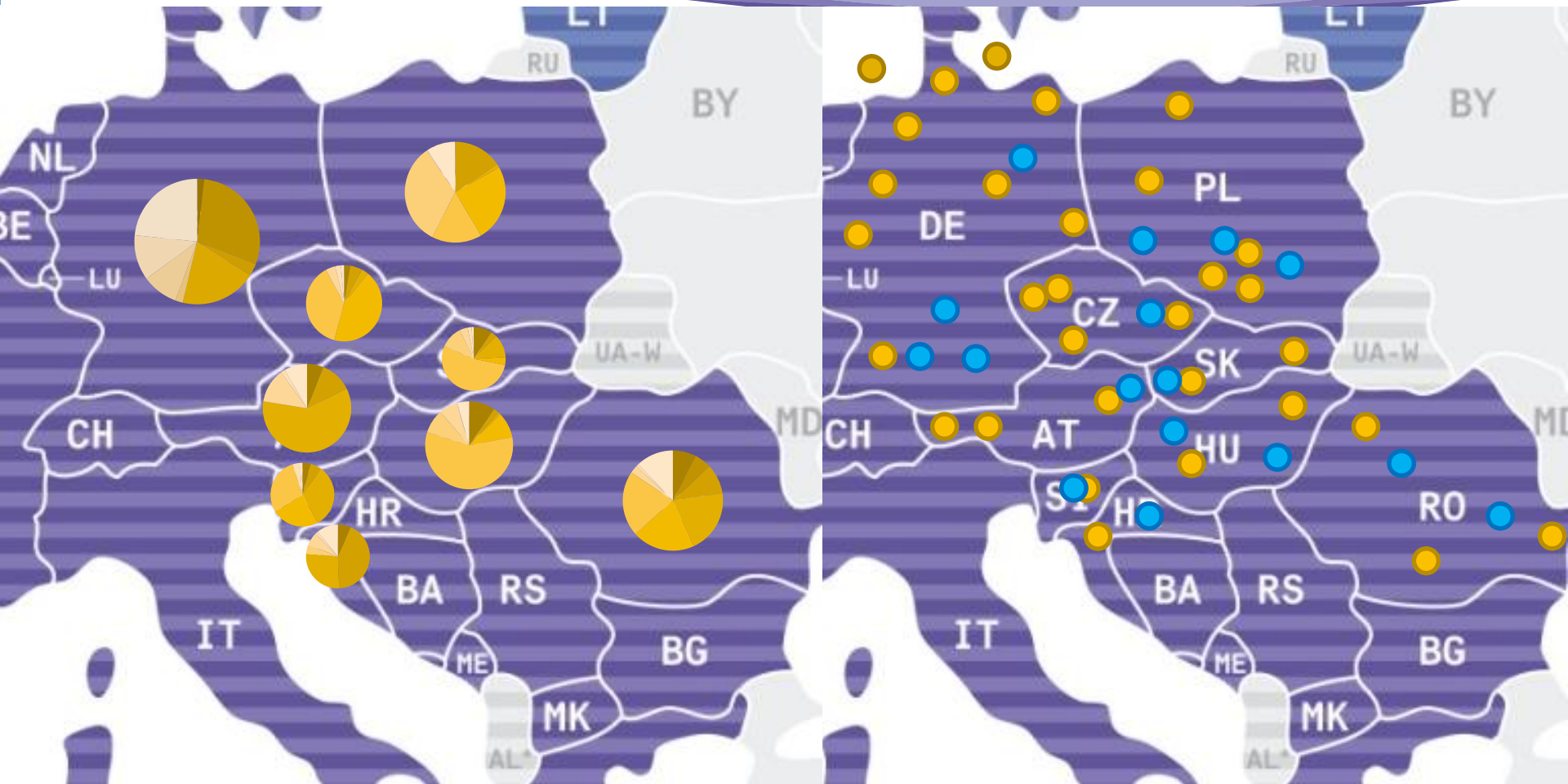
Market Studies



Grid study

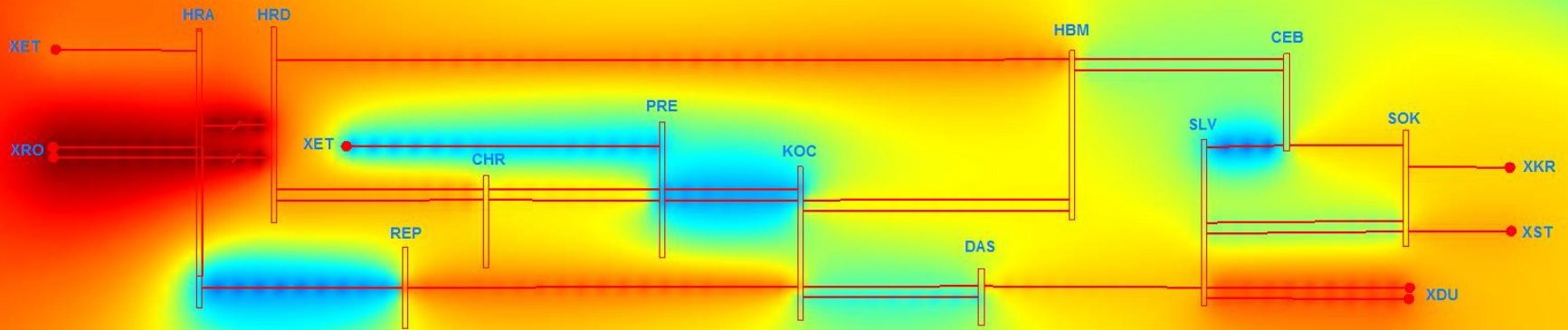


From Market Studies towards Network Studies



Impact of the assumption on network (V1 vs. V4)

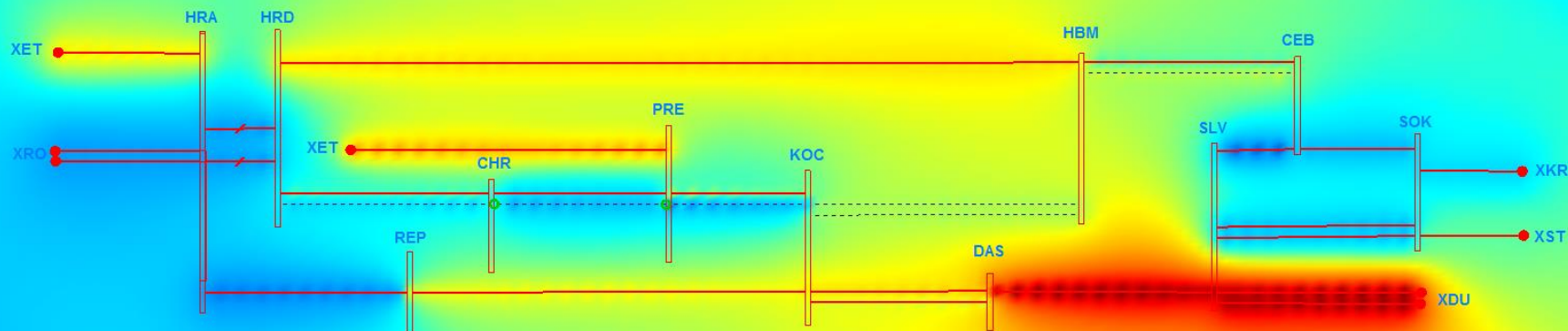
Representative cases – not extremes



Impact of the assumption on network (Vision 1)

Comparison situation with and without projects

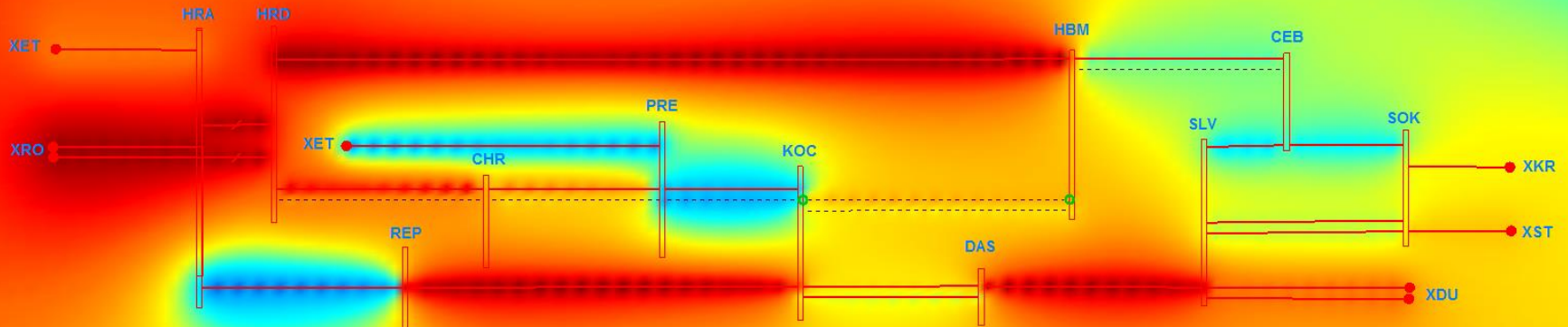
Representative cases – not extremes



Impact of the assumption on network (Vision 4)

Comparison situation with and without projects

Representative cases – not extremes



CHARACTERISTIC CASES identification



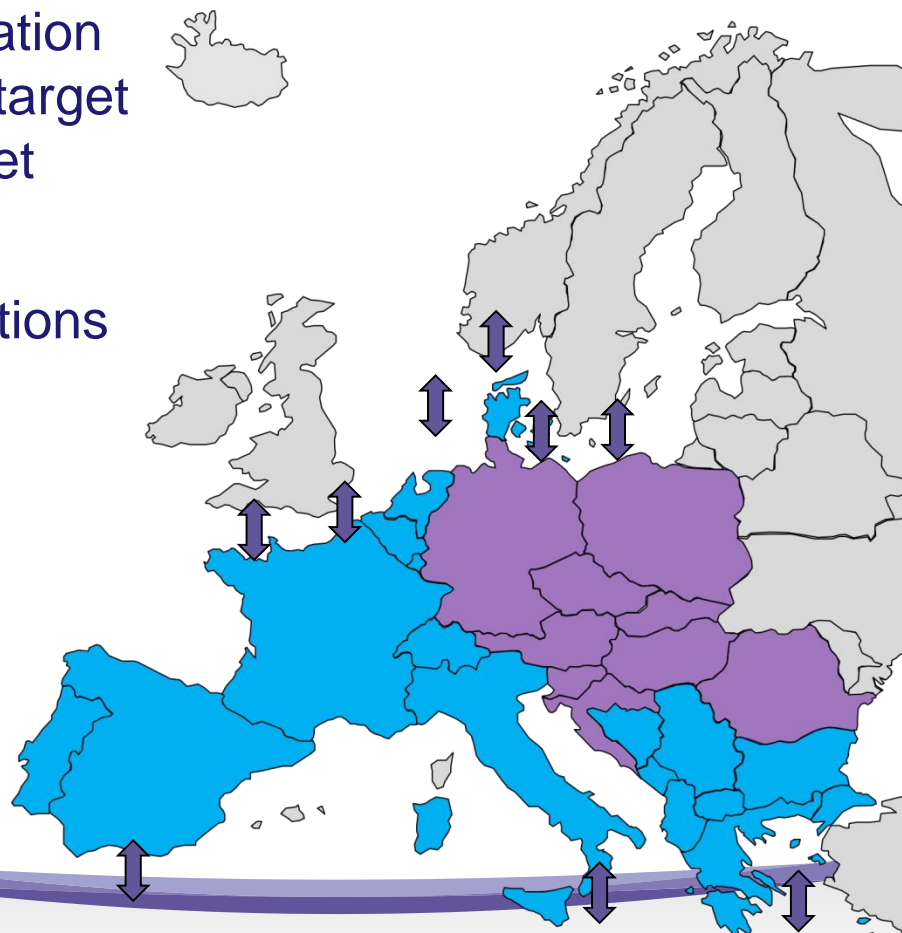
- For each combination of generation/load the following minimum was calculated

$$\min \left\{ x_j; \sum_{i=1}^m \left(\sqrt[2]{\sum_{j=1}^n (x_{j,i} - x_j)^2} \right) \right\}$$

- The vector of X_j represented the minimum distance from the hours in the group of similar generation/load situations
- The particular hour was identified by finding index i (*the hour*), when:

$$\min \left\{ i; \left(\sqrt[2]{\sum_{j=1}^n (x_{j,i} - x_j)^2} \right) \right\}$$

- RG CCE represented by „exact“ generation and demand pattern
- Rest of CE represented by generation and load adjustment (to achieve target country balances according Market simulation results)
- TSOs out of CE modeled by injections to border-nodes





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Steps towards the project assessment results



For each Case

- Losses
- N-1 calculation (N-2 when it is considered as a normal contingency – e.g. Connection of Nuclear or double circuit on 1 tower) – system adequacy
- **Take out all investment items of one project**
- Losses
- N-1 calculation (N-2 when it is considered as a normal contingency – e.g. Connection of Nuclear or double circuit on 1 tower) – system adequacy
- **Comparison of situations for cases and Visions**

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Project 48: New SK-HU interconnection, part 1



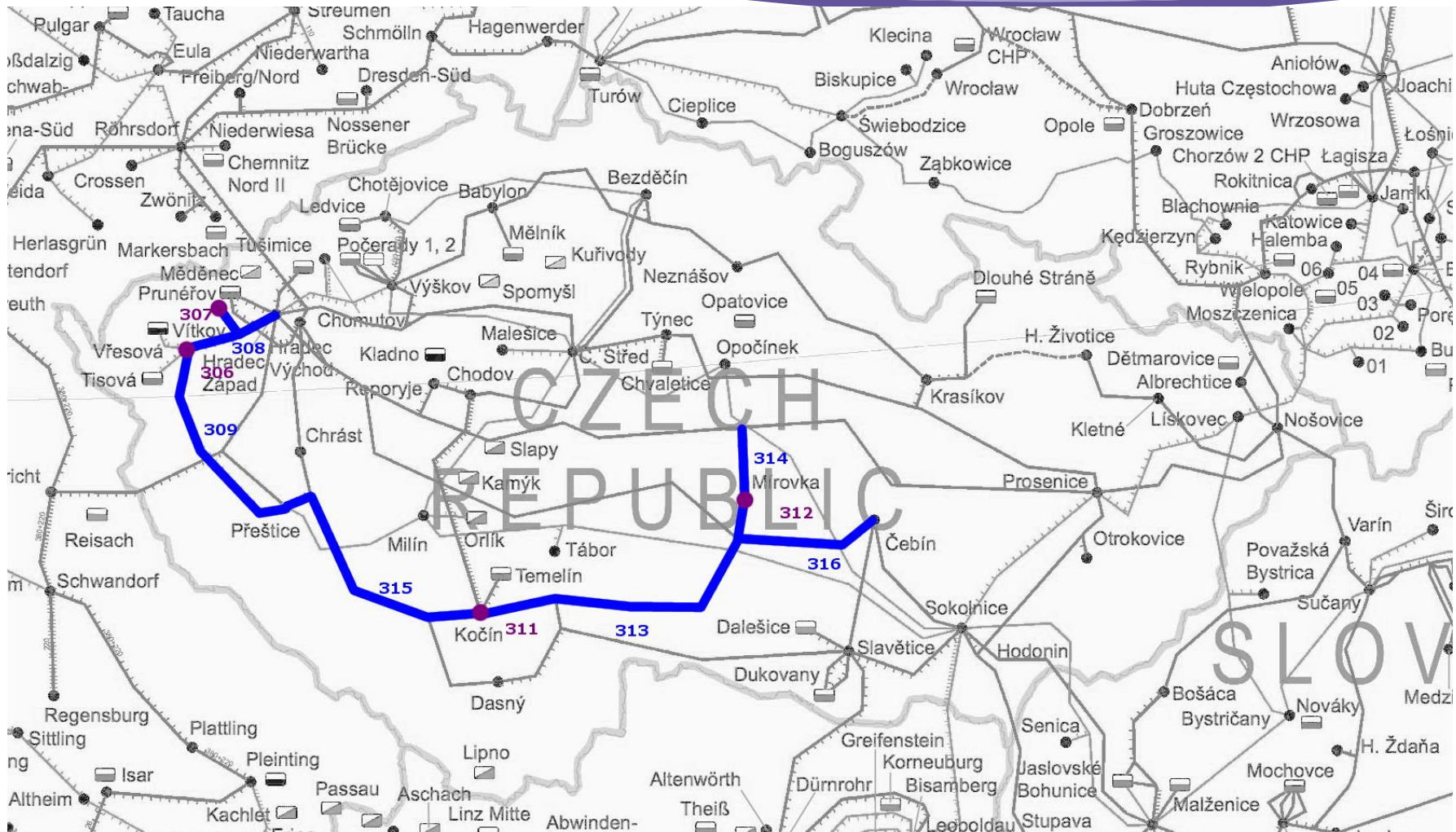
Project 48: New SK-HU interconnection, part 1



Project 48: New SK-HU interconnection, part 1

Short description	This cluster will increase the GTC between SK and HU. This project is the 1 st part of strengthening the SK-HU profile, the subsequent 2 nd part is project 54. (last commissioning of the first phase by 2018)	
	Vision 1	Vision 4
GTC Increase	600 - 1880 MW	Expected in range 600 - 1880 MW
Investment cost	150 – 220 M€	150 – 220 M€
B1: Security-Of-Supply	0 MW - New transformers in Gyor and Sájoivánka substations improve SoS also the new cross-border SK-HU and SK internal lines contribute in improvement of transmission systems operational security and SoS of both involved countries	0 MW - New transformers in Gyor and Sájoivánka substations improve SoS also the new cross-border SK-HU and SK internal lines contribute in improvement of transmission systems operational security and SoS of both involved countries
B4: Power Losses	Decrease 155 GWh/yr	Increase expected

Project 35: Czech North-South-East corridor



Project 35: Czech North-South-East corridor



Project 35 of ENTSO-E TYNDP : Czech North-South-East corridor

Short description	This project is required to facilitate power flows in the direction North-South and East-West, enhance the grid transfer capability between CZ and DE and supports the future generation evacuation. In addition the project ensures security of supply of the central part of CZ (last commissioning by 2024)	
	Vision 1	Vision 4
GTC Increase	0 - 500MW on borders + 1400 – 2200MW internally	0 - 500MW on borders + 1400 – 2200MW internally
Investment cost	573 – 736 M€	573 – 736 M€
B1: Security-Of-Supply	0 MW - New lines and transformers in substation Mirovka increase SoS by 520MWh/yr	0 MW - New lines and transformers in substation Mirovka increase SoS by 640MWh/yr
B4: Power Losses	Decrease by 240 GWh/yr	Decrease expected

Conclusions

- Through network simulation the other CBA indicators have been highlighted
- Vision 4 explores more grid requirements than the rest of the Visions

THANK YOU FOR YOUR ATTENTION!

Questions?

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