



Smart grid project SINCRO.GRID

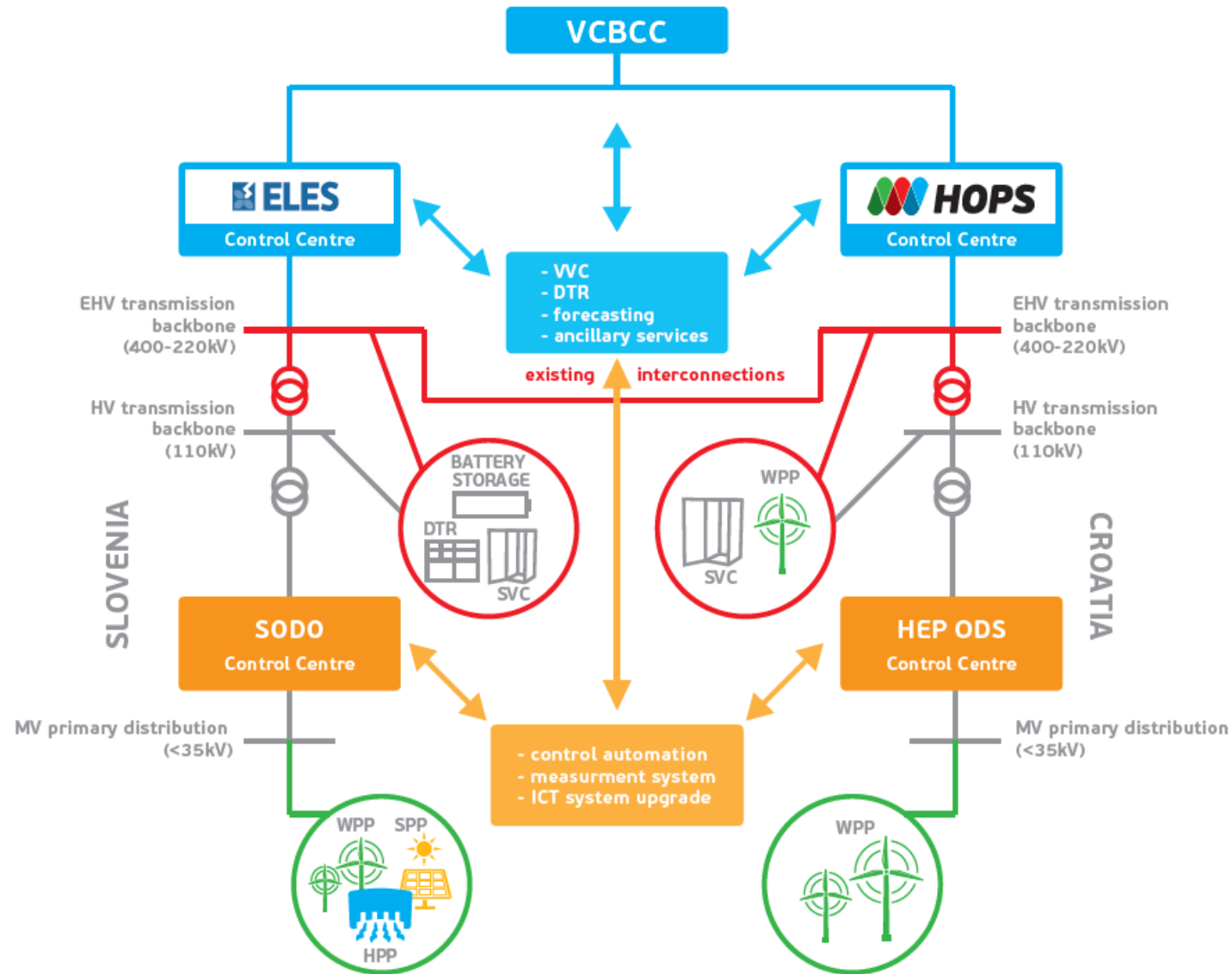
33. Symposium - CIGRÉ Srbija, Zlatibor, 06.06.2017.

mr.sc Dragutin Mihalic, dipl. ing., Croatian Transmission System Operator Ltd



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Connecting Europe Facility

SINCRO.GRID innovative approach



SINCRO.GRID – Compensation devices

SS BERIČEVO (400 kV)
SVC: +/- 150 Mvar

SS CIRKOVCE (400 kV)
VSR: -150 Mvar (ind.)

SS DIVAČA (400 kV)
VSR: -150 Mvar (ind.)
MSC: +100 Mvar (cap.)

Slovenia

$\Sigma = + 250$ Mvar (cap.)
 $\Sigma = - 450$ Mvar (ind.)

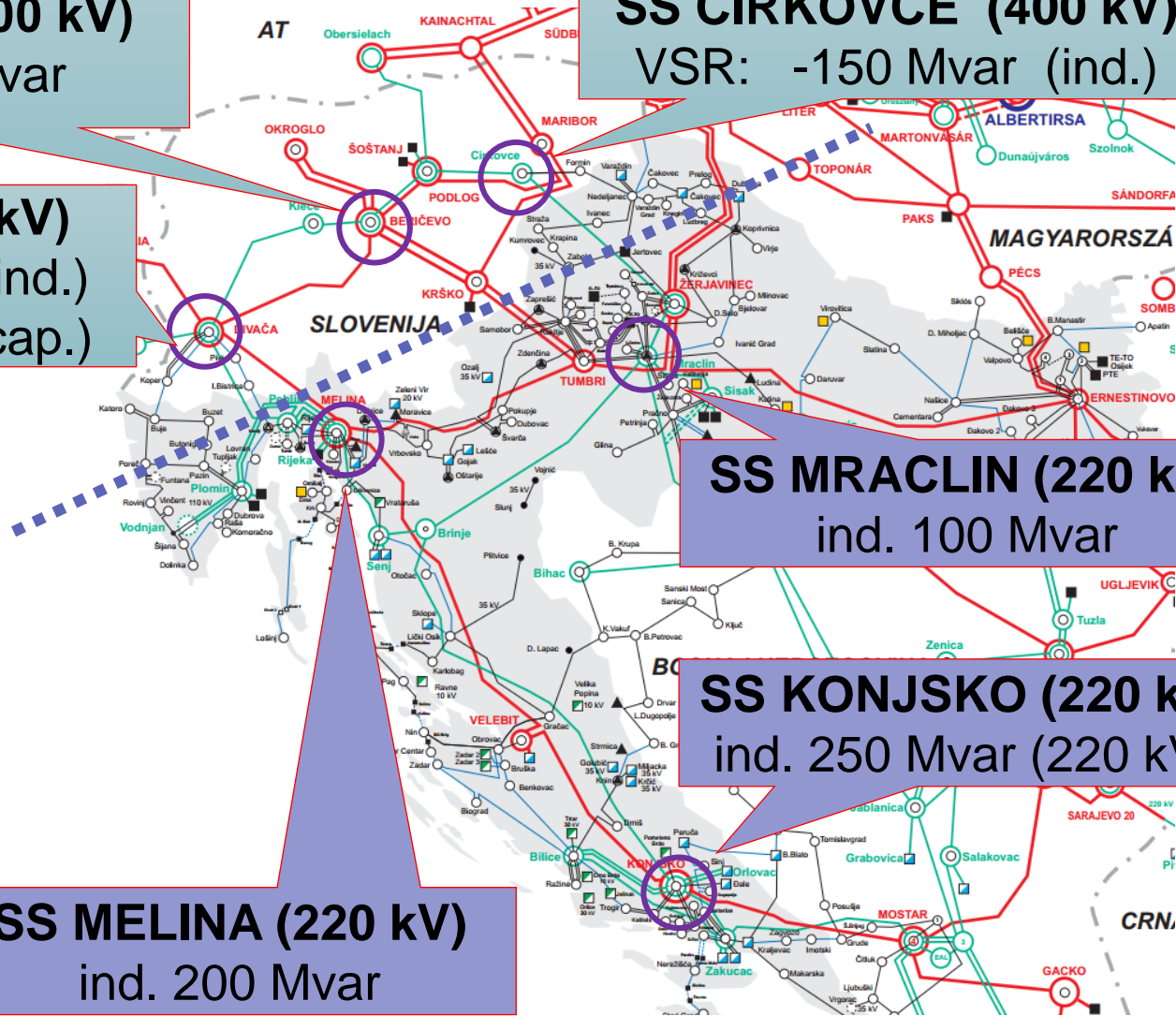
Croatia

$\Sigma = - 550$ Mvar

SS MELINA (220 kV)
ind. 200 Mvar

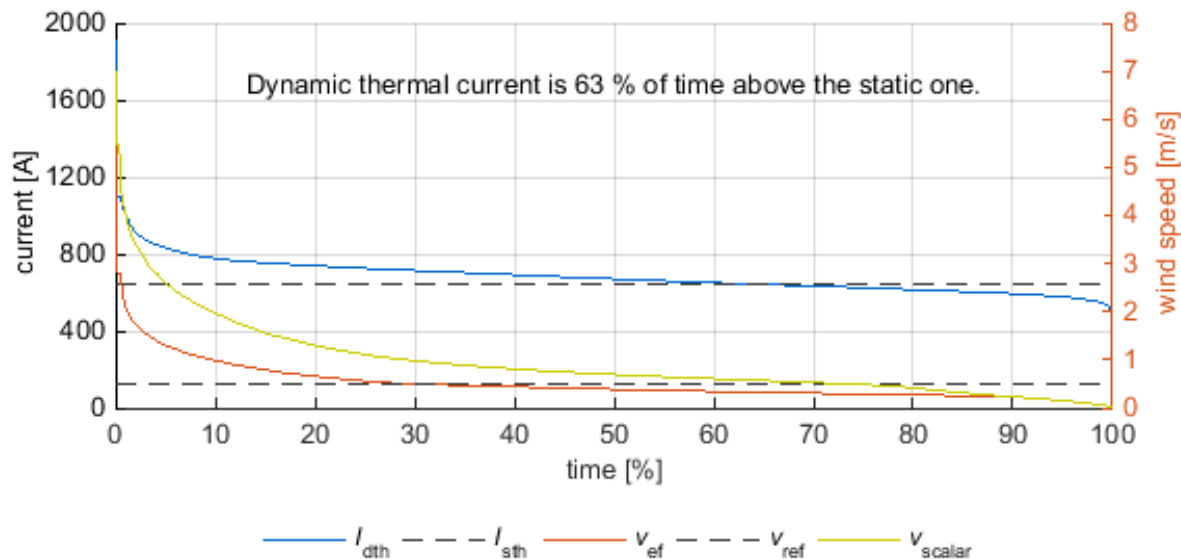
SS MRACLIN (220 kV)
ind. 100 Mvar

SS KONJSKO (220 kV)
ind. 250 Mvar (220 kV)



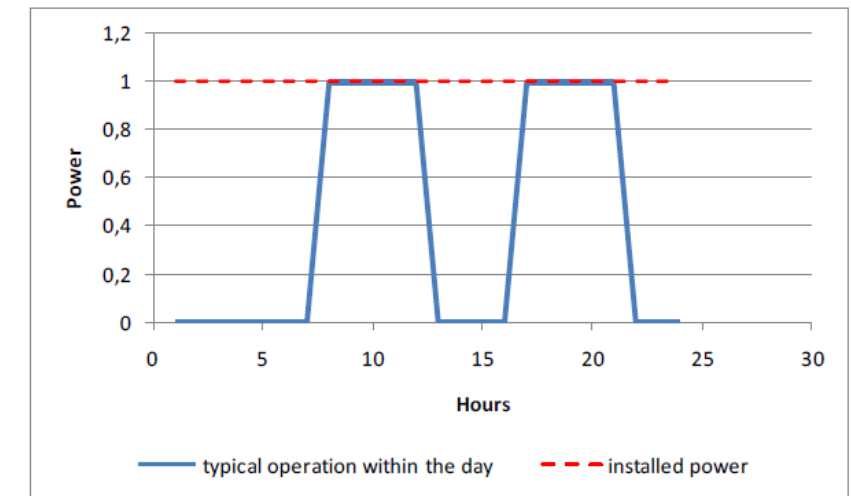
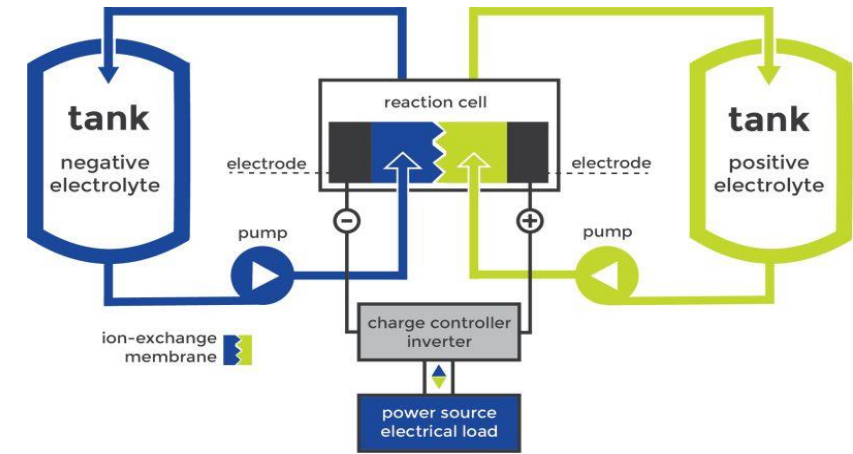
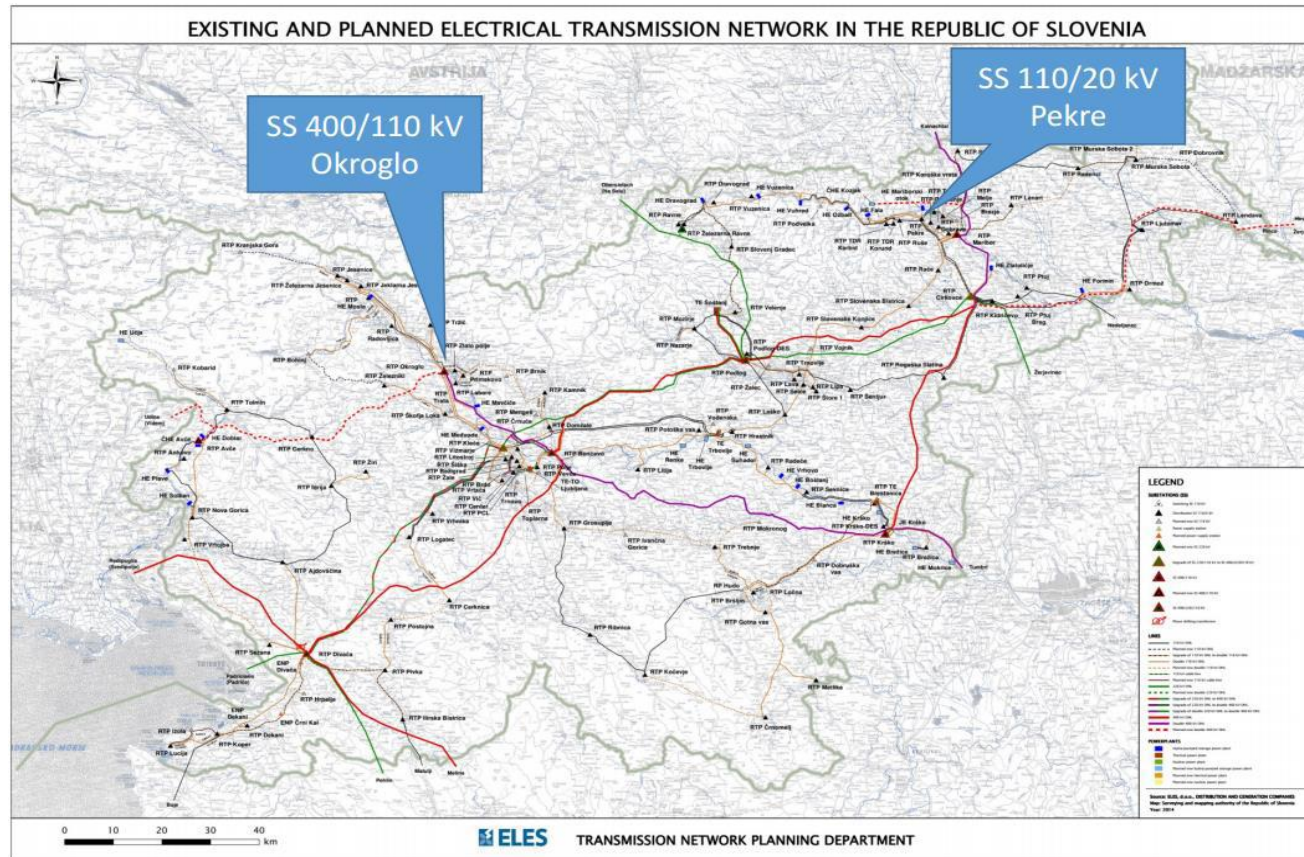
SINCRO.GRID – Dynamic thermal rating (DTR)

- using advanced algorithms and sensors
- better utilization of the existing grid
- increased maximum thermal capacity



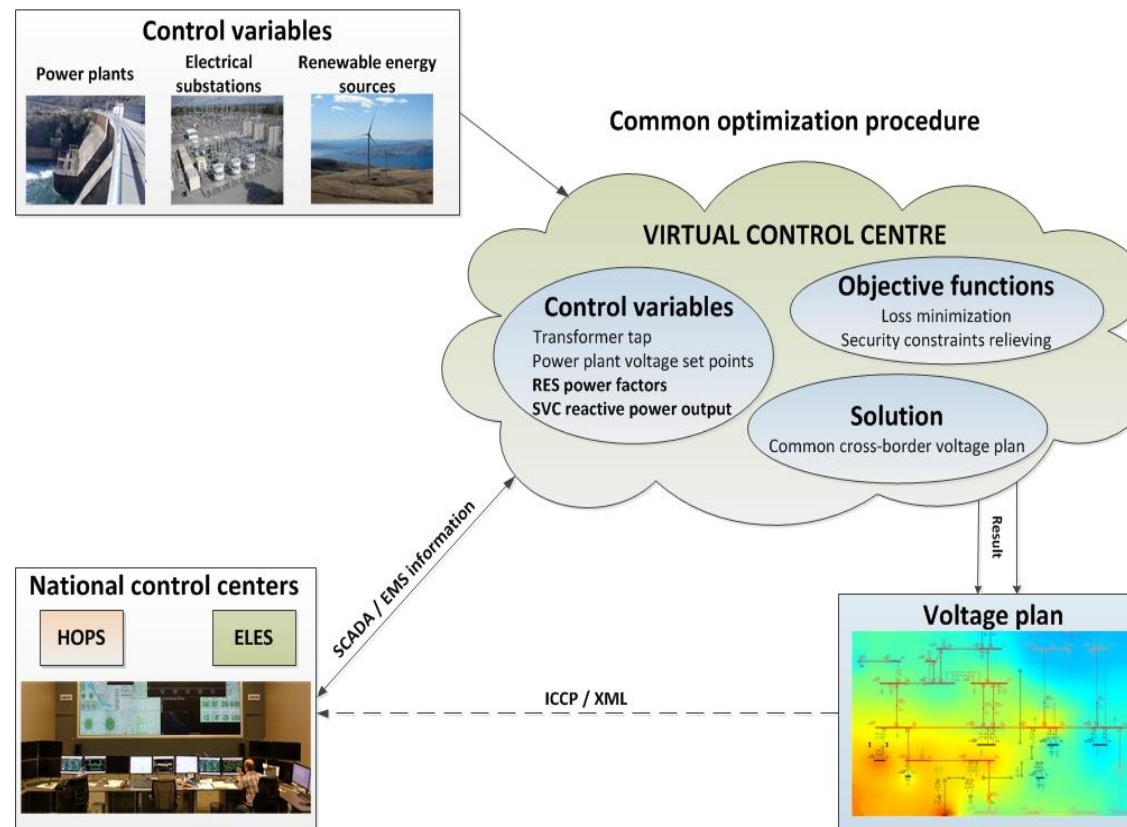
SINCRO.GRID - Batteries and integration of DG

- Batteries with a capacity of 10 MW in Slovenia
- Integration of distributed renewable generation

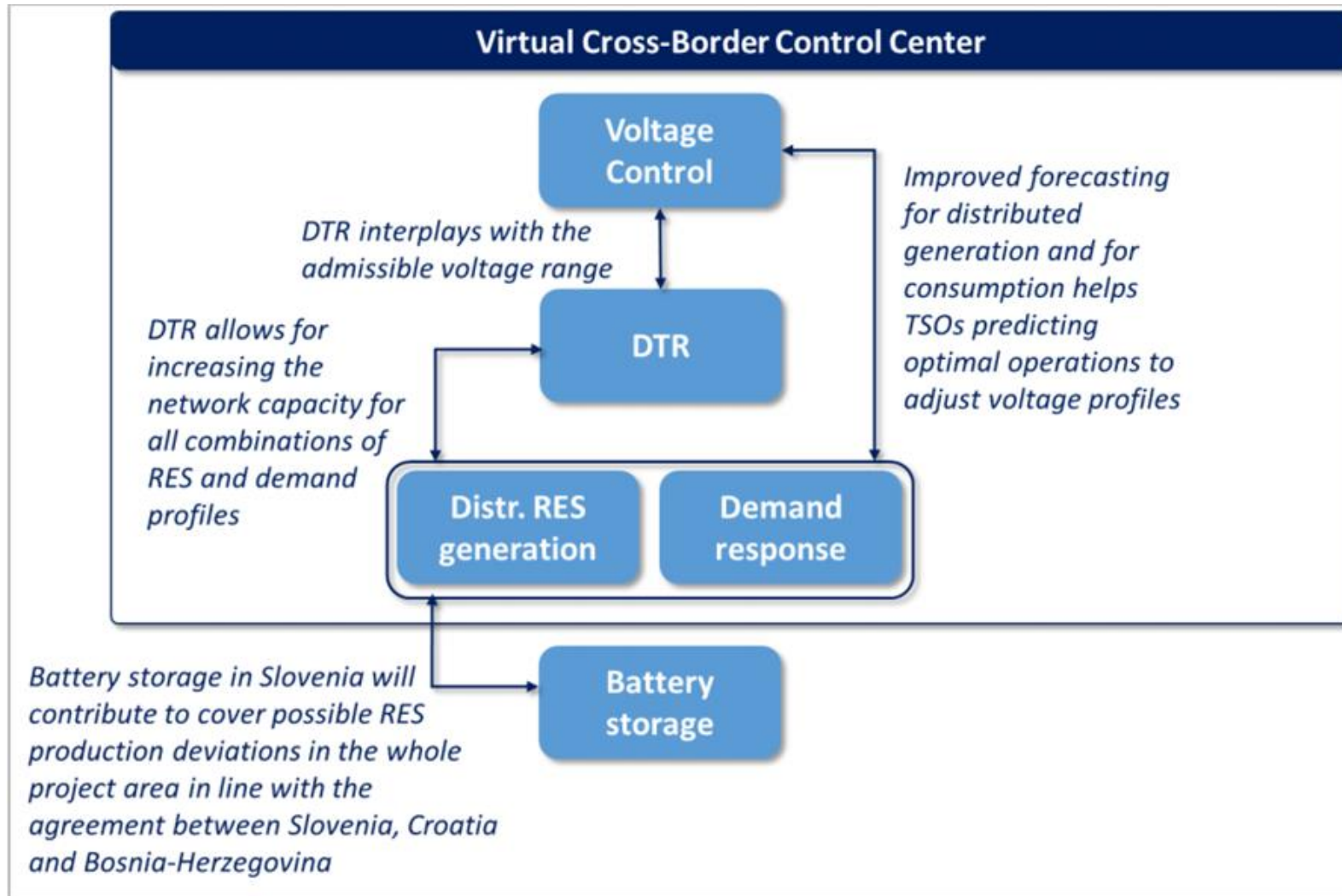


SINCRO.GRID – Virtual cross-border control centre (VCBCC)

- voltage control and loss optimization
- efficient and coordinated management of RES
- secure operation of the whole control area

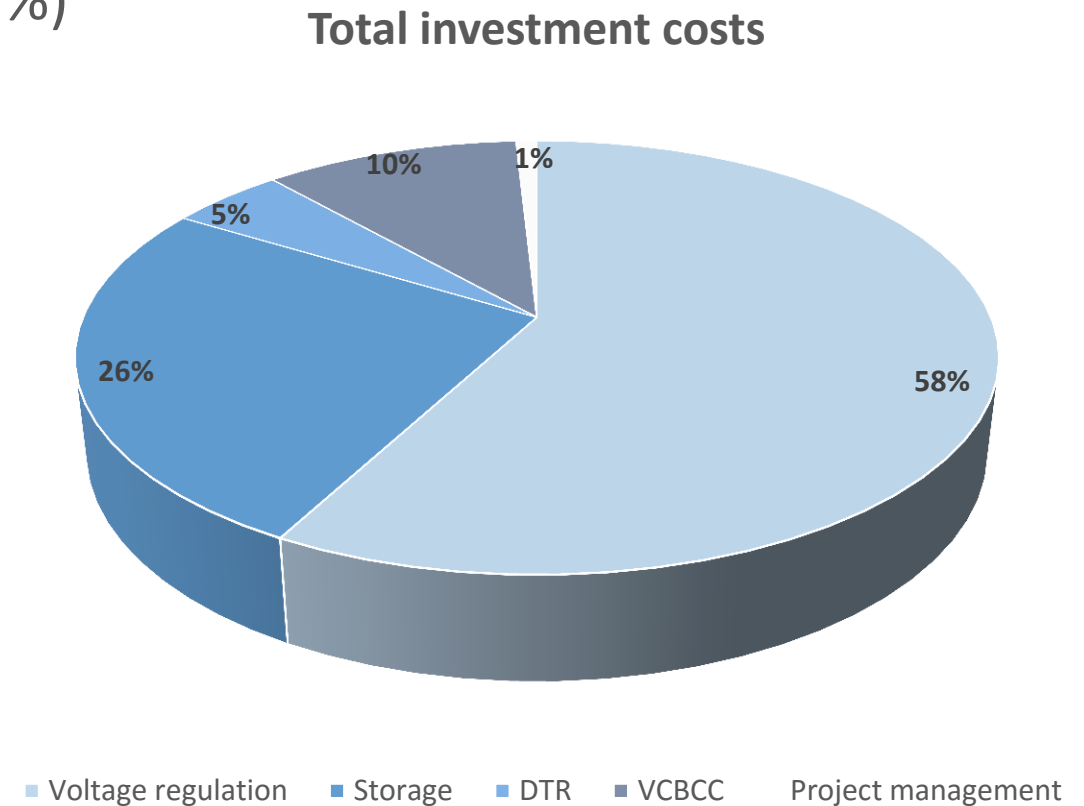


Synergies between SINCRO.GRID components



Total investment costs of SINCRO.GRID project in €

- Overall investment costs amount **88,6 million Euros**
- **€ 40,5 million** of EU funding from the CEF (51%)



Main steps taken by the SINCRO.GRID project so far

27.02.2015.

Submission of PCI application for projects with smart grid dimension

18.11.2015.

PCI labelling (Project no. 10.3)

The project was successfully applied for the 2nd list of PCI projects in 2015
Best evaluated project in EU in the smart grids field

08.11.2016.

Submission of Connecting Europe Facility (CEF) application

17.02.2017

EU Member States agreed on the Commission's proposal to invest €40,5 million

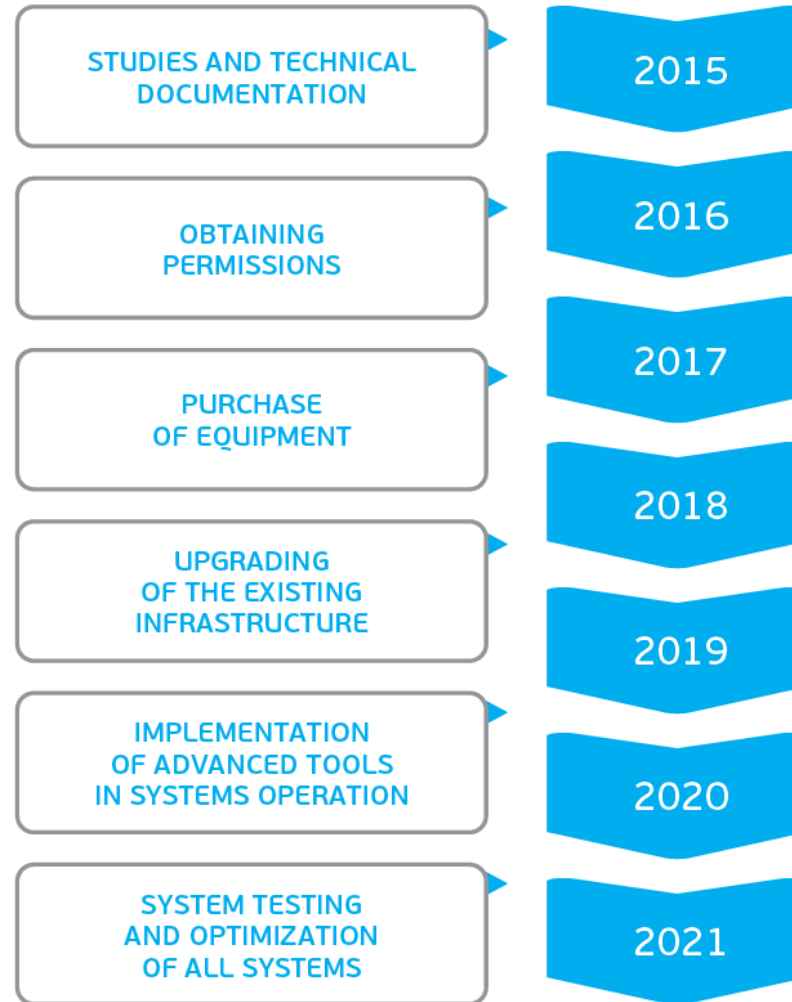
22.05.2017.

Grant agreement signed

06.06.2017.

SINCRO.GRID – Project timeline

Project Timeline



Main benefits of compensation devices:

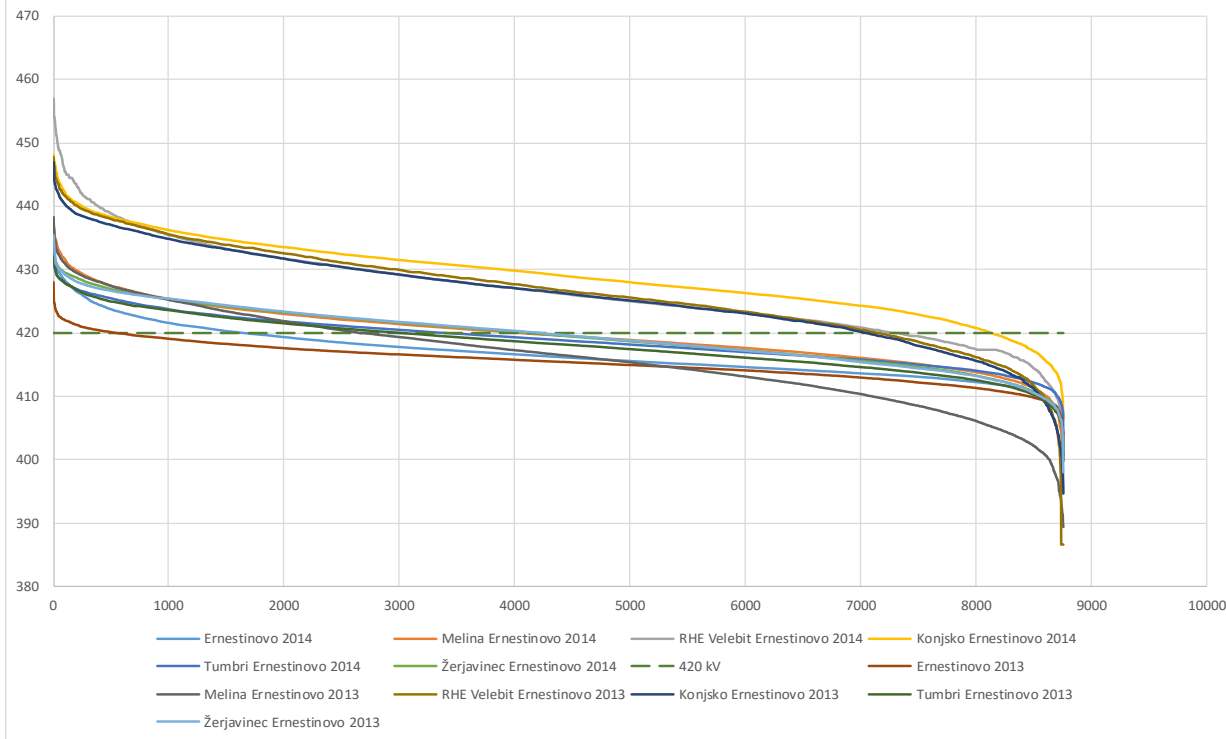
- Solving issue of voltage profiles in both transmission systems of Slovenia and Croatia
- Extension of equipment lifetime due to lower dielectric stress
- Increased security of supply due to decreased insulation failure probability
- Load flow optimization
- Improved dynamic system response

SINCRO.GRID – Croatian voltage profile

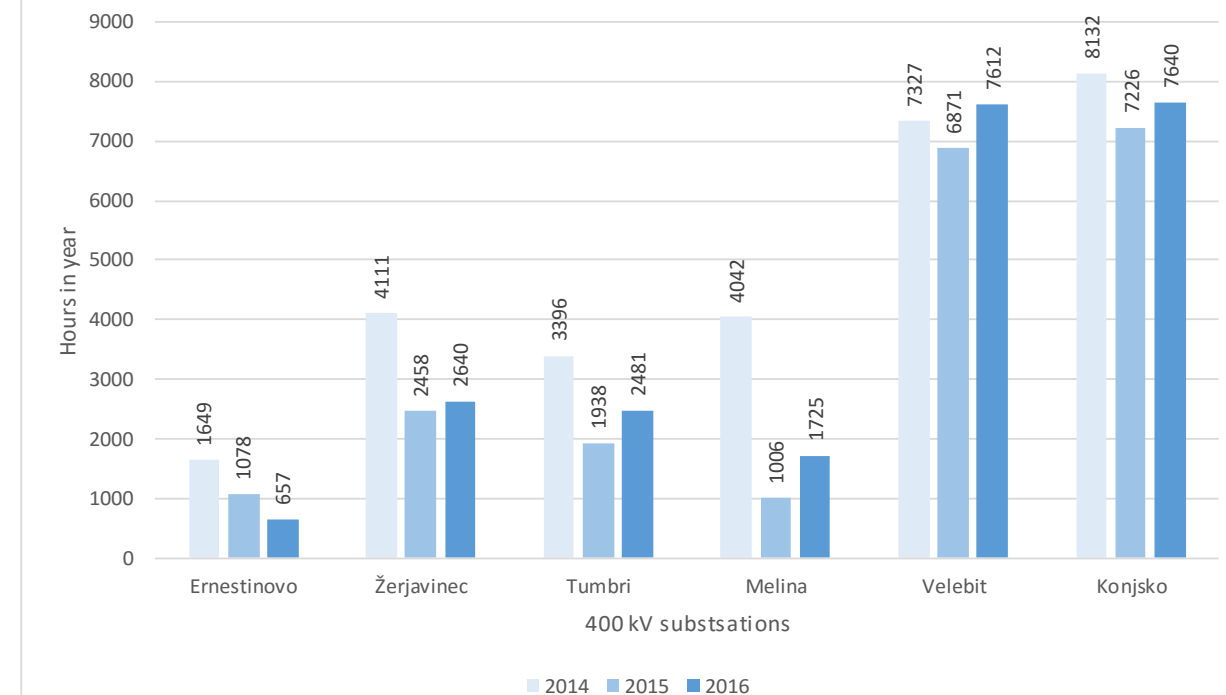
Main issues:

- Very high voltages in 400 kV and 220 kV network during low load periods
- Southern part of country faces more severe voltages

Arranged diagrams of voltage levels for 400 kV nodes in 2013 and 2014

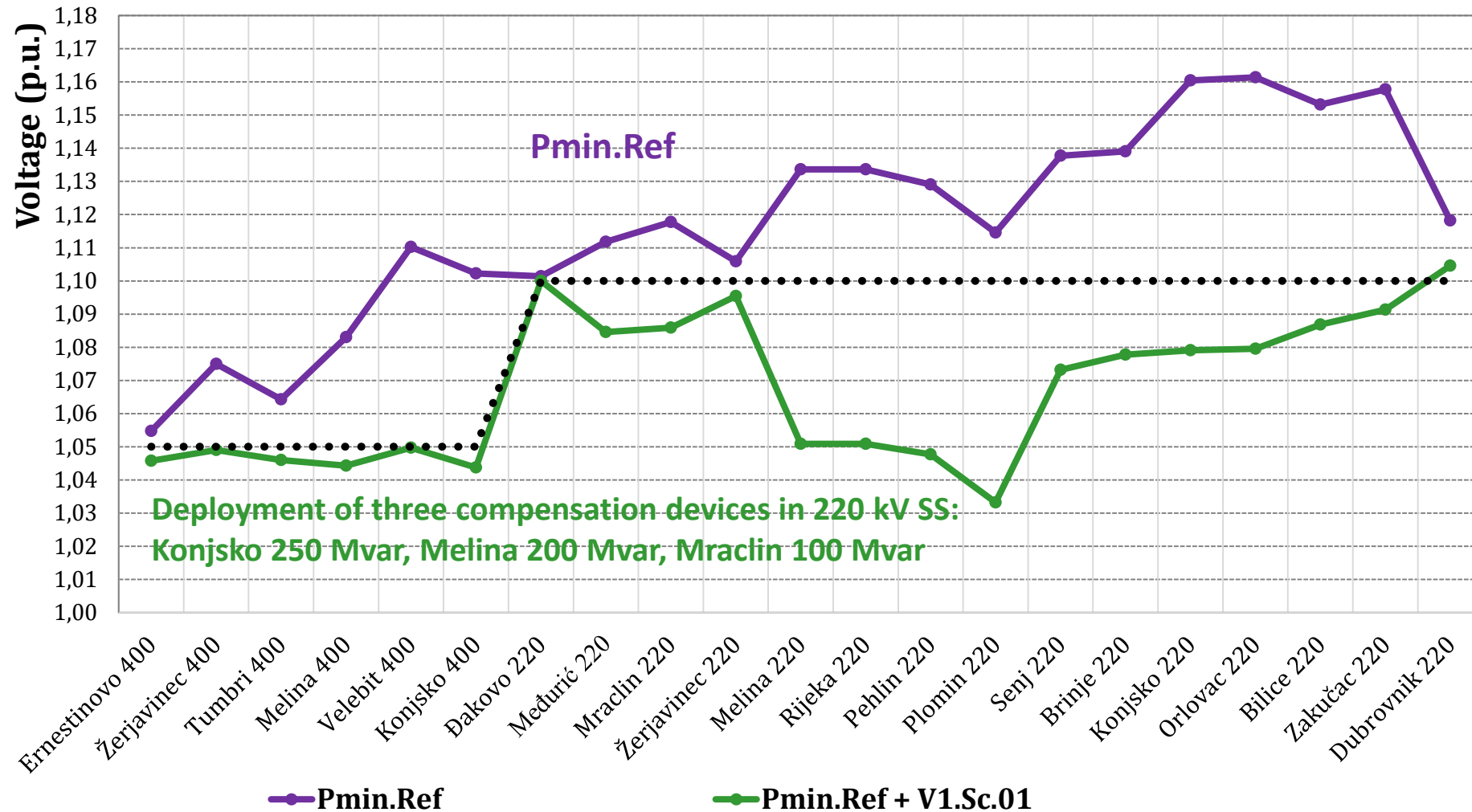


Hours above 420 kV



SINCRO.GRID – Voltage profile after deployment of compensation

Deployment of three compensation devices in 220 kV

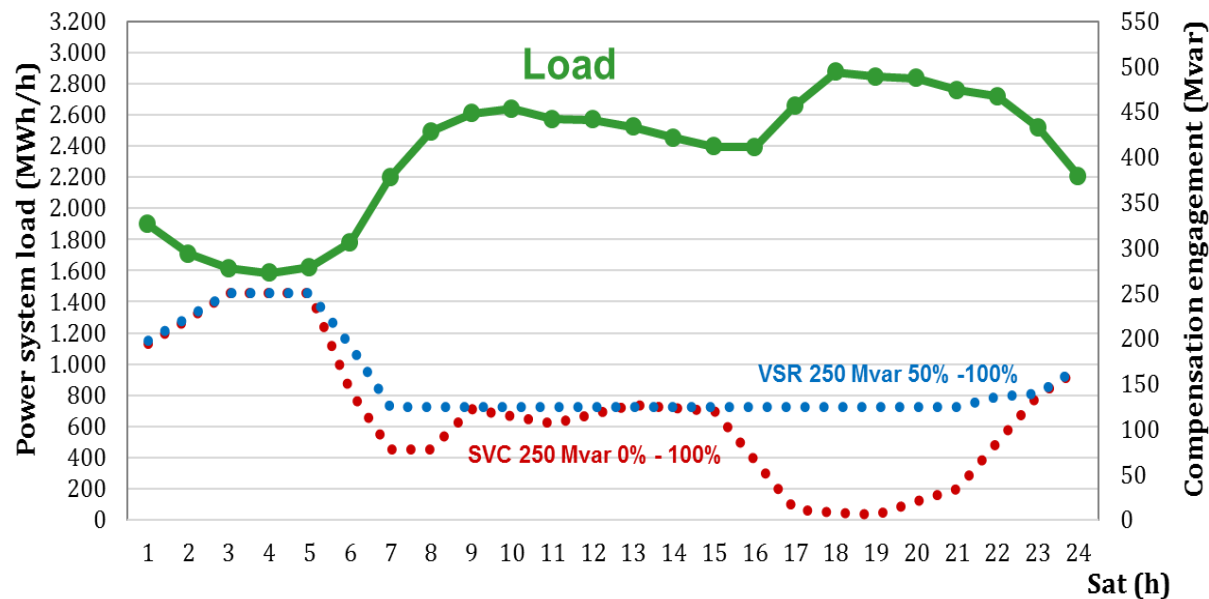


SINCRO.GRID – Compensation technology

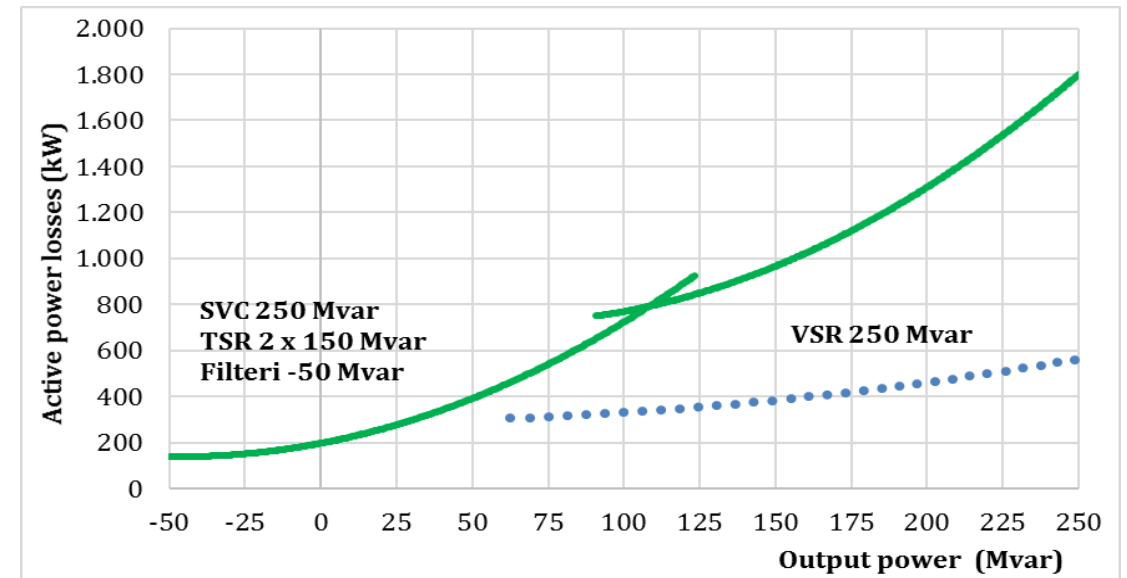
Dual impact on the overall transmission network losses:

- own-consumption of devices
- reducing "transmission losses" through the control range of output power

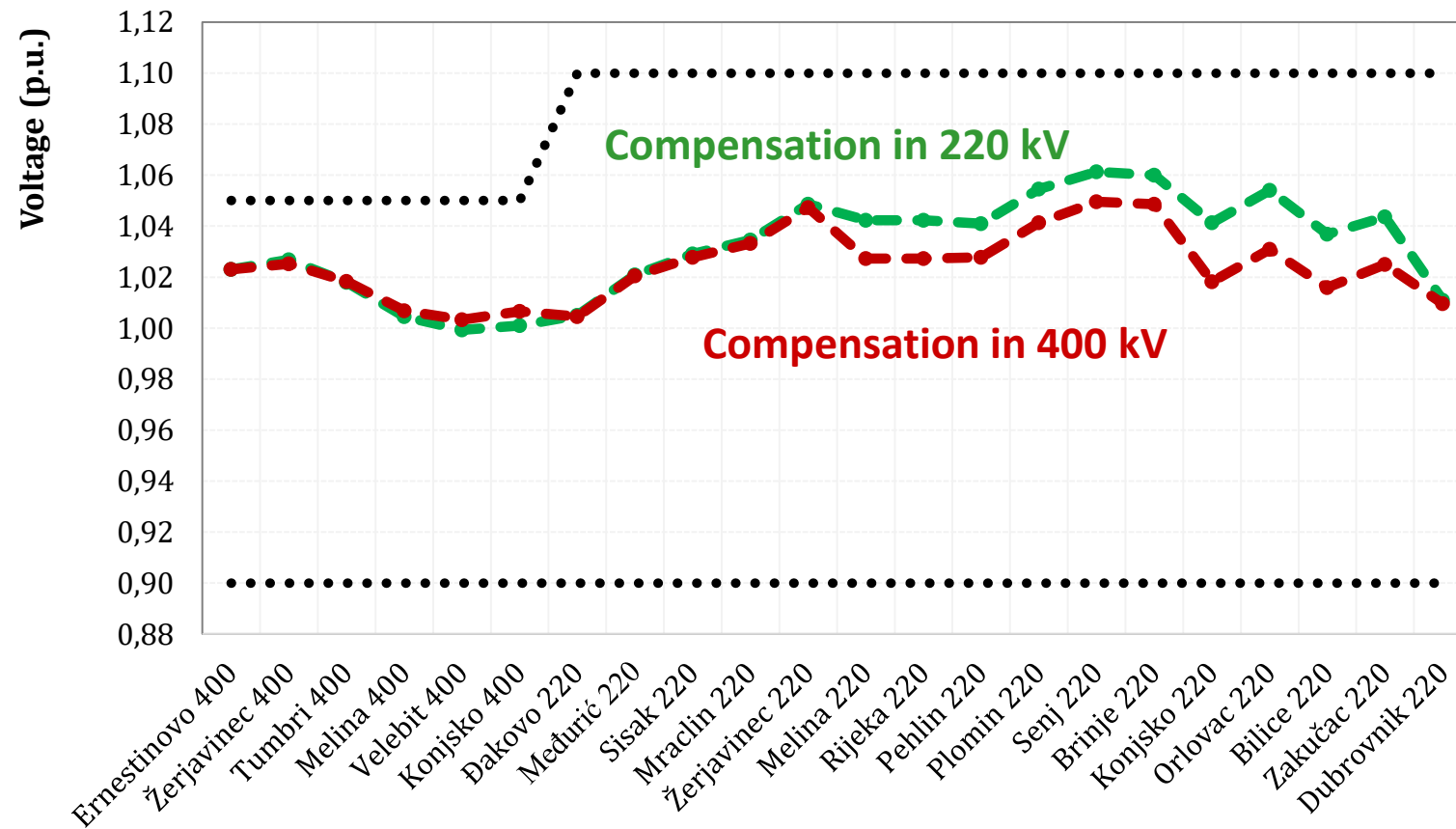
SVC → greater impact on transmission losses



SVC → 1.5 to 3.3 times greater losses than the VSR



- Installation of compensation devices in 220 kV network = lower losses

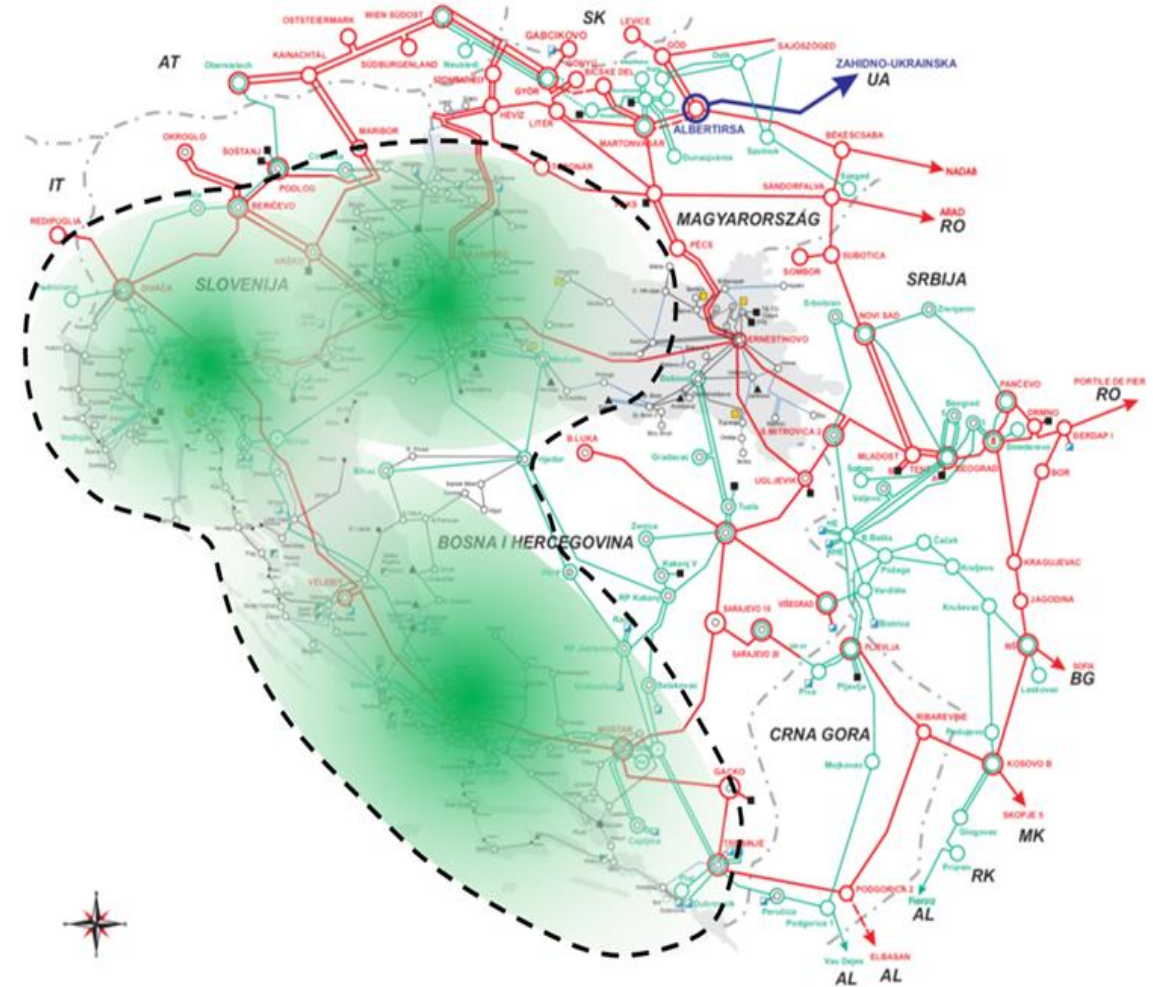


SINCRO.GRID – final solution

➤ Three compensation devices in 220 kV nodes

➤ 550 Mvar:

- SVC Konjsko 250 Mvar
- VSR Melina 200 Mvar
- VSR Mraclin 100 Mvar





Co-financed by the European Union
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Thank You for your attention

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