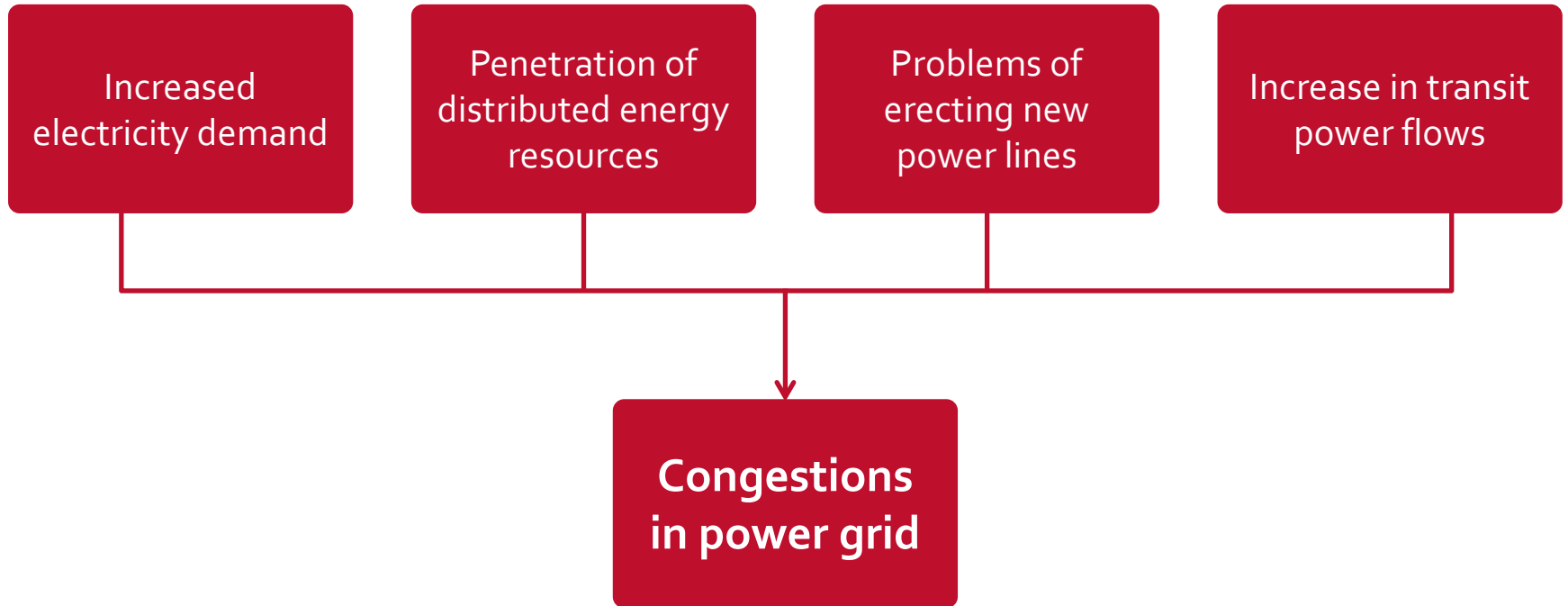


Improve Grid Capacities and Secure Grid Operation

**SOLVERA
LYNX**

The Problem



Solutions

How to relieve congestions?

Long term (5-10 years)

- Build new power lines
- Build new generation capacities*
- Decrease load/demand*

Mid-term (3-5 years)

- Upgrade/upgrade power lines
- **SUMO with Dynamic Thermal Rating - DTR**

Short term (1-3 years)

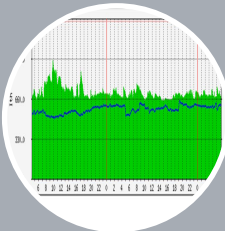
- Re-dispatch
- **SUMO with Dynamic Thermal Rating - DTR**

* (out of TSO scope)

Comparison of Solutions

Solution	Implementation time	Cost	Impact on capacities
New power lines	5-10 years	€€€€€€	High
Upgrade or uprate	3-5 years	€€€	Medium
SUMO (DTR)	1-2 years	€€	Medium

SUMO as a Solution



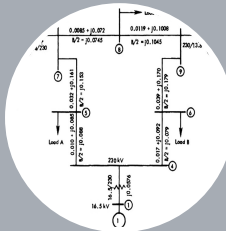
DTR



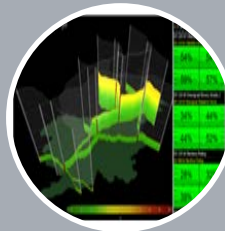
Weather Measurements & Models



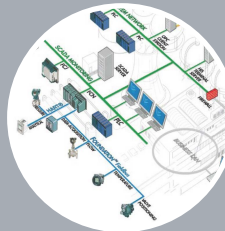
Forecast of Weather & Power flows



Network analyses for real-time & near future



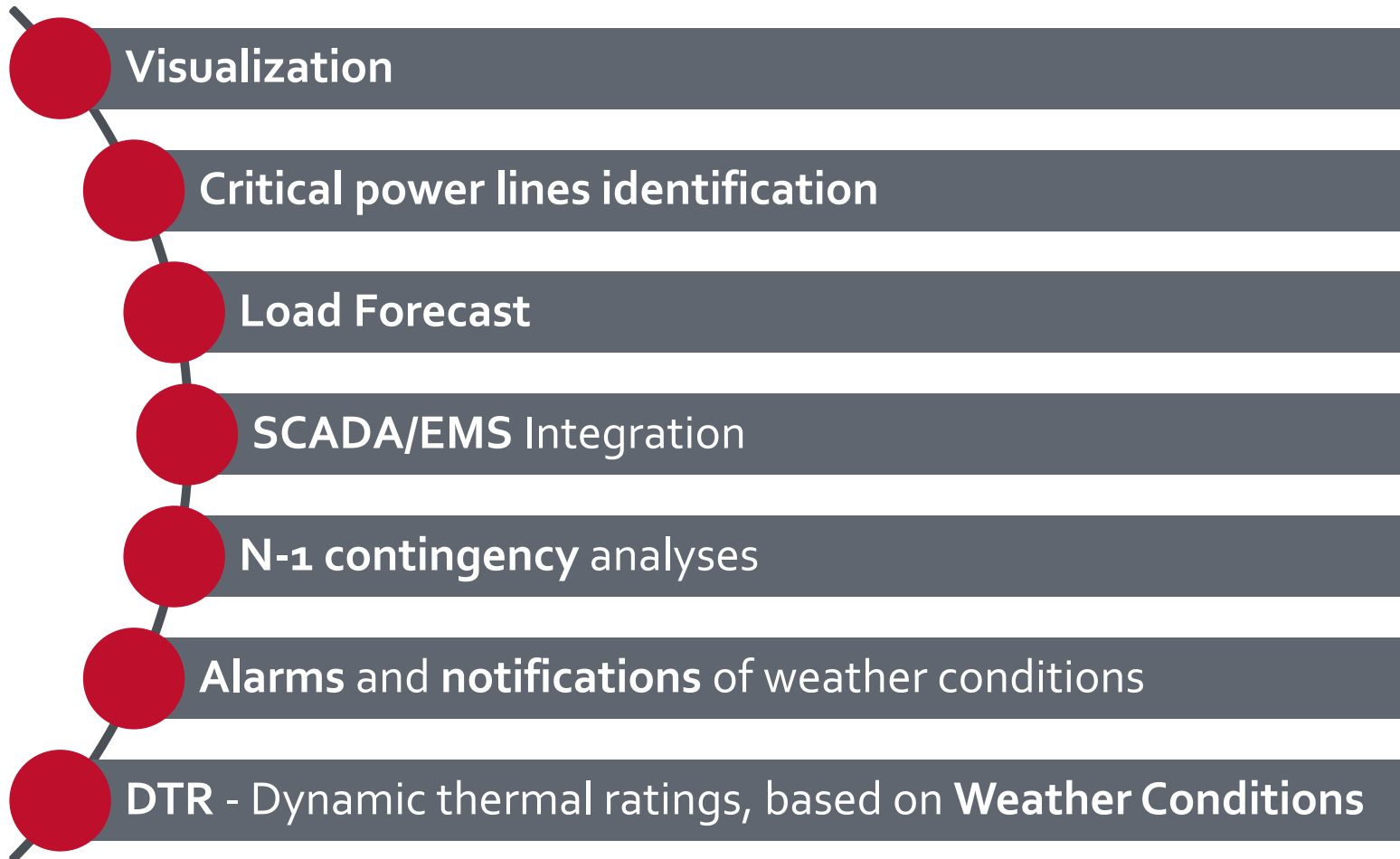
Visualization and alerts



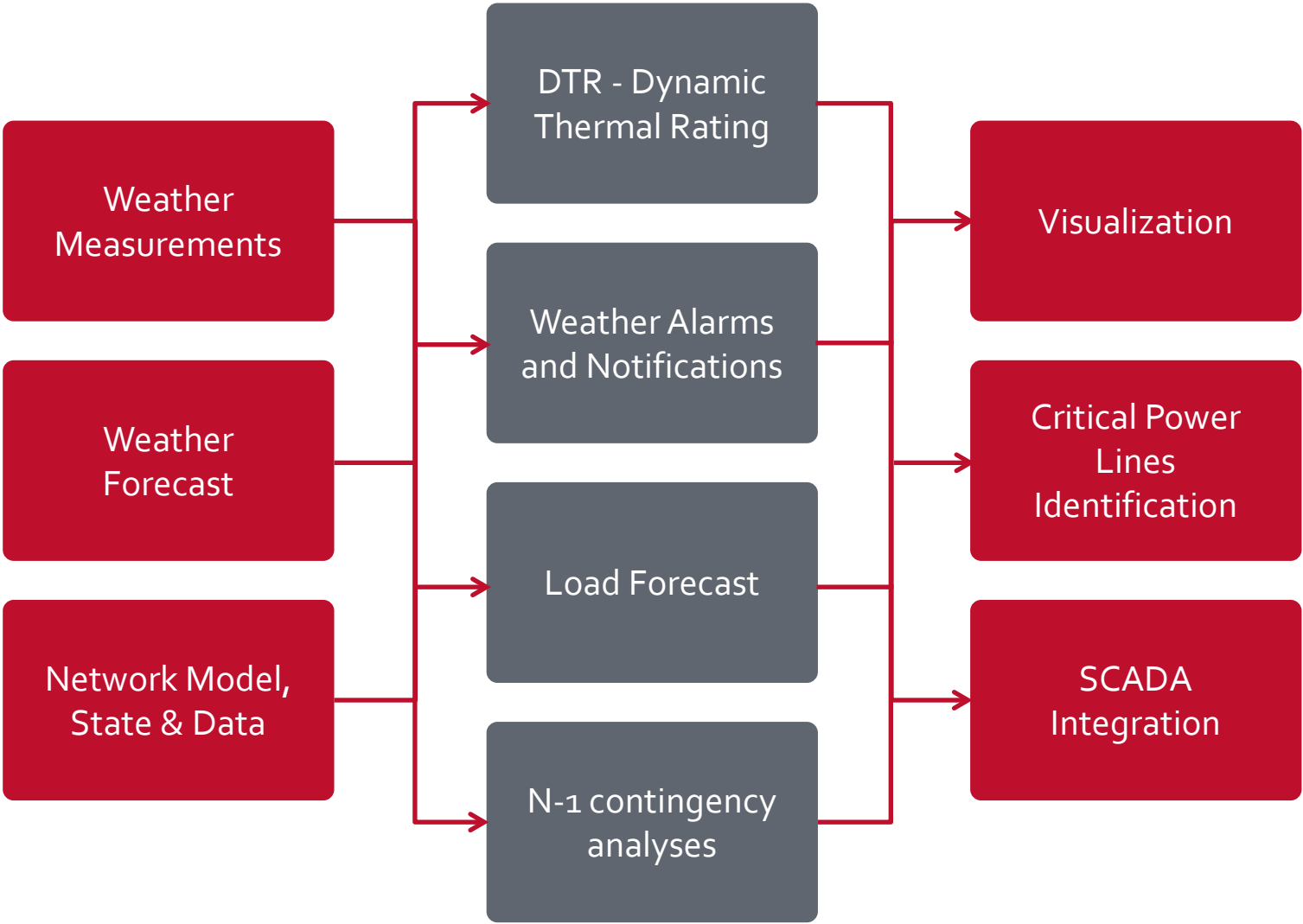
SCADA/EMS integration



Sumo Features



Sumo Functions



Sumo Advantages

Local weather data

- Limit assessments are calculated based on **local weather data** (measurements and models)

DTR algorithm

- Improved DTR algorithm is tested on an open-air test site with actual conductors used on power lines

Non invasive installation

- Installation and DTR calculations are non-invasive (no need for **switching off the power line**)

Experience

- **Experience** gained from everyday use of SUMO is used for **new and improved functionalities**

USE CASE: Avoiding N-1 Overload

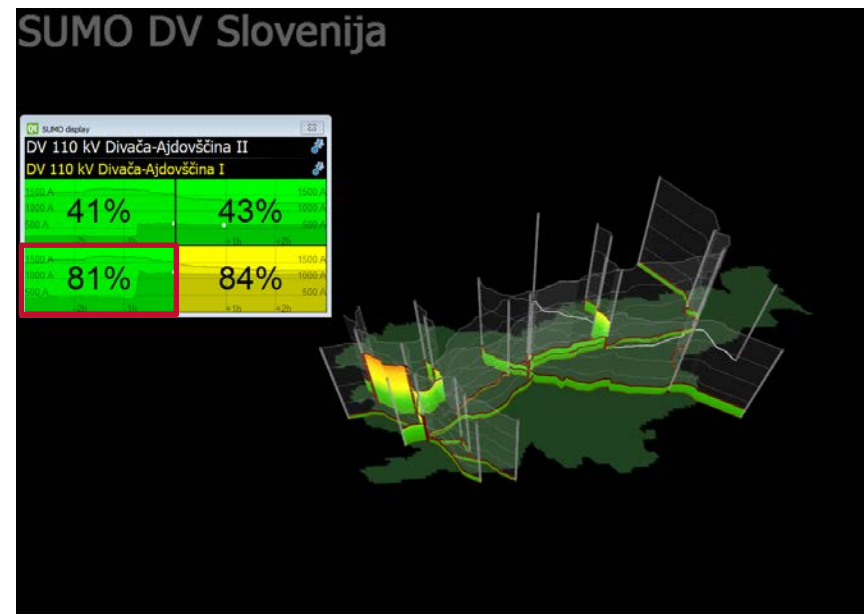
Static operating limit: 1200 A

N-1 calculated load: 1300 A

DTR calculated limit: 1600 A

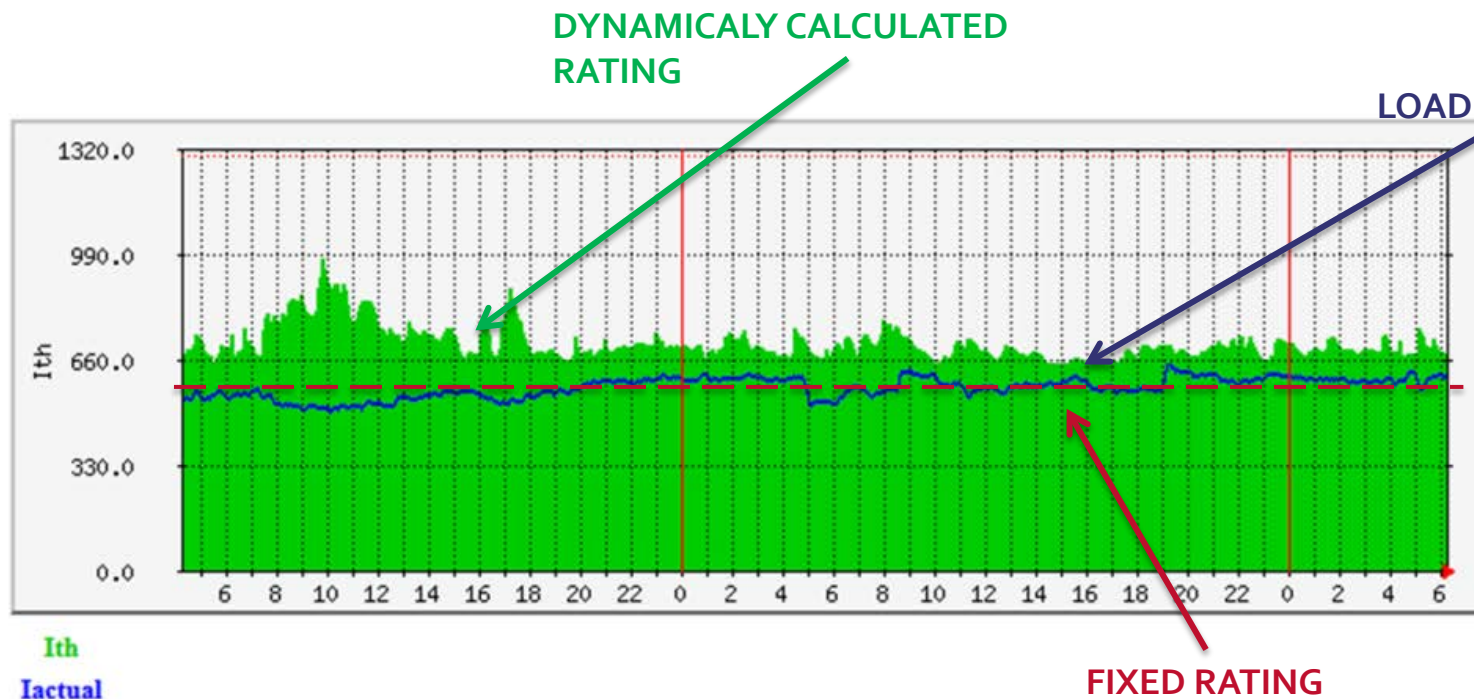
- N-1 load / static limit = **108%**
- N-1 load / DTR limit = **81%**

If static limit was considered, the N-1 overload would trigger a process for re-dispatching the loads or activate generation to relieve congestion

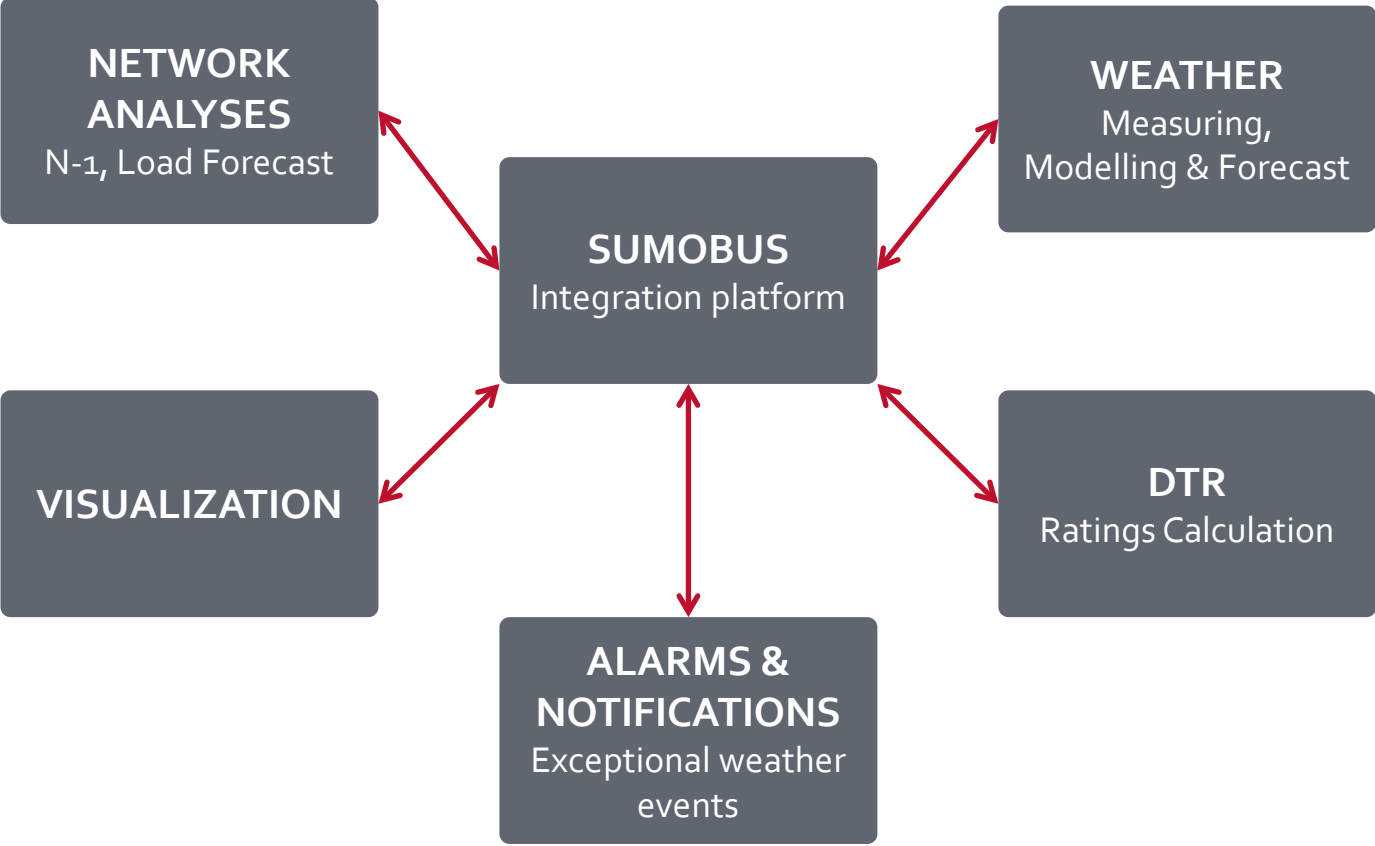


Calculation of Ratings With Real Weather Conditions

Short term – operational phase
avoiding re-dispatching and switching maneuvers



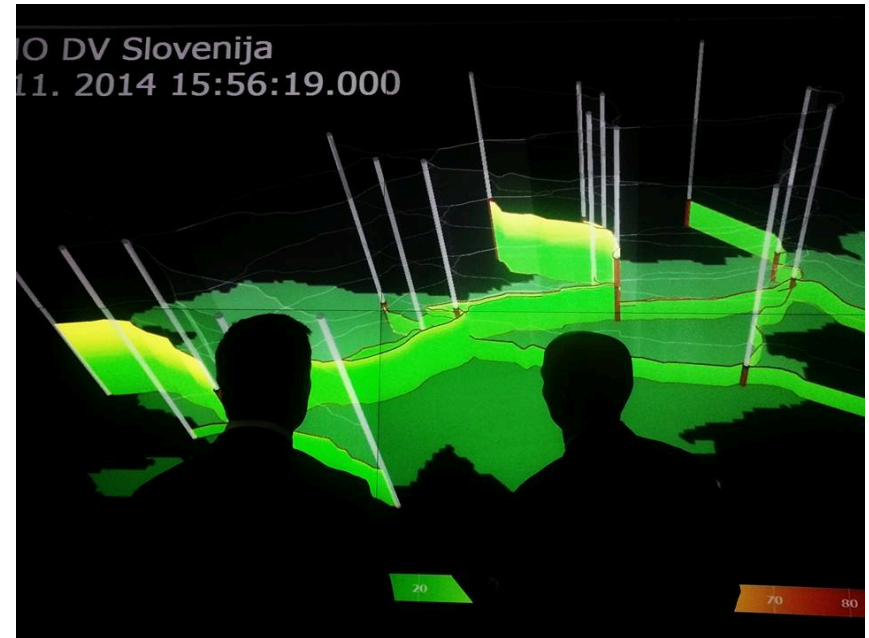
Sumo Building Blocks



Example Of Implementation

ELES, Slovenian Transmission System Operator.

- 2013 – Pilot
- 2015 – Full implementation
- Implemented on 23 powerlines
 - 12 @ 110 kV
 - 6 @ 220 kV
 - 5 @ 400 kV
- One 400 kV Phase-shifting transformer



Conclusion

SUMO enables the Transmission System Operator to

- **Better utilize** the existing power grid
- **Secure and remedy operation** in changing environment
- **Improve awareness** of the situation in power grid.

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