SUCCESS CASE 26.2024

Strategic CAPEX Modelling

WEB APPLICATION

THE CHALLENGE

In the context of the global surge in connections of decentralised energy sources and electric vehicle (EV) chargers, CEZ Distribuce is committed to staying ahead of the curve. Anticipating the challenges brought by this trend to distribution system operators, CEZ Distribuce prioritised **predictive modelling of the impacts of** these **new assets on the grid**. The insufficient efficiency of the existing computational tool prompted the development of a new web application designed to **support investment planning in the distribution network**.

THE SOLUTION

Leveraging the Monte Carlo method, CEZ Distribuce's new computational system repeatedly simulates the connection of new devices to the grid (e.g., decentralised sources, EV chargers, and other electric appliances) based on various input scenarios. This is followed by the calculation and evaluation of the physical impacts of these assets on the network, such as line and transformer overloads, voltage change limit exceedances, etc., resulting in a list of potential weak points of the distribution network. Finally, the approximate capital expenditure (CAPEX) necessary for reinforcing these weak points is calculated. The results of this analysis are then used as one of the bases for determining the company's **long-term investment planning**.

MAIN ACHIEVEMENTS

The key achievements of the system include algorithm adjustments that yield **more accurate results**. Additionally, the **computation time was reduced from hours to minutes**, depending on the number of simulations. The new web application, with a uniform design, allows for a **simple initiation of calculations, management of input data** and, most importantly, a **clear presentation of results**. The architecture of the new solution also enables **automatic updates of input data** and the **historical archiving of all calculations**.

For more information about the project, please contact:
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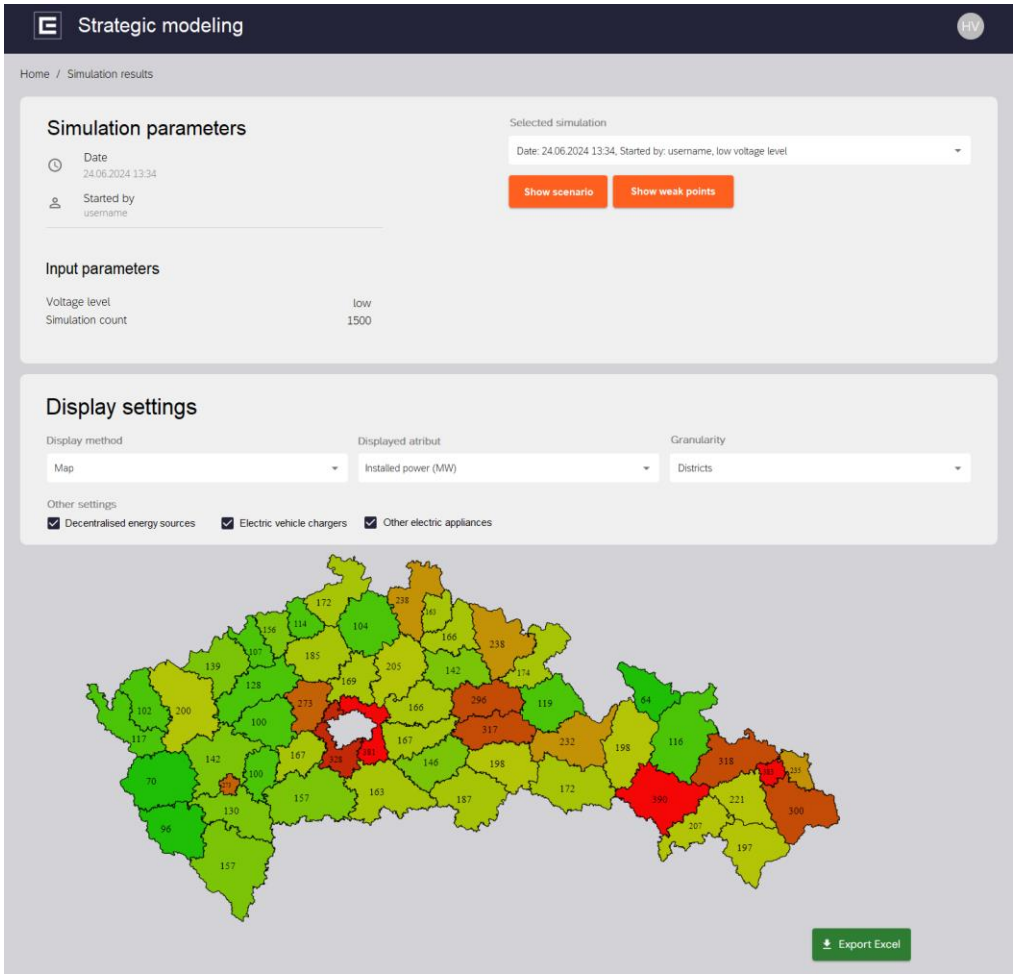

Screenshot showing an example of a particular calculation result. Locations with higher installed power are highlighted in dark red colour.

KEY SUCCESS FACTORS

The key factors for success included the **selection of suitable technologies and the employment of parallel computing** to optimise computation times and enhance accuracy. Equally important was the **smooth collaboration between software developers and project owners**, who detained the know-how of the algorithm itself.

WAY FORWARD

Since the current version of the application only serves for calculations at the low and high voltage levels, one of the future steps will be the **development of the application for the extra-high voltage level**.