Innovation type:
Software tool

TRL: 6

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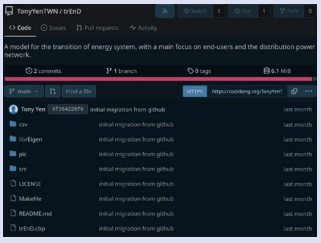
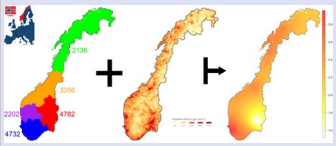
Target group:

Actor/ purpose	x
DSO, TSO	x
Technology provider	
Member organisation	
Market operator	x
Research/ Consultancy	x
Teaching	

Illustration



Screenshot from Codeberg



High spatial resolution estimation of the electricity demand of end-users

High spatial resolution modeling of TSO-DSO interactions and end-user flexibility of the power system

Written in c++, trEnD is an open-source energy system model with emphasis on the end-users and the distribution grid. It has been used to study the value of end-user flexibility for redispatch under a TSO-DSO coordinated scheme and for reliability of the power system during contingencies in the Norwegian context.

Challenge

Extending the rich knowledge base of CINELDI in the operation and investment of distribution grids and end-user flexibility to the transmission grid level requires nation wide energy system models that also retain sufficient granularity of spatial resolution at the finer scales. In addition, more often than not necessary data required are difficult to comprehensively obtain from all the DSOs across the transmission grid.

Solution

The model developed uses open data from NVE and ENTSO-E to estimate the electricity demand of end-users at a high spatial resolution and also represents the physical characteristics of individual distribution grids reasonably to simulate the interactions between the TSO, the DSOs, and the end-users at various stages of the power markets and operation.

Potential

In previous CINELDI works, investigation of the value of end-user flexibility for the Norwegian power system has been conducted based on this model. While the model currently uses open data, more sophisticated data from individual DSOs can be used in the future for better representation of the power system. Other types of market frameworks (such as the balancing markets) can also be integrated in the workflow in the future. The code is also versatile enough to be applied in other nations if desired.

Reference in CINELDI

The code has been made available to the public on Codeberg under the GPLv3 license through the following link:
https://codeberg.org/TonyYenTWN/trEnD/