

## Pilot project: Predicting peak load in secondary substations

*Machine learning models have been developed for predicting the load of transformers in secondary substations. The benefit is that it allows avoiding overloads, thereby avoiding/reducing the risk of operational interruptions (and thus interruption costs), as well as extending the lifetime of components.*

### Challenge

Secondary substations are grid asset that Glitre Nett are interested in avoiding overloads on, both to prevent overheating/failure and to avoid shortening their lifespan. This is an area that has received little focus, partly because measurement data from secondary substations is not always available.

### Solution

Glitre Nett wanted to gain more insight into this and therefore focused on predicting the load of secondary substations. The method that has been developed is, however, applicable to other areas as well, and this must be evaluated on a case-by-case basis. ML-model XGBoost proved to be the model giving the best predications. The development of suitable ML models was challenging. This is partly because substations can have very different patterns and dynamics for energy flow. Some may have stable, repetitive patterns based on seasonal variation, while others may exhibit seemingly stochastic behavior. Substations with many customers will have a more stable and predictable curve, while a substation with few customers (1-5) will typically have a load curve with a clearly stochastic character. As a consequence, it was concluded that it is not possible to create a single model that can be trained to predict the load for all substations. It was therefore decided to train separate ML models for each individual substation. All models are based on the same technology (XGBoost), but training is done separately based on data for each substation.

### Potential

The solution is in operation at Glitre Nett and daily predicts the load of 130 selected secondary substations. These often have high loads and are therefore important to focus on. Historical and predicted load is show for each secondary substation and a map is made showing the stations with a predicted load of above 80 % of nominal load. The prediction as 2 days ahead. This can be useful for all DSOs in Norway.

### Reference in CINELDI

- [Pilot "Predicting peak load in secondary substations" report](#) (in Norwegian)

Innovation type:  
Method

Innovation:

TRL: # 7

Year: 2024

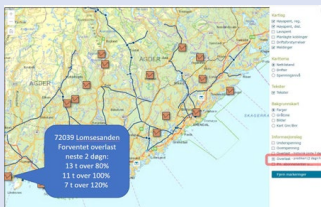
Contact:

Per Oddvar Osland, Glitre Nett

Maren Istad, SINTEF Energi

Potential users:

User	X
DSO, TSO	X
Technology provider	
Member organisation	
Market operator	
Research/consultancy	
Teaching	



Map with predicted load.