Main research interest (DSC/e related)

Along with research on uncertainty and complexity of the development of smart energy systems, our data-relevant interest is two folds. On the one hand, availability of measurement data from various actors including customers, network operators, and energy suppliers opens up possibilities for accurate and reliable energy analytics. We are researching advantages of machine learning, especially deep learning, for energy and price predictions. On the other hand, we aim to enhance real-time system awareness for network operators as well as involved stakeholders using (IoT) data integrity. This would lay a foundation to sustainable energy systems with high levels of automation and security.

Scientific staff (DSC/e related)

Approximately half of the EES group is focusing on data driven research. Key involved staff:

**Prof. Guus Pemen** (group chair)

*Power quality, data management, state estimation*

**Prof. Sjef Cobben** (part time)

*Sustainability, smart planning, electric vehicle charging, self-healing, storage*

**Prof. Han Slootweg** (part time)

*ICT, supply-demand matching, forecasting*

**Dr. Madeleine Gibescu**

*Balancing Smart Grids, power system optimization, DC grid technologies, local markets*

**Dr. Phuong Nguyen**

*Active distribution networks, micro-grids, multi-agent system, data analytics, deep learning*

**Dr Wilbert de Krom**

*Data analytics for energy (part time)*

Furthermore 5 PhDs and 2 PDs are working on various Data Science projects

Success stories

- Supervised energy predictions for smart grids and smart buildings based on deep learning, e.g. advanced Restricted Boltzman Machine based methods, with less than 2% error.
- Effectively overcome the ICT intermittent and data lost to retrieve real-time data, interpolate missing figures and predict behavior of solar PV inverters using MQTT protocols and cloud-based programs.
- Automatically alter the transformer’s on-load tap changer according to the operation modes and status of various location of solar PV inverters. Successfully deploy and verify cross-platform communication with contemporary industrial distribution automation platform, OPC-UA.
- Applying Bayesian for fault location in medium voltage grids with underground cables;

Project examples

- **INCREASE** – EU-FP7 project – Increasing penetration of renewable energy sources in the distribution grid by developing control strategies and using ancillary services
- **Smart Grids (B2B & B2C) BEMS** - TKI Switch2SmartGrids, Advanced Optimization for comfort level and energy consumption between the smart grid and built environment
- **DISPATCH & DISPATCH 2** - NWO URES & URES+ Distributed intelligence in smart power routing and matching
- **m2M-GRID** – ERA-NET Smart Grid Plus From micro to Mega grid – Integration of micro-grids in active distribution network