Title	Evaluation of grid modelling & simulation tools
Company	Saxion, Research Chair of Sustainable Energy Systems
Assignment Type	Internship/Graduation EEE
Version	20240426

Introduction

This assignment is to be carried out for Saxion University of Applied Sciences, in the research group of Sustainable Energy Systems. It is part of the “Mooi – Energy Control Business Park” project, headed by the Saxion research groups Sustainable Energy Systems and Ambient Intelligence. The project is focussed on the Ecofactorij business park in Apeldoorn. In addition to the companies located at the business park, educational institutions are stakeholders in the project, including the University of Twente.

The desired outcome of this project is a practical guide on how to implement an Energy hub in a business park, whereby the Ecofactorij will be used as a use case. Energy hubs are facilities which can generate, convert and store energy. This energy can be in multiple forms, such as electricity, heat and biogas/hydrogen, but electricity is always included. Energy hubs are useful when trying to balance energy demand and production, and are an important tool in the Netherlands when trying to tackle net congestion problems in the Dutch electricity grid.

Problem definition

There are many tools that can be used to model and simulate the behaviour of an electricity network. All claim to be the most comprehensive, most easy to use, most powerful or simply ‘the best’. However, which tool is the most suitable for any given problem is often unclear. Therefore choosing the right tool for problem to be investigated is difficult, and many times tools are chosen which function sub-optimally, due to a lack of overall knowledge pertaining to which tooling is available. Selecting tools would be easier and the confidence in the chosen solution would be greater if an overview was available. This overview details the necessary input knowledge, the produced outputs and a sense of the ease of use for a number of often used tools.

Objective

The objective of this assignment is to create an roadmap/overview that can be used by researchers to select a suitable tool for any given problem. To do this, multiple simulation tools must be evaluated. This evaluation entails implementing 1-2 standardized cased into each tool. Then, using your experience with using the tools, you will provide a comprehensive document that can be used to select a modelling tool for a specific problem based on KPIs. Furthermore, you document your evaluation procedure (test plan), so future modelling and simulation tools can be evaluated in the same manner, and the catalogue of documented tools can reliably expanded.

Assignment

The assignment activities are as follows:

- Literature research; you familiarize yourself with existing modelling and simulation tools by reading about them. A list of possible tools will be provided.

- You develop an approach for testing the modelling and simulation tools, and define the KPI needed / useful for evaluation The scenarios for testing and evaluation will be provided.
- You select (with your supervisor) two or more modelling and simulation tools to be evaluated.
- You evaluate the selected tools, and document your findings.
- You document your approach and reflect on its merits and possible improvements.
- You create a roadmap for future researchers to use to select tools.

What we offer
At the research group of Sustainable Energy systems, you will be able to:

- Work on problems that are relevant to the energy transition.
- Work on projects with regional partner companies and institutes.
- Have the independence to make the research your own, and have your curiosity lead the way within the bounds of the assignment.
- Make significant and relevant contribution to the projects we have. This includes the potential for scientific publications as well as presentations for partners.
- Work with researchers within the group allowing you to get up to date knowledge of energy transition challenges and solutions.

Requirement of Student
The student should be:

- Comfortable with modelling and simulations, as well as energy networks.
- Comfortable with dealing with applied research oriented projects.
- Preferable comfortable with programming, including Python.
- Proactive approach.
- Able to work independently.
- Able to manage client expectations.
- Be able to work toward strict deadlines.
- Have an acceptable level of communication (English or Dutch).

If you are interested please contact b.homan@saxion.nl for more information and to set up an interview.