PhD Vacancy for "Energy Hubs for Integration of Large-scale renewable Energy: Modelling and optimization of an energy hub"

The Department of Thermal and Fluid Engineering jointly with the Department of Mathematics and Computer Science (EEMCS) at the University of Twente are currently looking for a PhD candidate in the field of energy systems integration. We are concerned with questions related to energy conversion and storage technologies for a sustainable society. Through theoretical analysis, numerical calculations and experimental investigations, we develop fundamental knowledge with applications in industry and the built environment. Priority is given to the efficient use of energy and the minimization of environmental impact of our future energy systems. Information about the involved research groups is available at https://www.utwente.nl/en/et/tfe/research-groups/TE/ and https://www.utwente.nl/en/eemcs/energy/

The challenge

Increasing decentralized power production from wind and solar are putting a strain on the capacity of the electricity grid in different parts of the Netherlands. Consequently, new projects cannot be connected to the grid preventing growth of renewable energy production. Also, when power demand is exceeding the transport capacity, an extra alternative electricity flow is needed to fulfil the power demand. This could be solved by increasing capacity: grid expansion. However, this is expensive and takes years of time to be realized. Although grid expansion is inevitable in the long term, a solution is needed for a short/medium term. If the copper route (i.e. reinforcing the grid by adding more cabled) is not a viable option anymore, then an alternative route through conversion to energy carrying molecules can be a solution. For this purpose we need major breakthroughs, advanced technologies and new integrated renewable energy systems for the energy hubs. Such an energy hub is a place where different forms of sustainable generation, storage and conversion come together to ensure a reliable supply of clean energy to customers in its surrounding.

Integrated networks of heat, gas and electricity systems with innovative energy conversion and storage technologies are required for the energy supply in our future cities, and without cooperation between very different stakeholders this transition will not be possible. In the present 4-years project you will develop innovative strategies by developing models of subsystems of energy hubs by combining energy carriers such as electricity, heat and gas which these models can accurately simulate the dynamic behavior of the system. Such models can either be used for the energy calculation tool, but also as validation base for less complex models within an energy management system (EMS) and explore if the models would fit to the current optimization algorithms for use in such an EMS setting. The UT has developed a platform for smart grid model predictive control called DEMKit. The PhD can work on digital twin modelling and application of DEMKit.

The project is executed in close cooperation with Alliander, TNO, Saxion University of Applied Sciences, EIGEN, Ventolines, Recoy, Semper Power, PARKnCHARGE, ElaadNL, Over morgen, Connectr and Shared Energy Platform. The project is funded by the MOOI-SIGOGE.

Our offer

We offer you a PhD position in a challenging multidisciplinary project. The university offers a dynamic ecosystem with enthusiastic colleagues and contacts with industry and society.

- A four-years fulltime PhD position.
- You will be part of a dedicated team with which you will collaborate extensively with industry.
- A gross salary between € 2.443 and € 3.122 per month
- An annual holiday allowance of 8% of the gross annual salary, and an annual end of year bonus of 8.3%.
- A solid pension scheme.
- Minimum of 29 leave days in case of full-time employment.
- Professional and personal development programs.
- The University of Twente is situated on a green and lively campus with lots of facilities for sports and other extracurricular activities.

Your profile

- You hold a MSc degree in Mechanical Engineering, Electrical Engineering, Sustainable Energy Technology, Computer Science, Mathematics or in a field that is closely related to this position.
- You are eager to learn about:

    - modelling and analysis of energy systems, renewable power generation, and energy conversion and storage technologies;
    - smart energy systems including different energy carriers such as heat, electricity, gas and fuel.
    - working with simulation software packages and relevant application toolbox, preferably in MATLAB/SIMULINK and Energy Equation Solver for the simulation of supply and demand in sustainable energy systems over time.

- Your writing skills are good.
- You are a creative person that shows initiative with a hands-on mentality.
- You have excellent communication skills.
- You are fluent in English, both spoken and written.
- A high degree of responsibility and independence, while collaborating with close colleagues, researchers and other university staff is strongly encouraged.
- Willing to be involved in educational tasks.

Information and application

You are welcome to contact Dr. Yashar Hajimolana (s.hajimolana@utwente.nl, +31- 534898462), Dr. Gerwin Hoogsteen (g.hoogsteen@utwente.nl), Prof. Johann Hurink (j.l.hurink@utwente.nl) and Prof. Gerrit Brem (g.brem@utwente.nl) for any questions you might have.