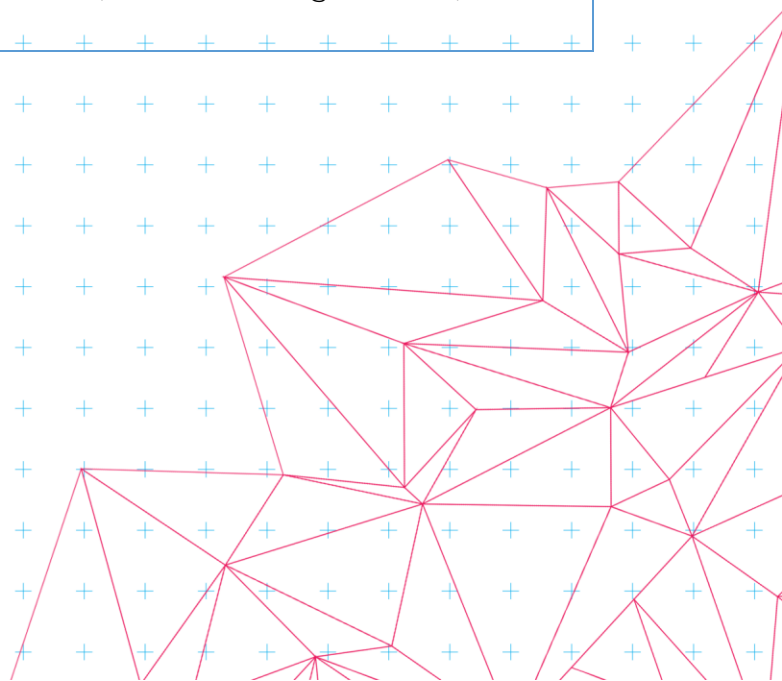
TU/e
INNOVATION SPACE

Challenge name	Energy transition
Challenge owner	Neways
	X Company ϒ Research ϒ Student team
	Marcel Linssen
Brief summary	The demand and supply of electricity and heat do not match in time with overload in the network as a result while storage capacity is not used. This leads to consumers buying electricity when it is expensive and supplying it when no one needs it at low or maybe even negative prices. In this challenge, we will look into using green hydrogen created with an electrolyzer to assist in the energy transition. The focus will be on the energy system in a house or a street.

About the challenge owner

Neways is an international innovator in electronics for smart mobility, connectivity and semicon solutions. With more than 50 years' experience and strong engineering power, we are proud to act as technology innovation partner for the most demanding customers in the industry. Neways develops and produces electronics that facilitate major trends around global ESG themes. Our team of more than 2,500 specialists across the Netherlands, Germany, USA, China, Czech Republic and Slovakia enables future solutions for EV charging, electric power trains, digitizing health solutions, sustainable agriculture, producing microchips and more.



Challenge description

With the increased attention to energy consumption, carbon dioxide emissions and global warming, the existing system of electricity supply and demand is requiring a significant shift. Energy is used when it is hardly generated, making it expensive, and it is produced when the demand is much lower. One reason for this is that the availability of affordable solutions for local energy generation (solar cells, windmills,...) has turned consumers into prosumers, who often produce a lot of energy at times when they don't need it themselves.

Because of this, the central grid concept is under pressure, since it is not designed to deal with this massive difference in supply and demand at different times of the day. Furthermore, the huge increase in electricity demand due to the increasing popularity of electrical vehicles (EVs) introduces additional worries for energy companies.

All of these issues have led to the rise of smart, new concepts, which aim to decrease costs and pollution, while safeguarding energy availability through clever sharing of resources. Climate-friendly energy sources like solar panels have the disadvantage that power generation is maximal during mid-day, while households often need most power in the evening hours. Therefore we will look into the possibilities of using green hydrogen created with an electrolyzer. We want to challenge students to come up with sustainable uses of this technology.

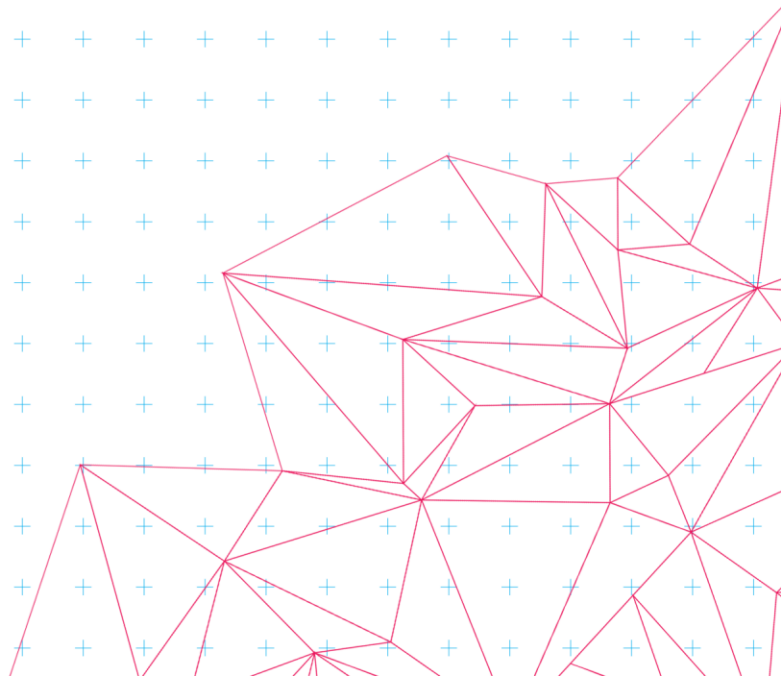
Input and involvement of challenge owner

We will challenge the project team on their solutions from a technical perspective as well as a business perspective by upfront discussions and reviewing afterwards.
As an outcome we hope for a concept that we can present to possible OEM's as a way forward to solve the challenge. This then could lead to an industry consortium that provides a solution to some of the questions raised by the Energy Transition.

Resources

We offer to the students

- Expertise regarding electronic control systems
- Workplace (if and when needed)
- Support in market access (if and when needed)



Roles of different disciplines (only for ISBEP)

Architecture, Urbanism and Building Sciences	How can this solution be implemented in a home (decentralized case).
Automotive Technology	The evaluation and car design challenges related to the possible use of the produced green hydrogen as car fuel
Chemical Engineering and Chemistry	Design of the electrolyzer, assessment and evaluation of the flexibility challenges of the electrolyzer, integration of the electrolyzer in system
Data Science	Smart data-based coupling of the green hydrogen production to the renewable energy or even wind and solar patterns. Coupling to electricity market
Electrical Engineering	Design and evaluation of the optimal coupling between the renewable energy supply and the electrolyzer.
Industrial Design	Optimal integration of the different components into an attractive design
Industrial Engineering	Business model finetuning, including evaluation of decentral and centralized concepts. Coupling to electricity market
Psychology and Technology	What is needed to make this concept attractive for consumers (decentralized case), i.e. what is needed to make people want to install it in their homes?
Sustainable Innovation	To make this a future proof solution including end-of-life aspect. Safety aspects of hydrogen in central or decentralized aspects
Mechanical Engineering	Design, modelling and/or construction of the electrolyzer and the coupling to other parts in the chain (solar panel, storage). Hydrogen mixing in existing gas grid. Link with iron fuels