Netherlands Enterprise Agency

Couperus Smart Grid

Smart Grid Pilot Projects – *Results as of September 2015*

Innovation programme commissioned by the ministry of Economic Affairs

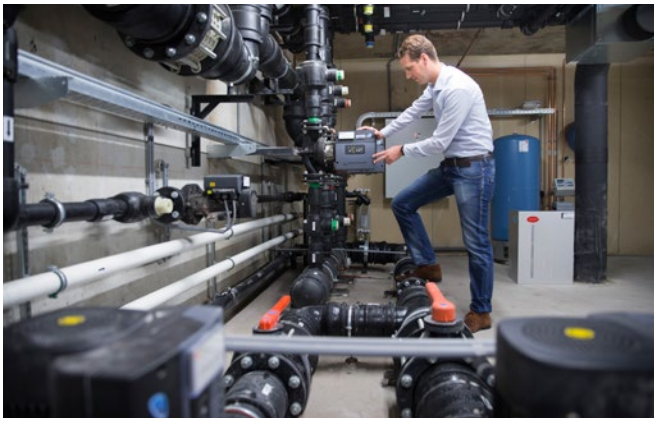
- Local electricity grid on DC voltage
- Electric transport and decentralised electricity generation
- Energy-neutral Heijplaat
- Modular smart grid for business parks
- Smart grid and energy transition in Zeewolde
- ProSECco examines four user groups
- Smart grid in sustainable Lochem
- Smart heat grid on TU Delft campus
- Your Energy Moment
- **Couperus Smart Grid**
- Cloud Power Texel
- PowerMatching City II

Goal
- Better alignment of supply and demand of energy from heat pumps with the PowerMatcher. Demonstrate the effectiveness of flexible energy consumption in an environment with many households.

Issues
- What is the most effective way to use renewably generated electricity?
- How can we reduce peak loads on the grid?
- How can we involve and activate consumers?

Duration
- January 2012 through summer 2015.

Project partners
- Stedin Netbeheer, Itho Daalderdorp, Staedion, SWY (Vestia), Eneco, TNO, IBM, Province of Zuid-Holland.



The apartment complex Couperus is situated in the Ypenburg district of The Hague. All 288 homes have a heat pump which is controlled by the PowerMatcher. This software system ensures that supply and demand of electricity are optimally aligned, resulting in less peak loads on the grid and a more balanced system. This means fewer grid upgrades will be needed in the future and the system will be more stable.

Results

There is no indication on the outside of Couperus, a stair-shaped apartment complex, that it is part of a pilot project. The experiment is taking place behind the scenes and the building's residents are not actively involved. They do not have to do anything with the heat pump and buffer installed in their meter cupboard, explains Stedin's innovator and spokesperson Arnoud Rijneveld. "We are studying how energy flexibility can be created without detracting from the residents' comfort or influencing their behaviour. The comfort of the residents is always our first priority. The acceptable deviation is approximately 0.8 degrees. This means that if a resident wants a temperature of 19 degrees, then the heat pump will be activated if it falls below 18.6 or rises above 19.4 degrees. Our tests showed that we can postpone activation of a heat pump by 6 to 8 hours by allowing this temperature range." This extra leeway is extremely useful to both system operators and energy providers, explains Rijnveld.

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"System operators try to limit peak loads as much as possible to prevent overloading the grid. For example, boilers are heated at night to profit from the low rate, resulting in a night-time peak. Now, instead of activating all heat pumps at 10.00 p.m., the PowerMatcher can distribute the load between 11.00 p.m. and 7.00 a.m., the period that the night rate applies." This provides opportunities for energy providers, who are faced with an imbalance between energy demand and supply due to the growth of local energy generation. "When the supply of wind power is limited, the PowerMatcher can delay activation of the heat pump," explains Rijneveld. "And it works the same in reverse: if a lot of wind power is available then the heap pump can be turned on earlier. Energy providers can really benefit from this."

Lessons

The pilot project proves that flexibility can be created without having to involve the consumer. However, Rijneveld believes that a lot more might be possible if they do involve residents. "To test this premise we interviewed 1200 consumers. These included Couperus residents, but also people who have solar panels or a TOON smart thermostat (supplied by Eneco) as well as consumers who use no sustainable devices. We asked them if they preferred their energy supply and demand to be controlled externally, as is the case with Couperus, or whether they would rather be actively involved. The results proved that people prefer to be in control. This does lead to lower yields, because people can only control their systems when they are at home, while we can manage everything 24/7."
The research also revealed that people need to be offered rewards to stimulate sustainable behaviour. "The current acceptable deviation in temperature does not lead to actual cost savings for the consumer," says Rijneveld. "If they want to save money, they may be willing to accept a larger deviation of 1.2 degrees. The more leeway there is, the more the flexibility."

Plans for the future

Although involving consumers would appear to be a promising development, the pilot project has not yet developed new products or services for the residents. "This is because we have not been able to create a win-win situation for all the partners yet," explains Rijneveld. "System operators work at the local level and with long-term goals; investments in the grid take 40 years to recover. An energy provider has national coverage and their profit models focus on the coming few years. Although this discrepancy forms a bottleneck, the various partners are understanding of the difficulties." Stedin sees plenty of potential applications of the knowledge they have gained to date. "Our concept for managing the heat pumps can also be applied to other areas. We have currently linked the system to wind power, but you can also use it with solar panels or hydroelectric power. This is only one of the ways Stedin envisages that we can prevent having to upgrade the grid, and possibly even allow the energy provider to close an extra coal-fired power station. I think the true key to a sustainable energy supply will be a combination of solutions."

More information

If you want to find out more about the solutions that were developed for the Couperus apartment complex you can contact Arnoud Rijneveld of Stedin at *arnoud.rijneveld@stedin.nl*.

Smart Grid Pilot Projects: energy innovations
The goal of the Smart Grid Innovation Programme (Innovatieprogramma Intelligente Netten – IPIN) is to accelerate the introduction of smart grids in the Netherlands. The Netherlands Enterprise Agency (RVO.nl) carried out the project for the ministry of Economic Affairs. Over the past years, twelve different pilot projects have gained learning experiences with new technologies, partnerships and methods. The pilot phase has now been completed, but most of the projects will be continued. Via RVO.nl they share their experiences of the five key themes involved in smart grids: legislation and regulations, user research and user participation, vision, standardisation and new products and services. The goal is to achieve large-scale roll-out via the path of experimentation.
More information: *www.rvo.nl/intelligentenetten*

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