Smart heat grid on TU Delft campus

Smart Grid Pilot Projects – Results as of September 2015

Innovation programme commissioned by the ministry of Economic Affairs

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TU Delft is working hard to make their campus more sustainable. Part of this metamorphosis involves a new smart heat grid. In collaboration with Imtech, Deerns, Deltares and Priva, TU Delft is converting the existing heating system into a smart heat grid that provides heat at various temperature levels from various conventional and renewable heat sources. The goal is to demonstrate that such a smart heating system can result in substantial energy savings and increased sustainability.

Results

Although heating accounts for 50% of our energy demand, TU Delft is one of the few pilot projects in the Smart Grid Innovation Programme (IPIN) to tackle this issue. “The other projects focussed mainly on electricity,” says Frank Baetens, process manager with the pilot project. “We are proud to be able to contribute to the theme of heating within the programme. Happily, this theme is also gaining increasing political attention thanks to the recent memorandum submitted to parliament by minister Kamp of Economic Affairs.” The TU Delft heating system includes 29 buildings that will soon be sharing heat. To this end, project partners Deems and Deltares developed the WANDA, HENK and LEA programmes that will jointly be responsible for the optimum alignment of the supply and demand of heat. HENK and LEA calculate the buildings’ heat requirements, while WANDA manages the supply of heat through the heat grid. The pilot project is currently validating the various

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models and evaluating the scenarios. The implementation and monitoring phase will continue until March 2016. The physical modification of the heat grid is to take place in the summer of 2015. “The present heating system is currently one big reservoir,” says Baetens. “After modification it will be possible to channel the heat to where it is needed. The first phase – insulation and implementation of low temperature heating – will lead to energy savings of 10 to 20%. But the real savings will be achieved if we can install a renewable geothermal heat source, which will supply between 40 and 50% of our heat requirements. We are currently hard at work investigating this option.”

Lessons
The pilot project initially set out to study cooling as well as heating options. “We ended up abandoning the cooling aspect because we had our hands full with heating alone. You mustn’t underestimate the preliminary work involved in such a project: we have invested at least 1000 man hours to date. Due to a lack of energy consumption data from the older buildings, we had to carry out a number of quick scans ourselves, which led to delays in the schedule. It costs a lot of time to develop and validate new models, simulate and monitor scenarios, revalidate, etc... and then we haven’t even started implementing. Focus is important; you must not try to study too many different elements in a single project. But nevertheless, we definitely plan to incorporate cooling in our grid at a later stage. We also want to involve students and the university staff in the further development of WANDA, HENK and LEA.”

Plans for the future
Although the heat grid is not yet up and running, TU Delft is already considering the future. The plans for connecting a geothermal heat source are serious. “But deciding exactly how this should be implemented is a real challenge,” says Baetens. “The geothermal source generates heat with a temperature of 70 °C, which has to be converted to meet both higher and lower temperature requirements. We think that heat pumps will be an effective solution for aligning the various temperature levels.” The requisite investment in the geothermal system of some € 16 million will not be put up by TU Delft, but instead by market parties. “We are investing in the preliminary research, modifying our buildings and will pay for the heat provided,” says Baetens. “By 2020, the university wants to halve the CO2 emissions in relation to 2012. Our smart heat grid in combination with geothermal heating could contribute 10 to 15% of this goal.” TU Delft is also involved in the plans for a Heat Pipeline Network: a system of pipes for heat exchange connecting the Westland greenhouse region to Rotterdam, The Hague, Leiden and Delft. “All these developments make the project hugely interesting to us as an educational institution; the grid is a wonderful training ground for our students,” says Baetens. And the rest of the Netherlands? “If the results are satisfactory, then any heat provider in the country will be able to use our models to save energy and increase sustainability. For me personally, I will be satisfied when I see the big smile on our energy manager’s face when he is presented with the first heating bill.”

More information
Would you like to find out more about TU Delft’s heat grid project? Contact Frank Baetens of TU Delft at f.a.j.g.baetens@tudelft.nl.