

Master thesis project at Uniper Benelux

Company Uniper Benelux
Location Rotterdam
Contact Rick van Staveren (rick.van.staveren@uniper.energy)

The design of a cost optimal combined electricity and heating system

Up until now, the CO2 reduction discussion in the Netherlands has primarily focused on the electric power system. Due to the Dutch energy agreement, 5 coal plants are being shut down and large on- and offshore wind projects are being developed.

However, a large part of Dutch CO2 emissions come from the built environment and are primarily caused by the heating of buildings. Although improved insulation will lower total heat demand, a large part of the demand will still exist in the future. Currently, the heat demand is mostly supplied using gas fired boilers while some cities have a district heating network which are fed by both gas and coal power plants.

Currently thermal production units are taken offline which reduces CO2 emissions from the electricity sector. However, the emissions from the heating sector remain and will be supplied by either gas fired boilers (which are less efficient than combined heat and power generation) or electric heating units (such as heat pumps). Using electric heating will increase power demand and require even more investments in sustainable technologies such as wind and solar, which is not always available when heat demand is high.

Separating the electric and the heating sector might lead to a sub-optimal design of both sectors and higher total CO2 emissions and cost than necessary. To our knowledge, no studies have optimized the design of both sectors together. Because of our current business of combined electricity generators and suppliers to district heating systems we are very interested how a future optimal combined heat and power system can be designed.

We are looking for a student who would like to perform a model-based study into the combined optimization of a heat and power system. This (optimization) model can be built in either GAMS, Xpress (dedicated optimization languages) or Python.

If you are interested in the described problem, or have ideas that are related to this subject, please feel free to contact us for more information!