Finding new players in an old market: The energy potential of a Swedish case study

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Planned industrial park Krona in Landskrona. Credit: European Science Communication Institute

Sweden has provided an example of how to reduce greenhouse gas

emissions while maintaining economic growth. A big part of this achievement is due to an extensive network of local district heating systems that work with non-fossil fuels and excess heat from energy-intensive industries. They hold a market share of about 60% and can now be found in every major town and city in the country, making it one of the best scenarios to test the EMB3Rs platform and its ability to identify new surplus heat sources among medium-sized non-traditional providers.

The EMB3Rs project, funded by the European Union, is developing a tool that will match potential waste heat and cold providers with end-users by assessing the possibilities they have of reaching economically viable exchanges. "The EMB3Rs project as a whole aims to map where heat is available and where there is a need for heat," explains Martin Andersson, senior lecturer at the Department of Energy Sciences in Lund University. "District heating in Sweden is a mature market and the dominating source of heat, so we will use data from the already existing nets to validate the EMB3Rs tool, and we will look on expansion possibilities."

Andersson is in charge of one of the seven case studies providing data for the creation and validation of the platform. He leads a team of three researchers at Lund University that will work in collaboration with Landskrona Energi, the local energy and district heating supplier in the southern city of Landskrona. Together, they will explore new business opportunities in the area for the recovery and reuse of surplus heat stemming from companies that, because of their smaller size or activity, are not usually perceived as obvious excess heat providers.

Lund University's team will study four potential heat providers identified by Landskrona Energi: a metalworking installation, an industrial park, an oat drink production plant, and a heat exchanger factory. "We will model and simulate what their impact on the dissipating net would be if they

are connected," explains Andersson. "For a connection to happen there needs to be a win-win deal for the provider and the district heating company. Both must make a profit from it and, since most district heating networks are municipality-owned, they can look into more benefits than just money." The researcher believes the EMB3Rs platform can serve as a tool district heating companies can use to motivate industries to provide excess heat, as well as a source of data for firms to make informed decisions when considering whether to become a provider or not.

The platform's models and simulations will answer questions like how far away district heating companies can extend their search for providers. Or what minimum temperature an industry's waste heat must register for a deal to be advantageous for both sides, based on the distance between the provider and the supplier's grid. "Normally, for what we call a third generation dissipating network, you need at least 80°C to connect a new source to the net. But this is also something that we could use the tool for: if we have a heat of 70°C, could we still use it? What would be the impact on the dissipating network?", explains Andersson. The results obtained will also allow determining what technology the provider should invest on to better recapture excess heat and transfer it to the grid. "If we have cooler temperatures, between 40°C and 70°C, that can also be recovered but you would need a heat pump. You would have to supply electricity and then move the heat from the cooler source to a hotter one. That would mean more investment and a higher running cost."

Kerstin Sernhed, senior lecturer at Efficient Energy Systems in Lund University, explains that high energy-consuming industries in Sweden, like paper factories or steel mills, know very well the benefits of providing waste heat to a district heating system and that they are already contributing to their local network. "But when it comes to those sources of lower quality heat, I don't think there has been much discussion

between district heating companies and potential suppliers yet because they don't know the possibilities there," she says. As an expert in district heating not involved in the EMB3Rs project, Sernhed believes the platform can help show the path to achieve an efficient workflow not only for countries that are still to build this kind of infrastructures but also for those such as Sweden, with a decades-long tradition of district heating networks that can still be expanded.

A greener source of heat

Sweden's waste management policies demand that trash be recycled whenever possible. When unfeasible, it is usually utilized as fuel for district heating systems, providing heat for 1.25 million flats and electricity for 680,000 in the country every year. Biofuels are another source of heat for the industry, which only resources to fossil fuels when demand peaks are impossible to meet with cleaner materials.

Excess heat recovery is also a common practice. In cities like Luleå, about 90% of heat comes from a neighboring steel mill, says Sernhed. "Suppliers have several furnaces and they use the cheapest fuel first, which is waste. You can actually get paid for taking care of garbage. The next best is biofuel, which can also be waste but from the forest, roots and branches you don't use, for example. And then, when you have a peak load, you burn oil." Of all of these, recovering surplus heat is the greenest alternative, according to the expert: "You use something that otherwise would be wasted." She believes that, when available, excess heat should become the main source for district heating, and that the industry should work towards building a network capable of recapturing heat at lower temperatures. This would increase the number of companies whose surplus heat is recovered, reducing greenhouse gas emissions.

In Landskrona's case study, Andersson estimates that, for each new

provider, the district heating company will be able to recover one megawatt of new extra heat: "So up to 1,000 homes can have their heat supplied per each extra connection." Landskrona Energi obtains most of its heat from a cogenerating plant where biomass and waste are burnt. The firm also imports heat from the surrounding district heating networks. "Basically, what we will replace is the need to burn as much biomass as it is being burnt today," says Andersson, who thinks a case study involving smaller surplus heat sources, like the one he leads in Sweden, will be very useful to test the platform's performance on different scales. "Providing energy to 1,000 homes is worth doing it."

Provided by European Science Communication Institute

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