

TECHNOLOGY IN ACTION



Decarbonising district heating and cooling



Orgalim's Technology in Action series showcases how the technology industries we represent are shaping a future that's good for Europe's economy and society – and how the right policy framework can help them do even more.

Challenge

One of the key challenges of the energy transition is the decarbonisation of the heating and cooling sectors. Buildings are currently the single largest energy consumer in Europe: their heating and cooling accounts for half of the EU's energy consumption, and still relies mainly on fossil fuels.²

District heating already supplies about 10% of residential and service sector heating needs in the EU and is increasingly recognised as part of the solution, "a potential backbone for coherent local energy transition strategies," as a European Commission study said.

But district heating (and cooling) systems still run mostly on fossil fuels, mainly natural gas and coal. One of the most critical technologies for decarbonising them – heat pumps – has yet to be widely scaled up for district heating systems.

This is the challenge that the industrial port city of Esbjerg took up a few years ago. Esbjerg has been the primary base for all Danish oil and gas activity in the North Sea for decades and its main power plant is coal-fired, emitting some 100,000 tonnes of CO₂ per year. Its ambition now is to be carbon neutral by 2030. How is it getting there?

² District heating and cooling in the European Union

Solution

The Esbjerg utility, DIN Forsyning is working with MAN Energy Solutions Switzerland to implement an innovative, large-scale heat pump system which will use sea water and renewable energy from wind farms to provide around 235 gigawatt hours of climate-neutral district heating to 100,000 inhabitants.

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Patrik Meli, Senior VP, Managing Director of
MAN Energy Solutions Switzerland Ltd



Visualisation of the new district heating plant in Esbjerg © Arkitema

“Using renewable energy sources directly breaks through the dependency on fossil fuels for heating and cooling and contributes to grid balancing,” emphasises Patrik Meli, Senior Vice President, Managing Director of MAN Energy Solutions Switzerland Ltd. “This sector coupling is key.”

Heat pumps are increasingly recognised as indispensable for cutting emissions and natural gas use in Europe; the challenge is scaling them up to the higher temperatures required to provide district heat.³ MAN’s ETES (electrothermal energy-storage) heat pump system being installed in Esbjerg is innovative in using carbon dioxide as a refrigerant, at higher pressures, enabling the higher temperatures needed. Industrial heat pumps with different refrigerants only work at notably lower temperatures and pressures.

The other advantage of using carbon dioxide is that it is non-toxic and non-flammable. This was of particular interest to the utility company in case of any leakage, as Denmark’s Wadden Sea is a UNESCO world cultural heritage site.

In its full configuration, the ETES system is also able to store any excess renewable electricity generated as thermal energy (in the form of hot water and ice in insulated reservoirs), so that the system can accommodate peaks

³The Future of Heat Pumps.

and troughs of renewable energy generation. The highly flexible system can also feed power into the grid when demand is high to help with grid balancing. This, as Mr Meli points out, is particularly valuable in a country like Denmark that has a high percentage of renewables in its energy mix.

Policy implications

Most important, says Mr Meli, is to be as open as possible regarding the technologies for decarbonisation, and not think in silos, focusing all efforts on one solution, like say hydrogen. We need to combine and collaborate on many different technology solutions to enable the sector coupling that is essential to our future energy systems. Esbjerg port has plans for the development of ammonia and fertiliser production, and data centres, all potential sources of waste heat for district heating, for example.

Secondly, while there are no regulations that stand in the way of heat pumps, the same cannot be said for energy storage, he points out. Specifically, Long Duration Energy Storage (LDES). The EU has set new targets for LDES, leaving it to the private market and investors to achieve these goals, but the tendency is to back the better-known solutions, namely batteries, hydro or, lately, hydrogen. Again, with new technologies emerging rapidly, it is important to ensure development is not limited to a few solutions. More support is needed to help scale-up other technologies from prototype to commercialisation.

Related Orgalim position papers

- [Renewable Energy Directive](#)
- [Energy Taxation Directive](#)
- [Energy Efficiency Directive](#)
- [Energy Performance of Building Directive](#)

About Man Energy Solutions



MAN Energy Solutions

MAN Energy Solutions Switzerland develops and makes high-tech compressions systems for a wide range of industrial sectors and applications, and has developed the MAN ETES Heat Pump Unit system being installed in Esbjerg. Based in Zurich, the company counts 800 employees and is part of Germany-based MAN Energy Solutions, which employs some 14,000 people at over 120 sites globally. MAN Energy Solutions’ stated purpose is to engineer systems for deep decarbonisation in the sectors that matter most. The company has committed to reduce CO₂ emissions in its own production by 50%, to offer a CO₂ neutral version for each main application in new build, and to ensure that its solutions for decarbonising marine, energy and industry make up at least half of total revenue – all by 2030.

man-es.com

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