Solstice

SOLSTICE® TECHNOLOGY HELPS DECARBONISE LONDON HOMES

CASE STUDY

As part of its pledge to become carbon neutral by 2030, Southwark Council in south east London developed a plan to decarbonise the gas-powered heat networks used by thousands of council homes across the borough. It brought in environmental contractor Vital Energi (with its partners ICAX and J&E Hall) to replace legacy gas boilers with modern heat pumps powered by low global warming potential (GWP) Solstice® N15 (R-515B) refrigerant – a 91% blend and sister product of Solstice® ze (R-1234ze) from Solstice Advanced Materials. The result? Over 2,000 homes were virtually decarbonised overnight.

BACKGROUND

Situated along the south bank of the River Thames, the London Borough of Southwark is home to one of the most socially and ethnically diverse communities in the English capital. Located between London City Hall, bustling Borough Market and the iconic, high-rise Shard to the north of the borough and leafy Dulwich village to the south is council housing for low-income residents, including Nigerian, Jamaican, South African, Polish and French immigrants. Southwark Council is responsible for the provision of public services and the upkeep of the public housing.

In March 2019, the council declared a climate emergency because Southwark is a low-lying area at risk of sea level rises and flooding from the River Thames. One of the outcomes was that the council accelerated its target of making Southwark carbon neutral by 2050 to 2030. To achieve that goal, the council would have to immediately tackle the CO2 emissions generated by the vast, gas-powered district heating networks supplying heat to 17,000 of its 55,000 council houses, among other measures.

To reduce the CO_2 emissions generated by its public housing stock, the council planned to add more insulation to the homes, use more Energy from Waste via the nearby South East London Combined Heat and Power (SELCHP) plant in Lewisham, and – most importantly – install high-efficiency heat pumps as an alternative to the traditional gas boilers that powered the heat networks.

Heat pumps are a cornerstone technology in displacing fossil fuel heating in the International Energy Agency's Net Zero by 2050 report, and in the case of Southwark's council homes, they would not only cut gas consumption but would generate low carbon district heating.

However, there was an economic challenge: Heat pumps cost considerably more than gas boilers and electricity costs more than gas – which would mean an unacceptable increase in costs to residents. To resolve this issue, the council applied for public funds such as the UK Government's Renewable Heat Incentive and Green Heat Network Fund to offset the installation and ongoing running costs.

In tandem, Vital Energi, a Blackburn, Lancashire-based environmental contractor, was appointed to design and build a new heat pump platform which would power the heat networks.

SOLUTION

After conducting feasibility studies, Vital Energi and its partners ICAX and J&E Hall designed and installed four bespoke 600 kW heat pumps and one 1 MW heat pump in three of the council's existing plant rooms, each linked to new 125m water discharge wells connected to the London aquifer.

To produce useable heat from the heat pumps, low global warming potential (GWP) Solstice® N15 (R-515B) refrigerant from Solstice Advanced Materials was selected.

Solstice for District Heating met Vital Energi and the council's requirements for safety, efficiency and cost. Both Solstice® N15 and Solstice® ze support temperatures up to 100°C (the council's heat network typically operates between 75-80°); offer low complexity, which helps to reduce capital costs; and deliver high efficiency, which helps to decrease both the financial cost and CO_2 emissions related to power consumption. Safety-wise, both provide low-risk, Class A toxicity and are classed as 'non-dangerous' PED Group 2 substances.

Moreover, Solstice for District Heating offered the application flexibility Vital Energi was looking for.

In this case, due to the heat pumps proximity to gas boilers, Solstice® N15 would be used as an A1 non-flammable solution with its low GWP of less than 300. Without proximity to a gas source, as in other heat pump projects, in the future it could migrate to the sister product Solstice® ze, which boasts ultra-low GWP of less than 1.

Another reason for using Solstice for District Heating was that it could use the council homes' existing pipework and thus minimize disruption for residents – a key project consideration.

Once the heat pump platform was completed, the heat networks were switched over to the new heat pumps while the legacy gas boilers were retained for back-up resilience.

The outcome of the first phase of the project was that over 2,000 council homes were literally decarbonised overnight, with little to no disruption to residents. Over time, Vital Energi and the council plan to migrate all of Southwark's public housing stock to low carbon heat.

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