Water source heat pumps for council estates in Southwark

London Borough of Southwark
Friday 30 September 2022

Summary

In a first for London, heat pumps that use water from the aquifer deep underground are keeping 2,000 Southwark homes warm. The heat pumps – which replaced gas boilers in a council retrofit project – extract naturally warm water from London's aquifer. The low-carbon tech then uses the water's heat energy to warm the homes and provide them with hot water, while helping the borough meet Net Zero.

Cllr James McAsh, Cabinet Member for the Climate Emergency and Sustainable Development, says: "Climate Change is a top priority for Southwark, and greening our homes and buildings is a crucial part of tackling that, as residential buildings make up nearly 30% of our borough's emissions.

"It is great to celebrate some of the successes we've had on carbon-saving projects, and share what we've learnt on this innovative project that was the first of its kind in London. These new estate-wide heat pumps will deliver a win-win for residents, keeping their homes warm whilst generating renewable energy and preventing thousands of tonnes of carbon dioxide from being emitted."

Cllr Darren Merrill, Cabinet Member for Council Homes and Homelessness, adds: "Right across the council we are working to tackle the climate emergency. These works have helped to improve the quality of housing for our residents whilst also helping us meet our ambitions for a healthier environment."

The ‘plant room’ with the installed heat pump at Newington Estate, Southwark. Image credit: Southwark Council

The problem

Of the borough’s carbon emissions, 75% come from buildings. Southwark’s climate strategy and action plan identified greening our homes and buildings as a top priority, as did our citizens’ jury on climate change. The council also wants to decarbonise its operations, including heating and power, improve air quality, and end its reliance on natural gas.

The solution

The new heat pumps serve 2,175 homes across three Southwark estates: Consort, Newington, and Wyndham. We installed the heat pumps as a retrofit upgrade to the estates’ existing heat networks, which used to be powered by gas boilers.

Studies showed that the locations we chose had the correct conditions to use heat energy from the underground aquifer.

How the heat pumps work

The system:

- extracts naturally warm water from 120-metre deep boreholes
- circulates the water around the heat pump, using its energy to provide residents with reliable low-carbon space heating and hot water
- returns the same water back into the ground at a cooler temperature

For more detail, watch this three-minute animation on how the heat pumps work.

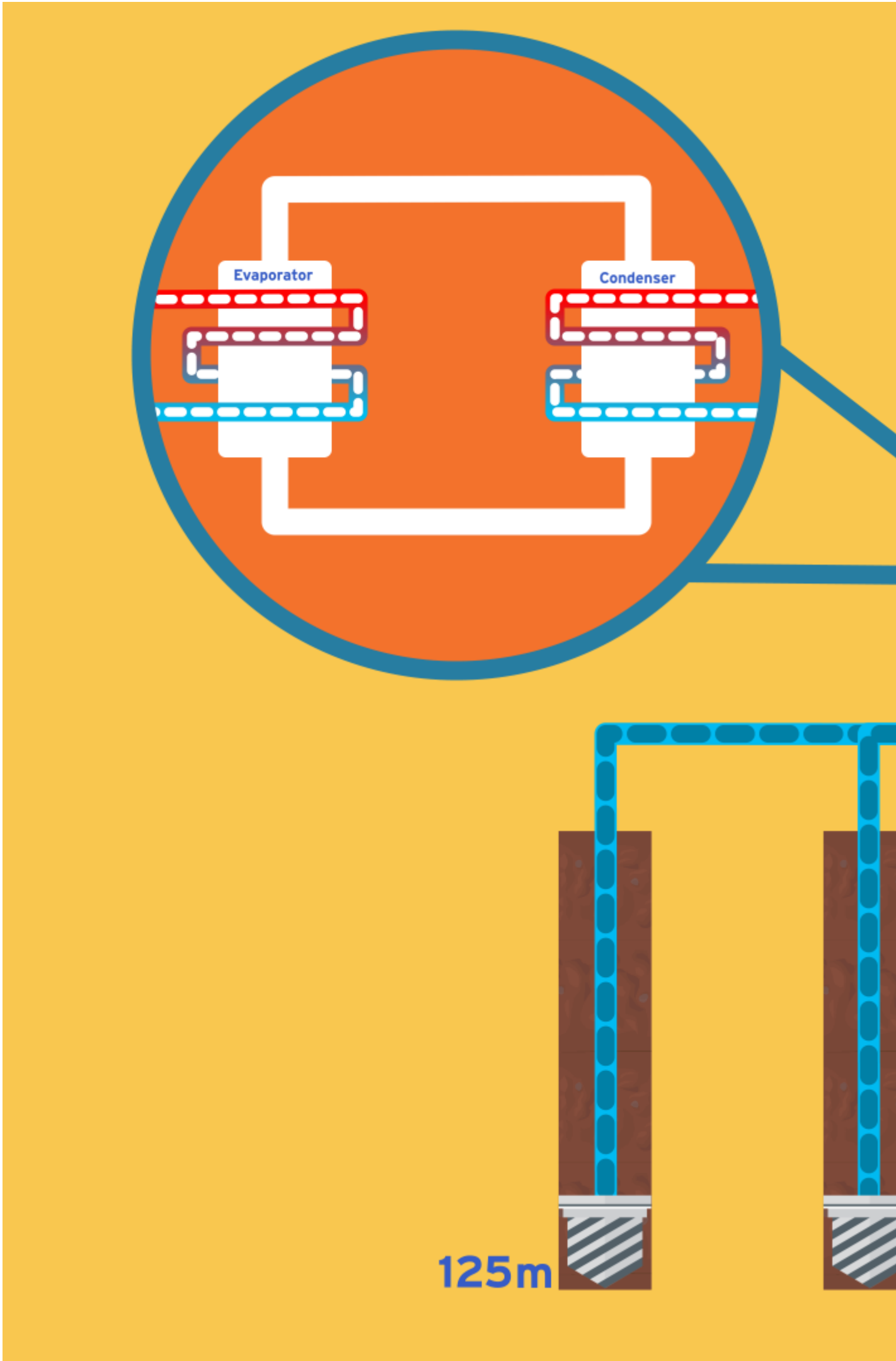
Evaporator
Condenser
125m

Image credit: Vital Energi

Timeline

We developed the concept for this project in early 2019 before we undertook a full feasibility study across the summer and autumn of that same year. In late 2020 we began construction after undertaking consultation and procurement exercises.

We carried out most of the works at the same time on all three estates. This meant multiple teams could be working at once, helping us stick to our tight timeline. But we had to phase the drilling of the boreholes because we only had access to one drill rig. As the rig finished at one site, we moved it to the next.

Two years after starting construction, we have now installed and commissioned the systems at all three estates. We are now beginning a 12-month ‘defects liability period’ – where the contractor is still responsible for the installation – which will include a lot of detailed monitoring.

Stakeholders

The project team consisted of council officers working in finance, engineering, and housing, as well as several councillors. The engineering team led the initiative, with colleagues from other teams joining at relevant points.

We brought on board our framework consultant CalfordSeaden to develop the project. And we worked with contractors Vital Energi and ICAX to install the heat pumps following a tendering process.

From the very start of the project we involved residents. Officers met with members of the tenants’ and residents’ associations at all three estates during the feasibility stage. Throughout the project, they updated all residents via monthly newsletters and meetings.

Impact

The new estate-wide heat pumps will deliver a win-win for residents. They will keep homes warm while generating renewable energy and saving thousands of tonnes of CO2.

The project is estimated to achieve 3,848 tonnes CO2 savings per year, which equates to around 1.77 tonnes of CO2 saved per home. This accounts for a significant portion of our overall target. The carbon savings from the initiative equate to:

- 3,848 people flying from Gatwick to Chicago every year
- an average car travelling 13,468,000 miles every year

From a technological point of view, this project can be replicated in Southwark, London, or elsewhere in the UK. But as the Non-Domestic RHI has closed to new applicants, and that funding was crucial to ensuring the project worked financially, we are now investigating different business models to allow further heat pump installations.

Co-benefits

Some of the project’s co-benefits include:

- improving air quality: the heat networks use mostly renewables and far less gas
- keeping residents warm: the heat networks have kept running throughout the project
- keeping costs the same: RHI income keeps the cost to the same level as before the pumps were running

Lessons learned

Overall the project has worked well, though there were some barriers that delayed delivery. The pandemic was one, as it made working on-site a challenge.

Another was having to make minor design changes once the project had already begun. For instance, we had to:

- drill boreholes in slightly different places from where we originally intended due to buried objects that had not appeared in our scans
- add more sound insulation to the heat pumps

One of the boreholes the project uses. Image credit: Southwark Council

We also had limited space in the ‘plant rooms’ where the heat pumps replaced the old gas boilers. This meant we had to consider the space constraints very carefully at the feasibility stage to ensure that the installations would be viable. Once we had entered into the contract, Vital Energi did 3D scanning as part of their design to add further detail.

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We funded most of the project with a low-interest loan of £7 million from the Mayor of London’s Energy Efficiency Fund. We are repaying this with income from the UK government’s Non-Domestic Renewable Heat Incentive (RHI).

Without the RHI income, the project would not have worked financially as electricity is more than three times the price of gas. This funding approach has meant that residents did not have to pay any capital contributions. There will also be no increase in heating cost as a result of decarbonising the heat networks.

We have secured the RHI income for 20 years, which will keep the upgraded heat network running. This means that despite the cost of electricity being higher than gas, the project will still make an overall saving.

But as the RHI is now closed to new applicants, it will be hard for this technology to bring the same benefits to people across the country. Projects like ours will need to find other support. Lower electricity prices for heat pumps could be one solution.

Links

To learn more, you can:

- get more project info on our district heating webpage
- watch this three-minute animation on how the heat pumps work
- read about our progress in tackling the climate emergency in Southwark

Contact details

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