



Full Circle SIF Project Show & Tell

Rona Mitchell, UK Power Networks

Yutian Zhou, Arup

Kayo Animashawun, SGN Commercial Services

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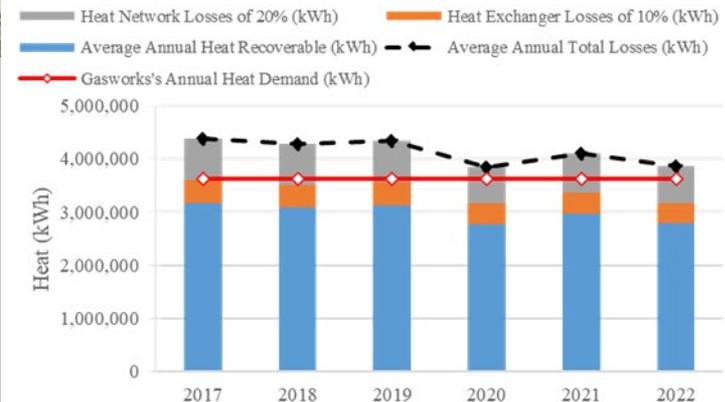
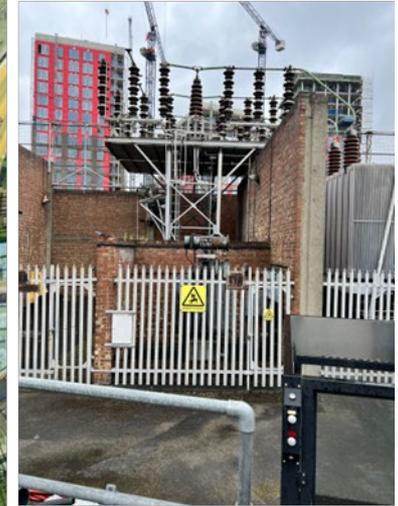
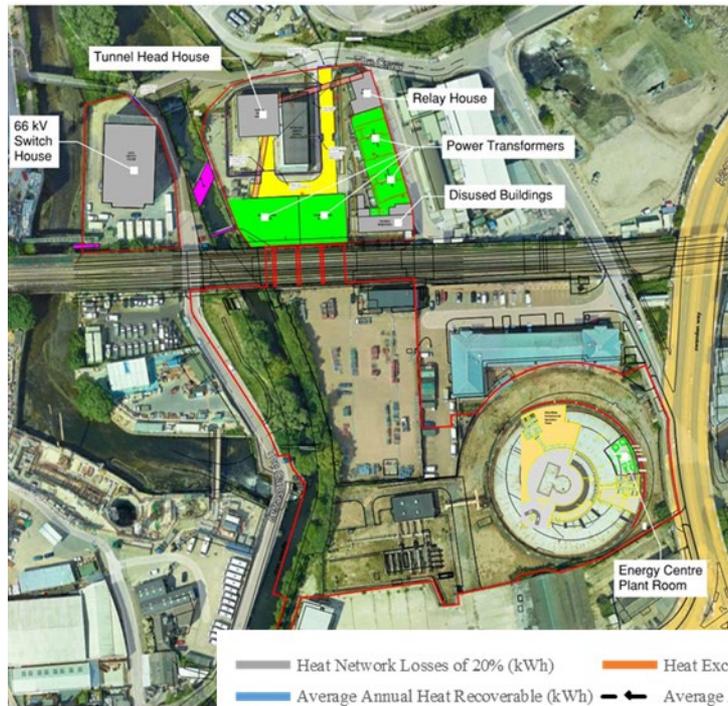


**UK
Power
Networks** 
Delivering your electricity

The Problem

Distribution Network Operators perspective:

- Several old transformers with higher losses serving in the UK's electricity distribution network.
- UK Power Networks has a Grid Substation, which consists of **four 132/66 kV** power transformers located 200m away from Energy Centre.
- Transformer's waste heat comparable to heat network heat demand
- Transformers will continue in operation for the foreseeable future.



The Problem

Heat Networks perspective

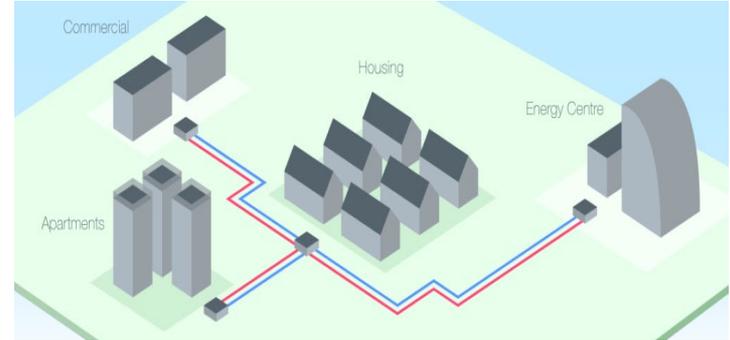
The heating of housing developments and urban communities traditionally comes from **costly and potentially inefficient carbon intense heating sources** such as natural gas or resistive electric heating.

Although Heat Networks are an effective low carbon heating solution most of their heat sources are expensive and inefficient when considered all year round due to system inefficiencies and cause reinforcements on the network side.

Opportunity

By harnessing **low-grade waste** heat from the DNO substations, we can enhance the SGN Wandsworth developments heat network efficiency and reduce costs for the end user.

Such an innovation is particularly important at this time given that consumers relying on gas dependent communal heating systems are experiencing a 350% rise in their energy bills.



UK households with communal heating facing 350% rise in energy costs

Surge in energy costs filtering through to low-income households on shared heat networks

- Lambeth council tenants 'in precarious position' after 350% service charge rise



Project Overview

Full Circle aims to provide affordable low carbon heating to wide range of domestic users by developing a **viable technical solution for heat recovery and integration which utilises transformer losses** as a heat source for heat networks.

Technical Assessment

- Determine counterfactual heat losses vs heat demand, identify heat interface and offtake options.
- Evaluate cost, benefits and risks to DNO and Heat Network.

Commercial Assessment

- Understand the benefits of the proposed heating design on customer bills and carbon savings.
- Initial commercial framework and contract developed.

Full Circle has **four key partners:**



Developer and operator heat network through JV with Vital Energi



Supporting and input into Local Area Energy Planning (LAEP) team



Distribution Network Operator (DNO) data and expertise

ARUP

Engineering company providing technical expertise on similar projects

User needs

Heat Network Operators

- A clear technical and operational deployment plan.
- An understanding of the business case.
- Funding sources and return on investment.
- Pass on savings to end consumers.

Local Authorities

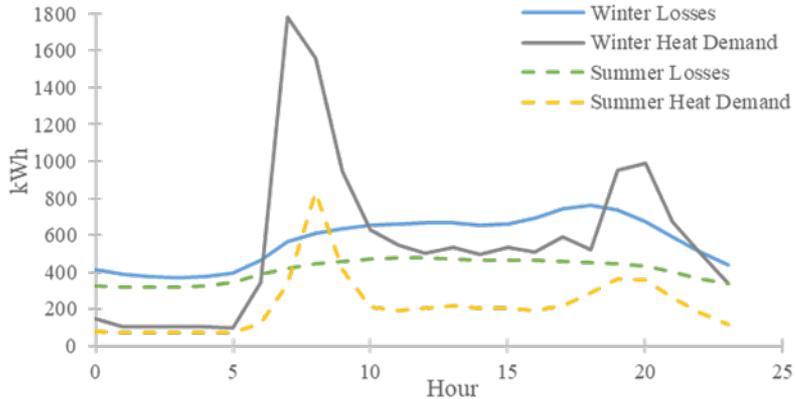
- Understanding the scale-up potential of solution to their local buildings.
- How this informs into their LAEP and complying with government planning policy frameworks e.g Heat Network Zoning.

DNO

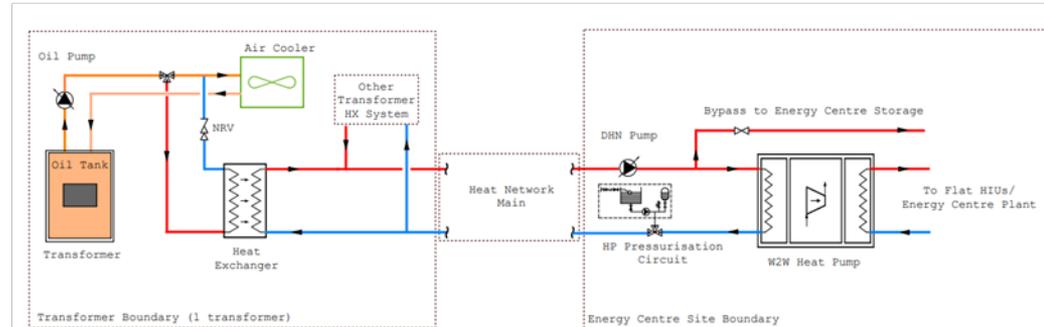
- Understanding of the potential heat recovery from transformers (repurpose losses).
- How to help facilitate the solution:
 - Security of supply maintained.
 - Commercial arrangements.
 - Regulatory considerations.

Project Outputs- Technical Assessment

- Four options have been appraised through an Integrated Risk Matrix.
- Annual heat recovery profiles developed based on historical load data.
- Heat network operation with heat recovery has been simulated to understand commercial benefits and potential carbon reduction.



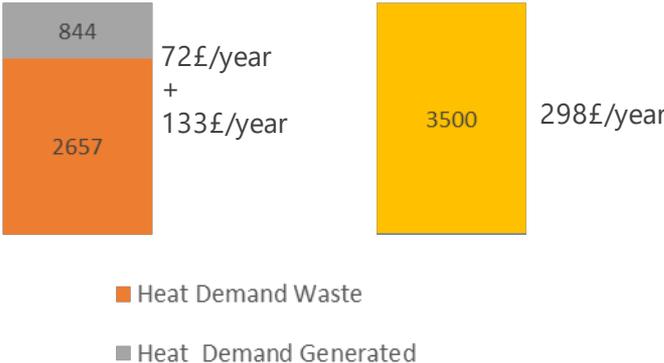
	Efficiency	Site Impact	Operational Impact	CAPEX	OPEX	Carbon Reduction	HX Scalability	Weighted Average Score
<i>Weighting Factor</i>	30%	5%	15%	10%	10%	25%	5%	100%
Oil-to-water HX	1.0	2.0	1.0	1.0	2.0	2.0	2.0	1.45
Air-to-water HX	3.0	4.0	4.0	3.0	4.0	4.0	4.0	3.60
Direct Contact w/ Air Cooler	2.0	3.0	3.0	2.0	3.0	3.0	3.0	2.60
Organic Rankine Cycle	5.0	5.0	4.0	5.0	5.0	5.0	4.0	4.80



Project outputs – Benefits

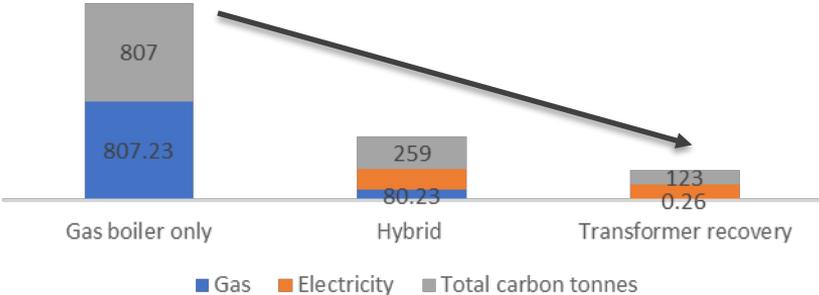
The transformer heat could deliver **75.9% of the site heat demand** and could reduce customers bills.

Heat Demand vs heat waste/generated



This is a **31.2%** saving on energy bill (£92.91)

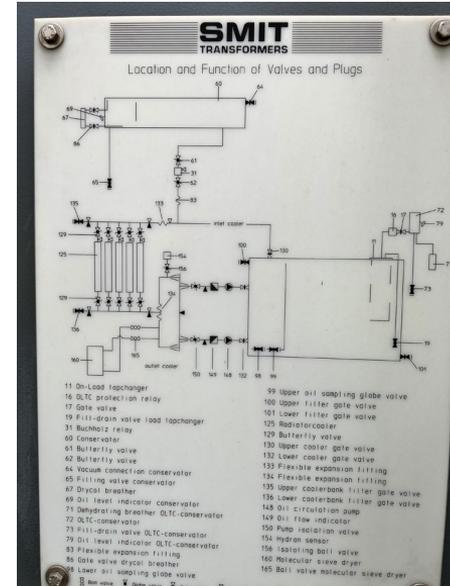
Decarbonization of heat network (CO2 tonnes savings)



Carbon saving of 53% when compared to the current hybrid, **85%** based on a gas only scenario.

What we learned and how our thinking has evolved

- The technical and commercial viability of the heat recovery scheme at Wandsworth was demonstrated.
- Commercial framework will be explored in detail in Alpha Phase.
- Engagements with transformer specialists, heat network operator, and suppliers went well, and contributed to the success so far.
- Site visit helped bridge the gap in information.
- Closer and in-depth collaboration among the partners are expected in Alpha Phase for detailed design.
- The project partners for Discovery Phase performed well and are expected to form the same partnership for Alpha Phase.
- New resources and expertise will be brought in by the partners in Alpha Phase, which will require more coordination and management.
- Key risk mitigation activities to include in next phase are site visits, investigations, contractors' engagement.



Looking ahead

Alpha Phase:

- Transformer heat recovery detailed design.
- Heat integration design.
- Stakeholder engagement with transformer specialists – looking at how active heat removal may increase asset rating and life span.
- Development of operation and maintenance framework and procedures.
- Commercial framework – supply agreement between the parties.
- Scale-up and roll-out mapping in UK Power Network areas and GB.
- Address regulatory barriers for implementation in business as usual.
- **Beta:** Demonstration project to de-risk future schemes.



THANK YOU
