SHIELD (Smart Heat and Intelligent Energy in Low-income Districts)

Discovery Show and Tell

Jonathan Gilmour, Carole Randall, Alex Templeton, Jon Cape

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Agenda

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- Project Overview
- Discovery Phase Activities
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- Benefits
- Alpha Phase
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Problem

The current approach to decarbonising heat and energy in consumers' homes is not inclusive of vulnerable consumers, low-income households, and social housing residents due to its high upfront costs and high running costs.

New approaches, technologies and business models are needed to make the decarbonisation of heat and energy affordable and accessible and can be scaled nationwide.

Project Overview

SHIELD aims to identify and deploy new viable pathways that can be scaled to decarbonise heat and energy for vulnerable consumers and social housing tenants. SHIELD will replace existing heating solutions with distributed data centres serving as innovative low-cost low carbon heating in conjunction with smart energy generation and storage technologies that will help to balance demand and supply and reduce the upfront cost and running costs of consumers heating and energy.

In the Discovery Phase, we looked at the feasibility of the below:

New Heating Technologies and low carbon technology (LCT) combinations

- Using the heat produced from Thermify's distributed data centres to provide low cost and low carbon heating that replaces consumers gas boiler systems
- Integrating Thermify's distributed data centres with Kensa's ground source heat pumps to enable interseasonal storage and heat multiple homes/flats. This is not possible with air source heat pumps
- Optimising onsite electricity generation from rooftop Photovoltaics (PV) and/or new rooftop wind energy technology with electric heating and/or electric vehicle (EV) charging and battery storage by matching the heat demand and load profile to the generation

Smart Energy Management

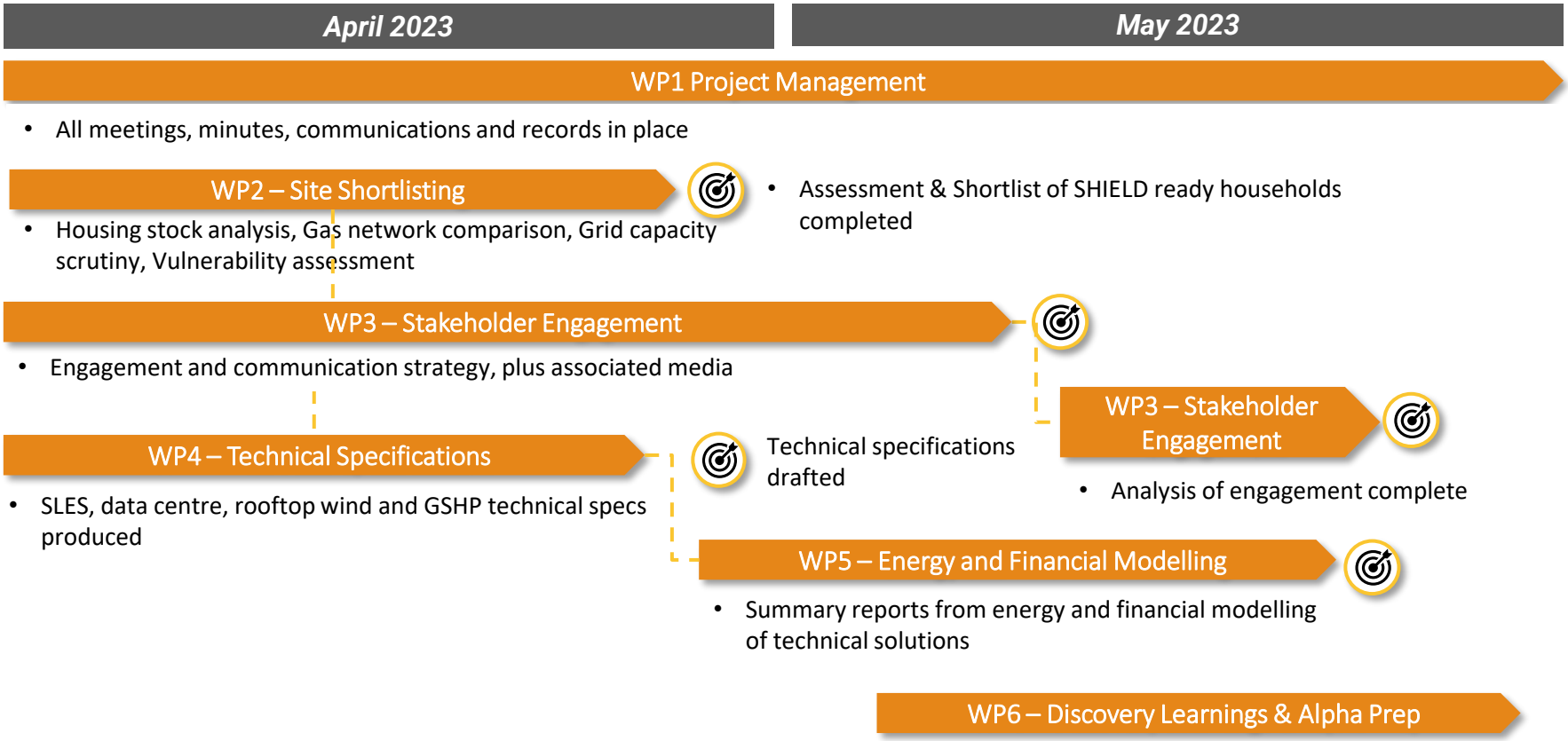
- Using a social Energy Services Company model (ESCO) and aggregating the systems and households in local community areas to:
  - enable smart local energy system management
  - services to the grid, such as flexibility
  - reduce the cost to the consumer of heating and energy and
  - provide new revenues

Human-centred approach

- Tailored engagement to capture the needs and requirements of social housing tenants
- Identify a shortlist and criteria for suitable vulnerable customers for the above technologies and appropriate engagement plans

Discovery Phase Partners

Discovery Phase Activities



User Needs

We engaged with Eastlight tenants via an online survey (471 responses) and a series of one-to-one interviews.

Among tenants responding to this survey:

- 68.3% of tenants would like to try out these technologies in 2024
- 26% may be interested in trying out these technologies in 2024
- 3 site surveys completed; all want to participate in a potential Alpha Phase pilot trial

Key findings

- Tenants are very concerned about the cost of energy (average answer was 9.1/10)
- Tenants are concerned about climate change (average answer was 7.8/10)
- Tenants are interested in learning more about low carbon energy alternatives that can reduce energy costs and carbon emissions (average answer was 8/10)
- Tenants are interested in learning more about the low carbon energy system being developed by the SHIELD team (average answer was 7.8/10)

Solution and findings

We refined the solution through the Discovery phase:

- SHIELD will deploy a Smart Local Energy System (SLES) using a standard social ESCO model. SLES optimises local generation and storage and uses grid flexibility to manage network constraints
- In residential homes, SHIELD will integrate solar PV and battery and heat storage with the Thermify HeatHub and smart energy management to help balance demand and supply and provide services to the grid and peer to peer trading
- Ground source heat pump integration with the Thermify HeatHub to heat multiple properties adds value in scenarios such as blocks of flats where space is limited and a Thermify HeatHub cannot be installed inside or on each customer's property.
- SHIELD has looked at integrating innovative rooftop wind technologies, however, due to their current maturity, SHIELD will revisit the use of this technology in later phases.
- Social ESCO model: develops and manages SLES and enables funding, scaling, addresses landlord and householder barriers, support for fuel poor and vulnerable households

Solution and findings

Site Selection & Shortlisting

- Shortlist of 3,000 out of 11,000 Eastlight homes in the towns of Witham, Colchester, Braintree, and Halstead for Beta Phase based on property type, location, Energy Performance Certificate (EPC), heating type and discussions with UK Power Networks' Connections team. It is likely connect & notify procedures will be appropriate.

Roll out

- Energy and financial modelling has indicated good scope for commercial scale up with substantial savings for tenants
- Progressing Building Research Establishment's (BRE) Appendix Q approval will be important due to impact on Eastlight's ability to meet energy efficiency targets in participating homes as these are based on EPC ratings
- If Thermify pays for its electricity use directly instead of the tenant, this would require a separate electricity supply for Thermify through a separate boundary meter unless there is regulatory change e.g. P379 style reform. Currently multiple suppliers are unable to compete for behind-the-meter energy volumes, measured via the same boundary Metering System.
- Will demonstrate during Beta Phase, several heat storage options to work alongside Thermify's HeatHub including new Q-Zeta low-cost high-capacity long duration storage solution

Customer Impact

- ~40% reduction in annual home energy costs against their current situations; with a potential bigger cut for those in fuel poverty due to incentives provided from industry
- The system is complex but is simple for tenants to use. Tenants set heat and hot water requirements as they would for a gas boiler and optimisation of the system is automated through smart controls. Tenants don't need to make behavioural changes to make savings.
- Extra support from Citizens Advice Essex will be provided for fuel poor and vulnerable tenants including those that are digitally excluded such as those who lack access to the internet.

Assessment of benefits

Cost to Consumer

- Based on current proposition assumptions, heating from the Thermify HeatHub could cost consumers only £300 per year and there are no upfront costs.
- Assumed there will be no upfront costs for solar PV and storage as the project will receive the revenues and incentives from services to the grid

Network Avoided Costs

- Reduced network reinforcement due to flexibility services being offered to the grid

Greenhouse Gas (GHG) Emissions

- There are GHG emissions benefits from consumers switching from traditional gas boilers to the SHIELD solution and consumers switching from air source heat pumps to the SHIELD solution
- There are no GHG emissions associated with heating for the SHIELD solution as heating is a waste output from Thermify's distributed data centre

Next steps in Alpha

October 2023	November 2023	December 2023	January 2024	February 2024	March 2024

Project Management

Tenant Engagement

- For shortlisted households, SHIELD will engage with and identify social housing tenants that are willing to participate in Alpha Phase and Beta Phase trials and gain feedback from them on the route to market and draft tenant agreements.

Commercial Agreements, Funding Structure & Energy Supply

- Route to market and Beta commercial, funding and operating model defined
- Supplemental Beta tenant agreement drafted
- Half Hourly electricity supply and peer to peer trading contract options developed for Beta

Technology and Modelling

- Complete detailed technology design, implementation plan, site survey's, connection assessments, updated CBA

Alpha Phase Pilot

- Deploy SHIELD pilot in 2 homes in Alpha Phase (Thermify HeatHub, PV, battery & heat storage.
- Test Thermify integration with Kensa Ground Source Heat Pump (GSHP) system in Kensa facility
- Gather tenant Feedback and monitor energy performance

Looking ahead to Beta Phase

For the Beta Phase, we are planning a project with c300 participating homes (this being enough to enable ESO and DSO grid services provision assuming a 3.68 kWh export per home)

Having considered the Eastlight stock, we are planning to recruit participating households from the four areas where most of the Eastlight stock is concentrated: Witham, Colchester, Braintree and Halstead. We have shortlisted based on EPC rating and heating system. The technology mix would be Thermify HeatHub, PV, battery and heat storage, GSHP, Rooftop Wind.

This solution and approach will be replicable across residential homes, housing associations, social landlords and councils.