GreenSCIES- Green Smart Community Integrated Energy Systems

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What is GreenSCIES?...

**GreenSCIES** is a research study that will deliver a concept and design of a technically and commercially viable integrated, local, smart energy network.

- Funded by Innovate UK, part of the Industrial Strategy Challenge Fund on Prospering from the Energy Revolution - BEIS.

- First of three stages, aimed to deliver a demonstrator project.
Project Objectives

- Deliver low-carbon, affordable energy
  - Efficient Use of heat
    - Capturing waste heat and using renewable energy sources
  - Balancing loads
    - Delivering heating & cooling by sharing heat between applications
  - Integrating new technologies
    - Transition to EV and V2G

- Design able to be used & operated in an urban environment
  - 5th generation district heating network with energy storage and AI optimization

- Develop a local energy market
  - Engaging local stakeholders to develop the business model
London Borough of Islington (LBI)

Islington has the highest population density of local authorities in England and Wales – **13,875 people/km²**
What are the smart technologies for LBI?

TECHNOLOGIES (SUPPLIES)
- High temperature heat pumps
- Low temperature heat pumps
- High temperature solar thermal
- Solar thermal
- Biomass boilers
- Anaerobic digestion CHP
- Gas fired CHP
- Fuel cells (methane or hydrogen)
- PV
- Wind
- Batteries
- Car Club EVs
- Commercial EVs (vans)
- Domestic EVs
- V1G - Smart Charging

SWOT
- Strengths
- Weaknesses
- Opportunities
- Threats

SOURCES
- Ground water (open loop aquifers)
- Surface water (Open loop rivers, canals)
- Ground coupled arrays (closed loop)
- Data Centres
- Electricity Sub stations
- Sewers
- Sewage farms
- Industrial waste streams
- Building air conditioning systems
- Tube vent shafts
- Cable tunnels
Thermal network

5DHC is a different topology
With decentralised ‘hub’ heat pumps

Standard typology

New typology

High-temperature network
unidirectional

Low-temperature network (LTN)
bidirectional
Thermal network

- 5DHC ultra low temperature loop needs a balancing mechanism e.g. aquifer boreholes
Low carbon heat sources
Heating and Cooling Demand
Power

Solar Photovoltaic (PV)

~ 18,000 m² potential area for PV

> 3MWp total capacity
Mobility

- EVs produce no air pollutants during operation

- Electric storage & vehicle to grid supply
  Integrated into the GreenSCIES schemes

Existing charging points in Islington
Summary data collection and analysis

- Building’s energy demand
- Energy sources
- Roof area available for installing PV
- Potential EV penetration scenarios for Islington

- Heating demand
- Cooling demand
- Secondary and renewable energy sources
Two viable 5th generation schemes

Scheme A
York Road

Scheme B
Northampton Square
Scheme A – York Road
Ventilation shaft & Boreholes
Scheme B – Northampton Square
Two data centres

- **DATA CENTRE 1**
  - **Borehole (Doublet No 1)**
  - Aquifer thermal storage for seasonal balancing

- **DATA CENTRE 2**
  - **Borehole (Doublet No 2)**
  - Aquifer thermal storage for seasonal balancing

**Scheme Details**
- **Heating**
- **Cooling**
- **Warm header**
- **Cold header**
- **Warm aquifer Store**
- **Cold aquifer Store**

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**Notes**
- This scheme integrates the use of aquifer thermal storage (ATS) for heat and cold production.
- ATS allows for energy storage over seasons, enhancing seasonal balancing.
- Integration with data centres optimizes energy efficiency and sustainability.
Developing a Local Energy Market

- Identifying stakeholder needs (impacts, barriers, gaps)
- Identifying customer segments & revenue streams

Business model with a value proposition for each stakeholder
Next Steps

1. **Concept feasibility study** (1\textsuperscript{st} Feb – 31\textsuperscript{st} Jul 2019)
2. **Detailed design** (1\textsuperscript{st} Jan 2020 – 31\textsuperscript{st} Dec 2021)
3. **Demonstration** (1\textsuperscript{st} Jan 2022 - )
4. **Replicability** (other cities in the UK and internationally)
Thank You

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