Secondary Heat
London’s Zero Carbon Energy Resource

Renewable District Heating and Local Heat Planning Webinar
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London's Journey: Targets and Policy Framework

New Mayoral Target
• Zero Carbon by 2050

Mayoral Strategies
• London Plan
• Environment Strategy
  • Includes Climate Change Mitigation & Energy
  • Mayoral Support Programmes
Decarbonising Heat

Heat:
~47\% of London’s energy demand
~ \(30\%)\) of London’s CO\(_2\) emissions

Real opportunity for local CO\(_2\) reduction:
• A local energy source best addressed at a local level
• City level energy efficiency reduces primary energy demand
  – Building retrofit
  – Use of waste heat
• Reduce carbon intensity of heat supply
  – District heating networks using secondary and renewable heat sources
Energy Supply Programmes

- **Heat Map**
  - Publicly available at: [www.londonheatmap.org.uk](http://www.londonheatmap.org.uk)

- **Energy Masterplans**

- **Decentralised Energy Project Delivery Unit (DEPDU)**
  - Technical, financial and commercial support
  - 2011-2015 - 21 projects worth over £100m and save 44,000 t of CO2e/year
  - EU ELENA funded project

- **London Green Fund**
  - £100m Environmental Infrastructure Investment Fund

- **Licence Lite**
  - GLA to become a junior electricity supplier

- **Energy for London (EfL) 2017**
  - £3.5m successor programme to DEPDU
  - 50% funded by European Regional Development Fund (ERDF)
CELSIUS - Smart District Heating and Cooling

- CELSIUS is an EU co-funded project - April 13 to Dec 17
  http://www.celsiuscity.eu
- Aims to help accelerate roll-out of district heating and cooling systems across EU by
  - Addressing technical, political, economic and social barriers
  - Illustrating the role they have to play in creating a secure, low carbon and affordable energy system in a city
- Delivering innovative demonstration projects with a focus on utilising waste heat sources
- Offering practical support and information to help EU cities develop these systems
- 20 Partners: Partner Cities – Gothenburg (Lead Partner), Cologne, Genoa, Rotterdam, London and Islington Council
Support for CELSIUS Cities

1) Demonstrators – highlights technical and financial possibilities and replicability of demonstrators

2) Celsius Toolbox – collates financial, technical and social information from the project & presents it in a Wiki format:
   - Social Toolbox – business models, financing & stakeholder acceptance
   - Technical Toolbox – upscaling, optimising & integrating technologies, systems & concepts
   - Road Map – Identifying the building blocks and pathways for transforming into a CELSIUS city

3) Expert Group – A diverse range of knowledge, experience and skill-sets that exist within the 20 partner consortium that will be used to provide direct support to cities on specific issues identified by them

4) Thematic Workshops – Workshops will be run to support cities in areas which cities have identified or confirmed are important to them

- Published July 2013
- [http://www.london.gov.uk/priorities/environment/tackling-climate-change/energy-supply](http://www.london.gov.uk/priorities/environment/tackling-climate-change/energy-supply)
What is Secondary Heat?

- **Waste Heat**
  - Emitted as a by-product from industrial, commercial and other operational activities

- **Environmental Heat**
  - Naturally occurring in the environment – air, ground and water

- Variable temperature (usually ‘low grade’)
- Variable availability (seasonal, diurnal)
- Usually requires heat pumps (500KW +)
- Higher inflow temp = higher COP of heat pump = better £ + CO2
- Efficiently distributed via heat networks (at say 70oC)
- Increasing value as grid decarbonises and carbon budgets tighten
Why Use It?

- Works with renewable energy to increasingly replace fossil fuels through to 2050
- Long-term viability of heat networks
- Reduces primary energy demand and CO₂ emissions
- Greater energy security and self-sufficiency
- Contributes to improved air quality - Zero NOx
Report Objectives

• Quantify availability, cost and energy utilisation considerations

• Understanding issues of integration with heat networks and buildings

• Inform national and city policy and the ‘market’

• Identify emerging project opportunities in London
Secondary Heat - Spatial
Secondary Heat Recovery Examples

**Metro Tunnel**

**Transformer**
Heat Pump CoP (Coefficient of Performance)

![Graph showing Heat Pump CoP (Coefficient of Performance) vs. Water source inlet temperature (°C)]

**Figure 2** - Heat pump COPs for four different heat output temperatures (500-1000kW scale heat pump).
Secondary Heat - Key Findings

• Low Grade Heat - most secondary heat sources need upgrading by heat pumps for use in heat networks
• Spatially well matched to heat demand
• Benefits optimised with lower temperature heat networks – flow temperatures 55⁰C to 70⁰C
• Insulating a building from an E to D EPC rating would allow 96% of its heat demand to be met from heat supplied at 55⁰C
Secondary Heat - Key Findings

• London’s 2010 heat demand is 66TWh/yr
• Secondary heat sources can provide up to 71TWh/yr of heat at 70°C:
  - 50 TWh/yr is attributed directly to secondary heat sources; and
  - 21TWh/yr to the electricity required by heat pumps
• Compared to conventional gas boiler heating:
  • 12 TWh/yr of secondary heat can be considered ‘cost effective’
    – Equivalent to 18% of London’s 2010 heat demand
  • 56 TWh/yr of secondary heat can be considered ‘CO₂ effective’
    – Equivalent to 82% of London’s 2010 heat demand
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www.london.gov.uk/environment-newsletter

CELSIUS:  http://www.celsiuscity.eu