Secondary Heat
London's Zero Carbon Energy Resource

Renewable District Heating and Local Heat Planning Webinar
25th January 2017

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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

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Decarbonising Heat

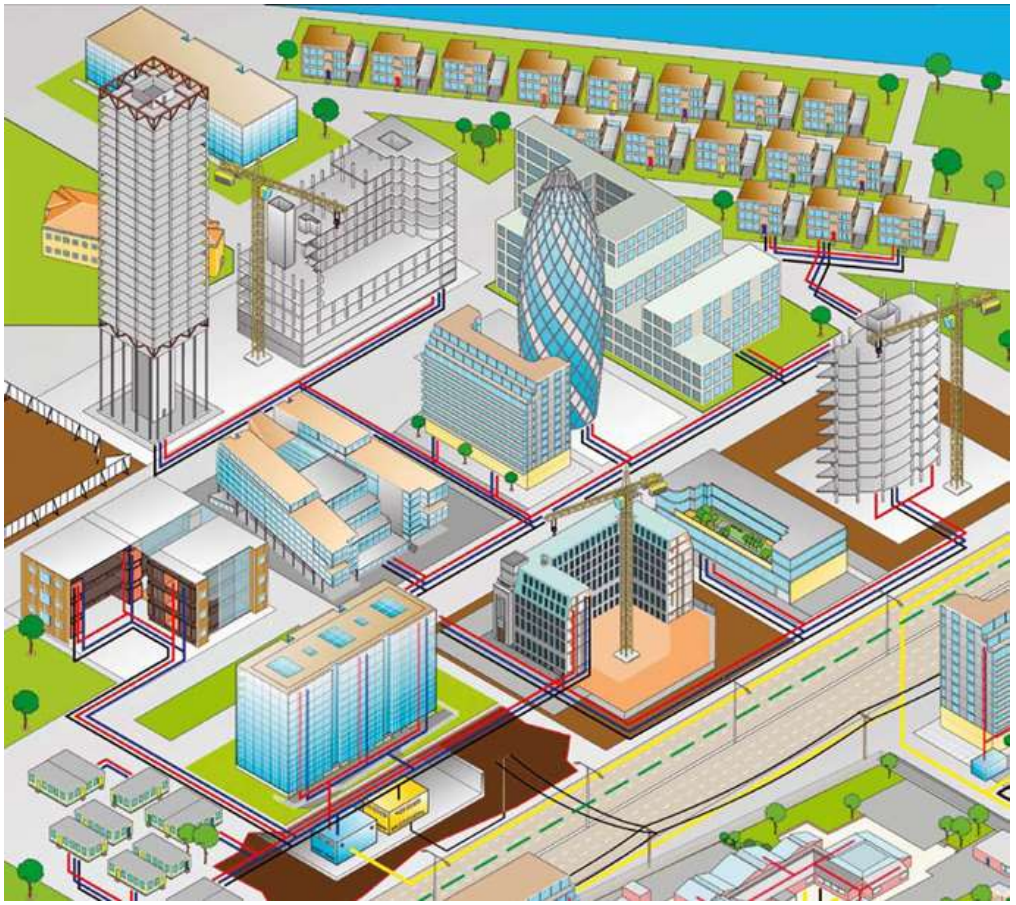
Heat:

~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



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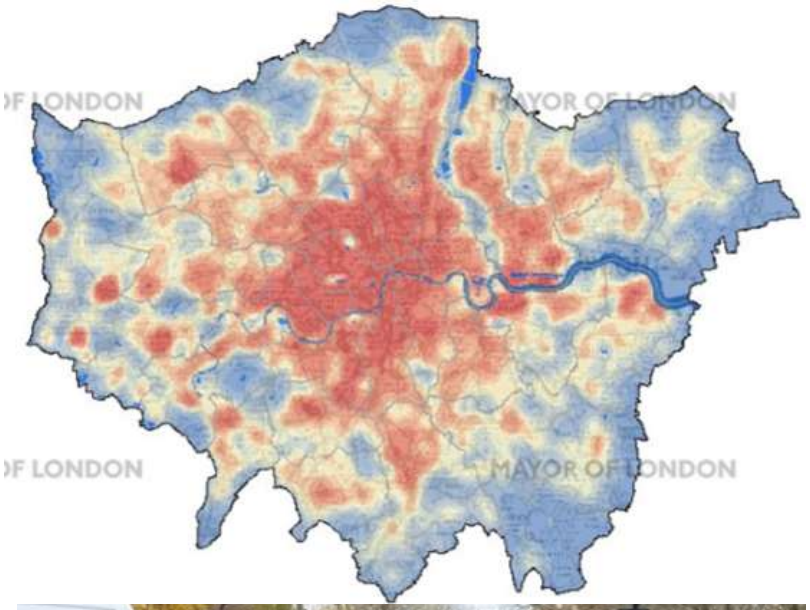
Energy Supply Programmes

- **Heat Map**
  - Publicly available at: 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

celsius smart cities

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement 314441.

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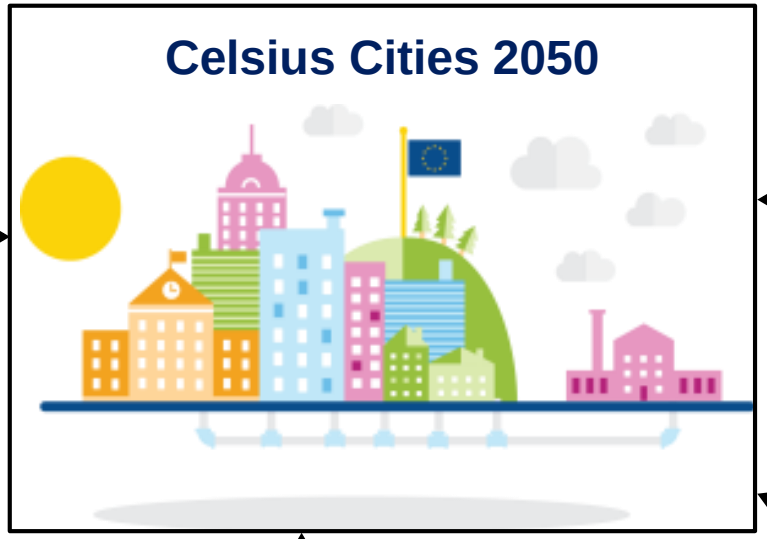
Support for CELSIUS Cities



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

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

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

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

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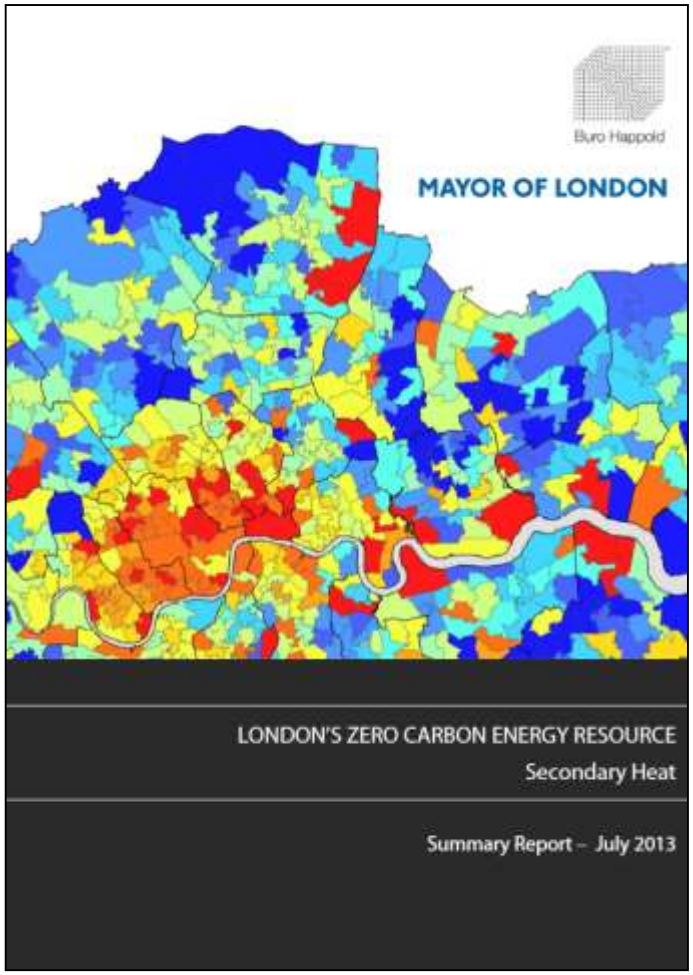
London's Zero Carbon Energy Resource – Secondary Heat



- Published July 2013
- http://www.london.gov.uk/priorities/environment/tackling-climate-change/energy-supply

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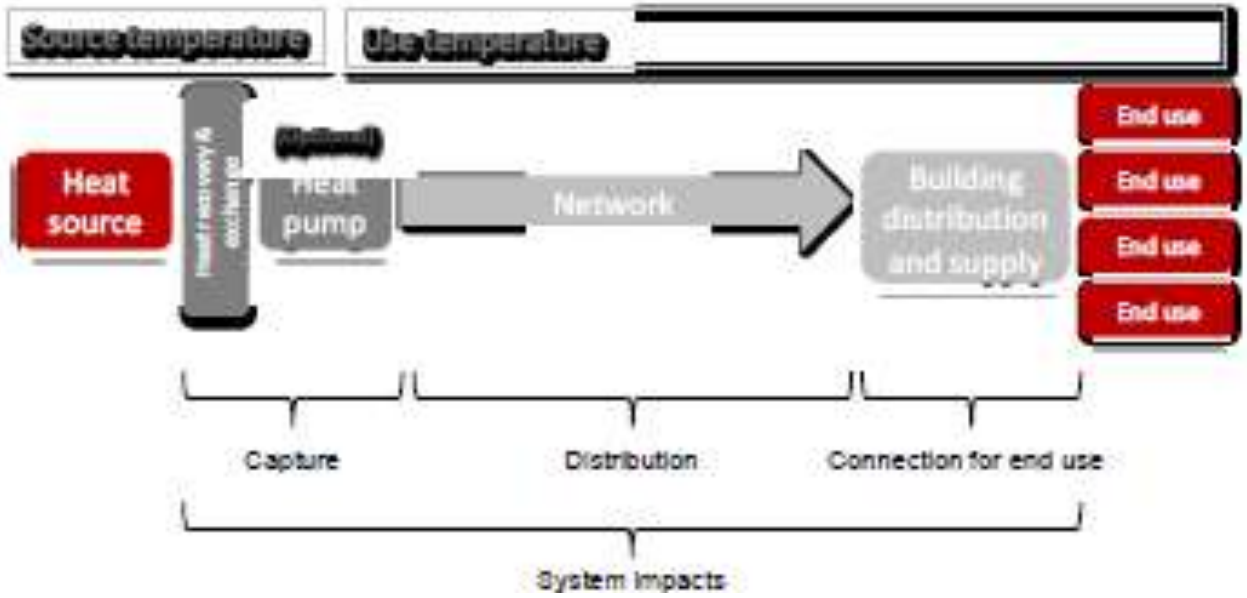
What is Secondary Heat?

- **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 CO_2 emissions
- Greater energy security and self-sufficiency
- Contributes to improved air quality - Zero NOx



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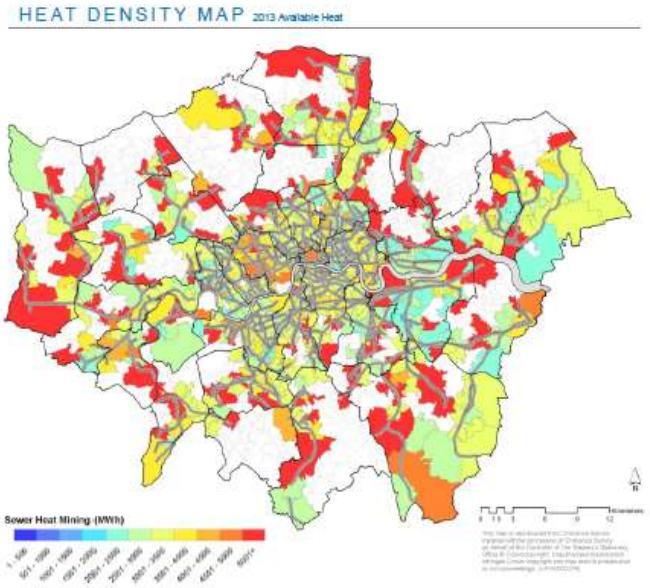
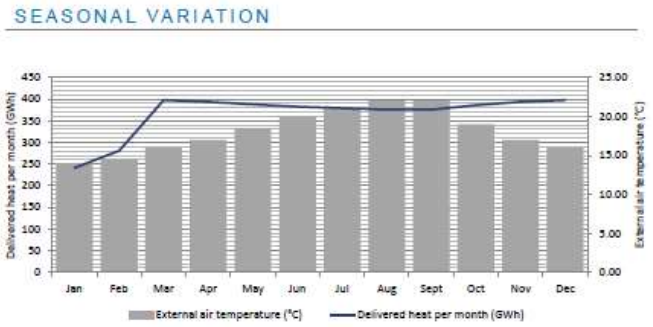
Report Objectives

- 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





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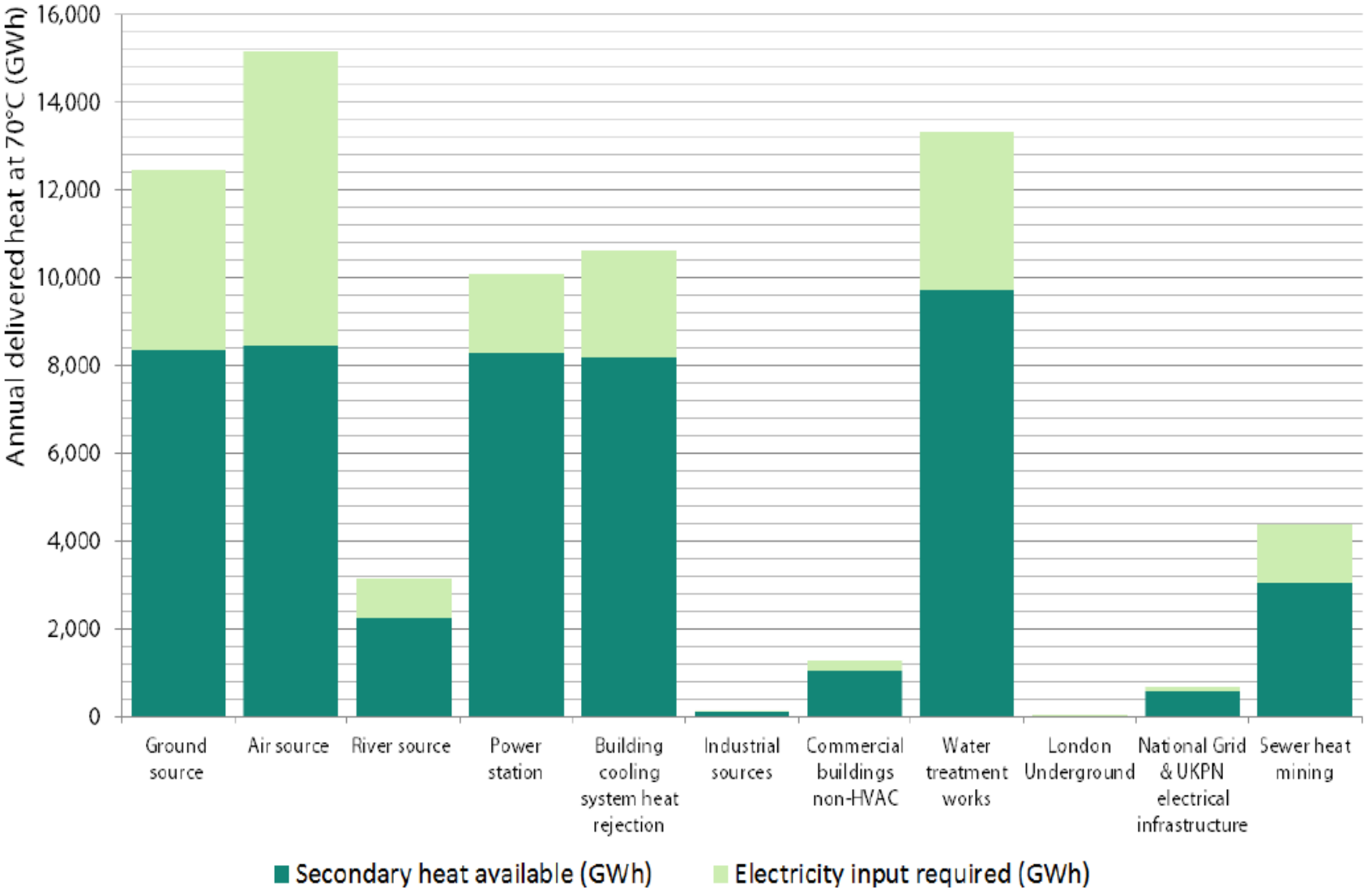
Delivered Heat and Sources



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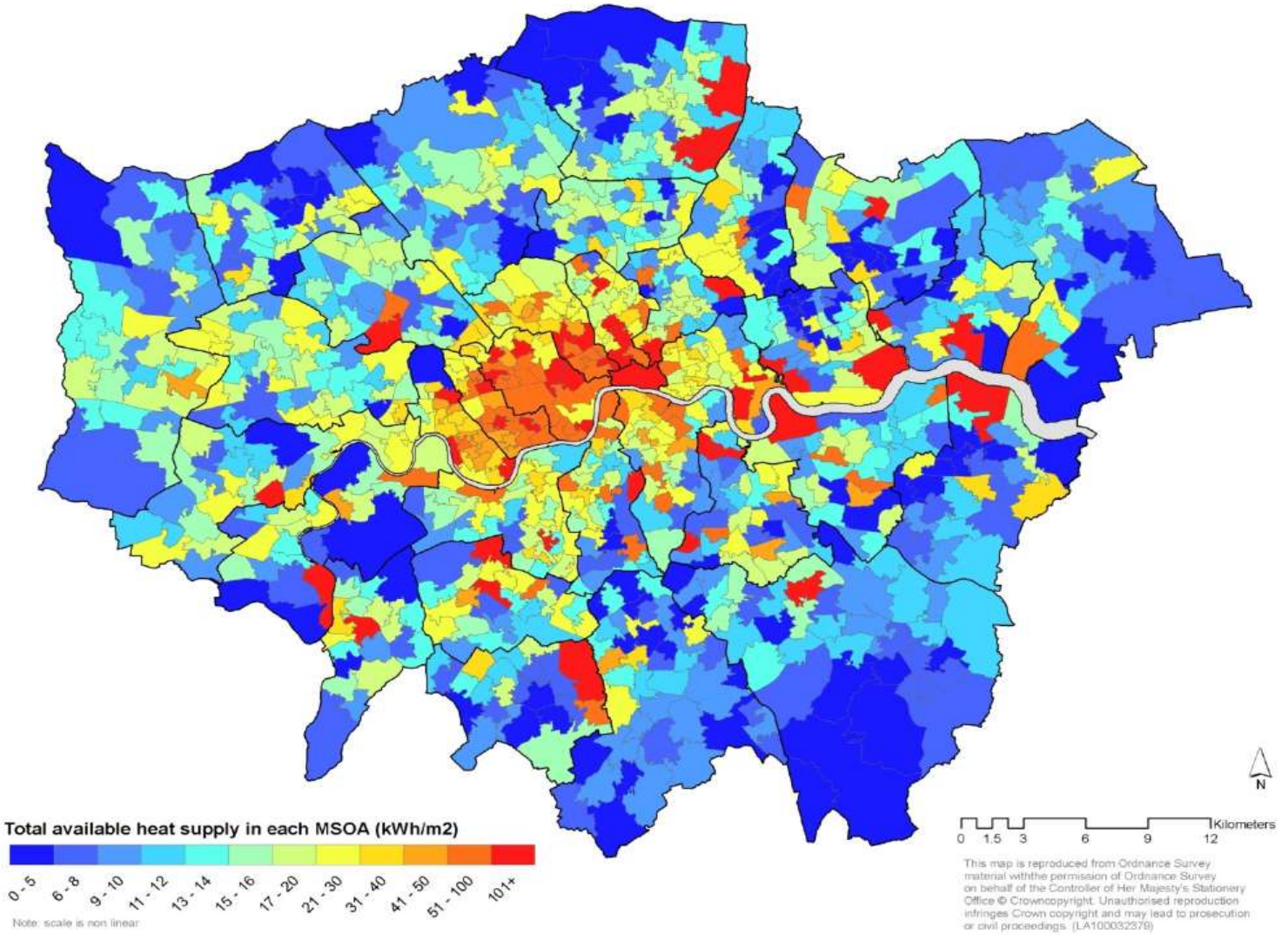
Secondary Heat - Spatial



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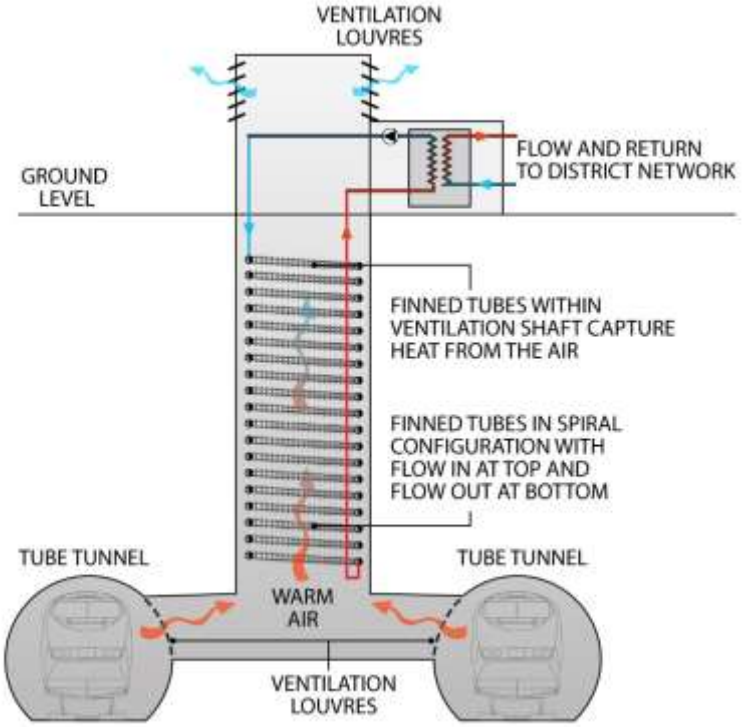
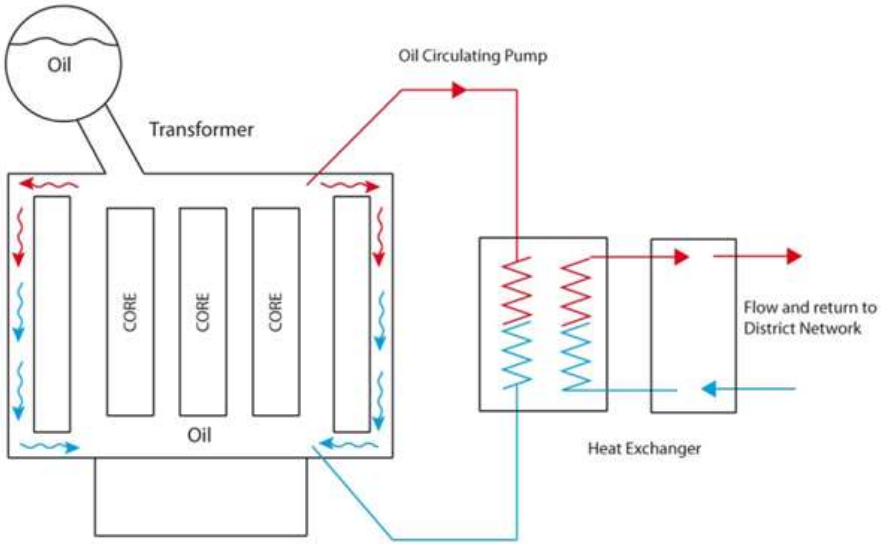
Secondary Heat Recovery Examples

Metro Tunnel



Transformer



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Heat Pump CoP (Coefficient of Performance)

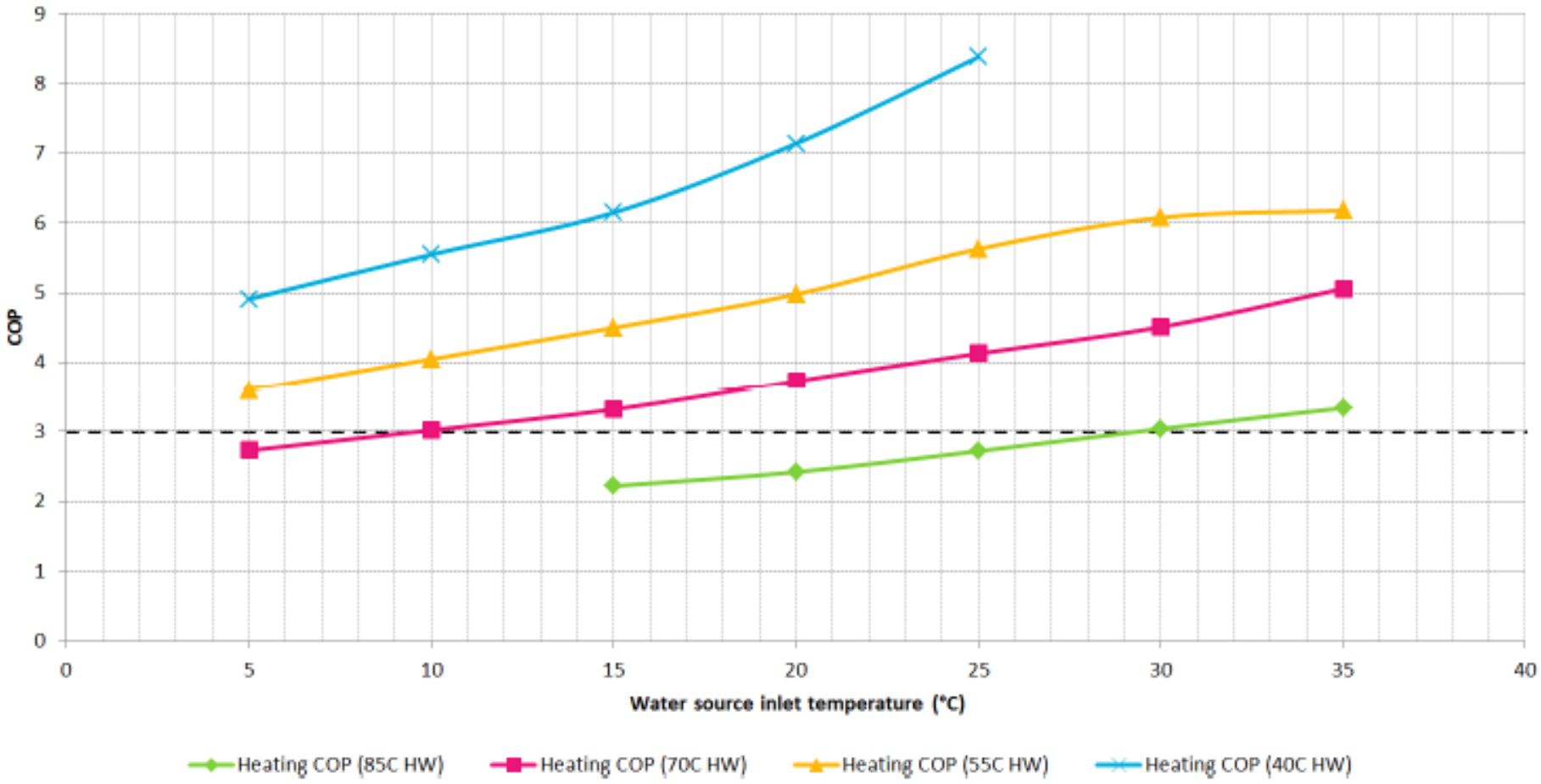

Figure 2 - Heat pump COPs for four different heat output temperatures (500-1000kW scale heat pump).

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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 55ºC to 70ºC
- Insulating a building from an E to D EPC rating would allow 96% of its heat demand to be met from heat supplied at 55ºC

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 'CO_2 effective'
  - Equivalent to 82% of London's 2010 heat demand

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Newsletter

www.london.gov.uk/environment-newsletter

CELSIUS: http://www.celsiuscity.eu