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WPs 2.1, 2.2, 2.3, 2.4, 2.5

London Underground
Hubbard Products Ltd
Asda
City Holdings Ltd
Islington Council

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WP 2.1 and 2.2 Retail refrigeration

Proof of concept prototype:

Chilled multi-deck (remote)

George Barker Leo cabinet (ASDA cabinet)

1. **Baseline optimised with EC fans, LED lights, large evaporator, optimised air flow**
2. **Doors → test currently sourcing**
3. **AirCell (low temperature range), new high efficiency evaporator, optimised fans and air flow → test completed confidentiality agreement**
4. **Occupancy sensors (lights) → test**
5. **Low emissivity packaging → test**

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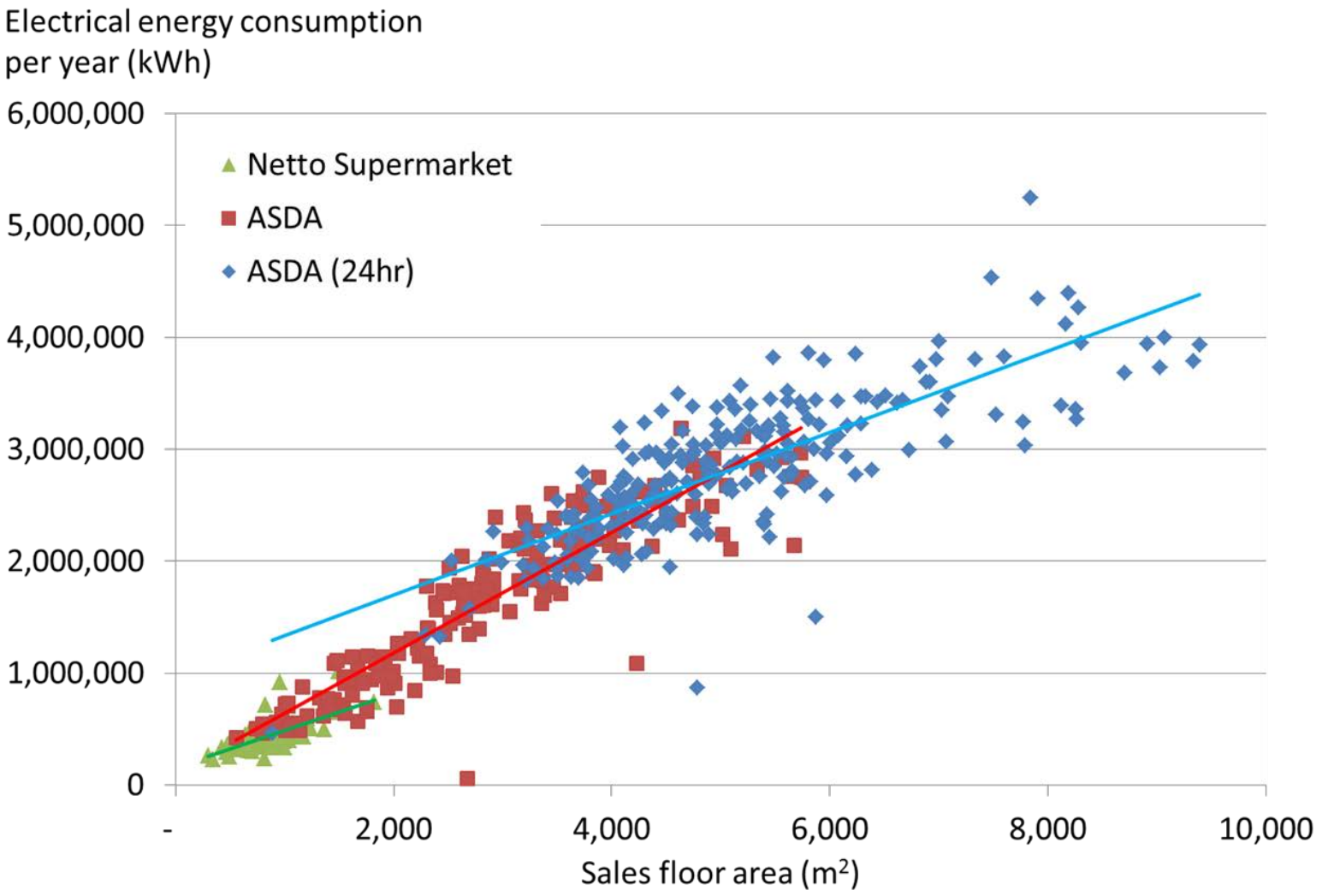
EUED cross centre project - Supermarket energy benchmarking project



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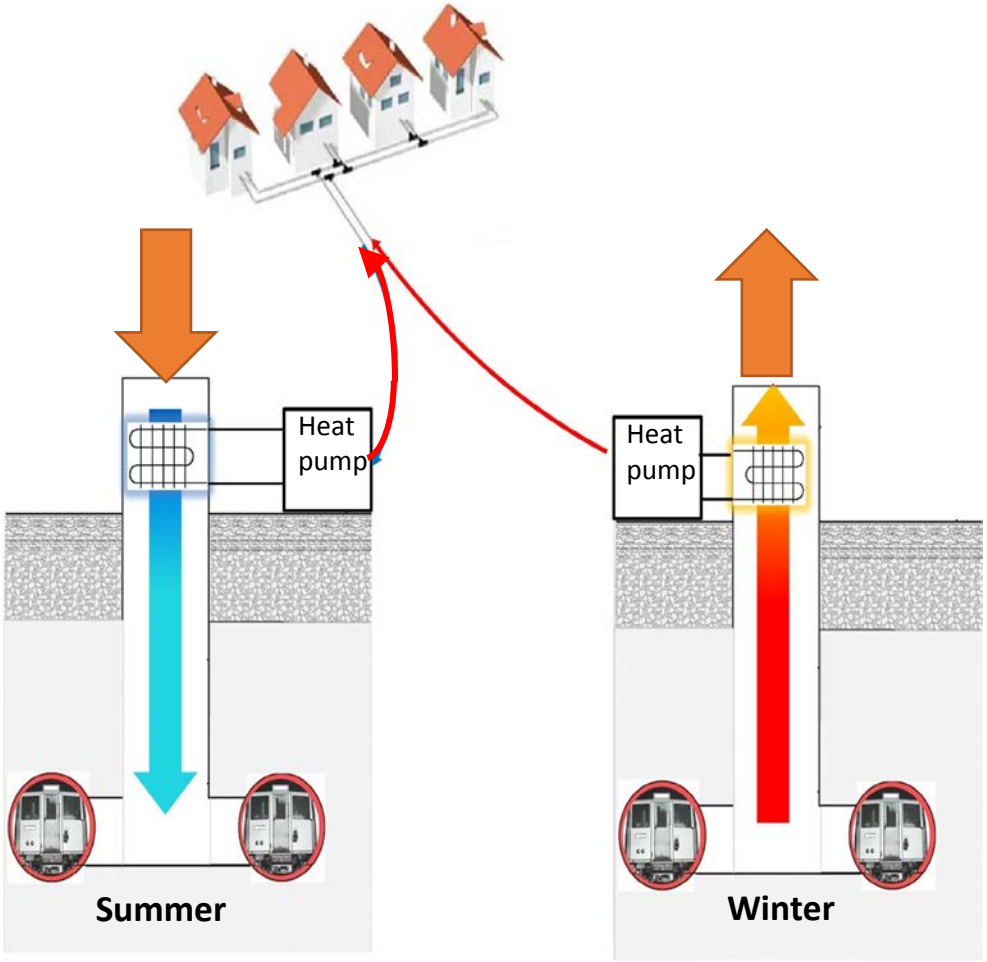
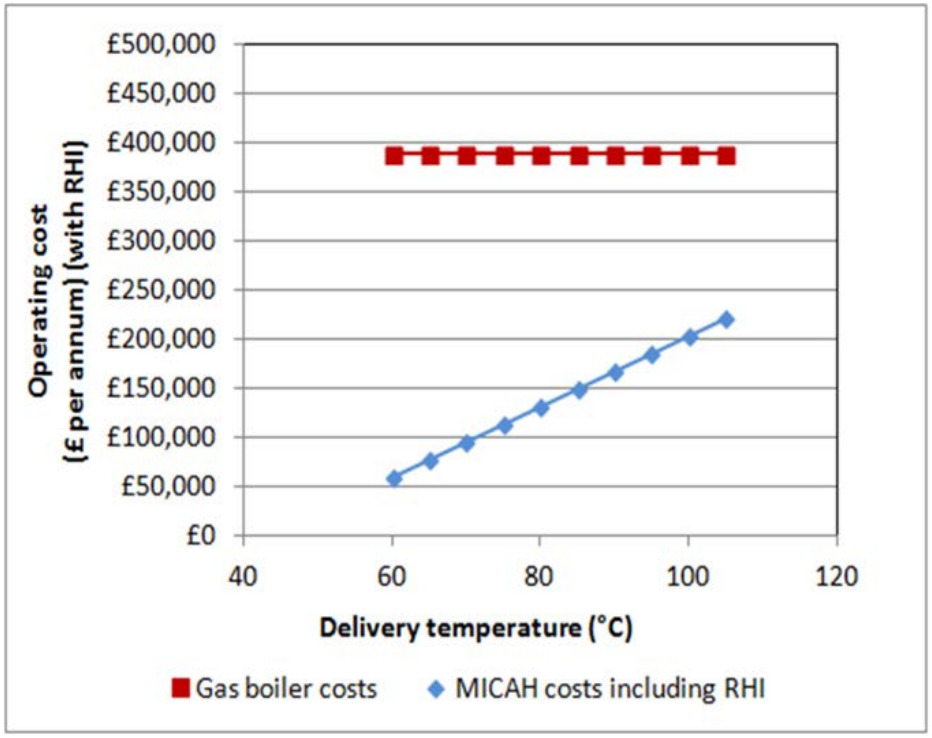
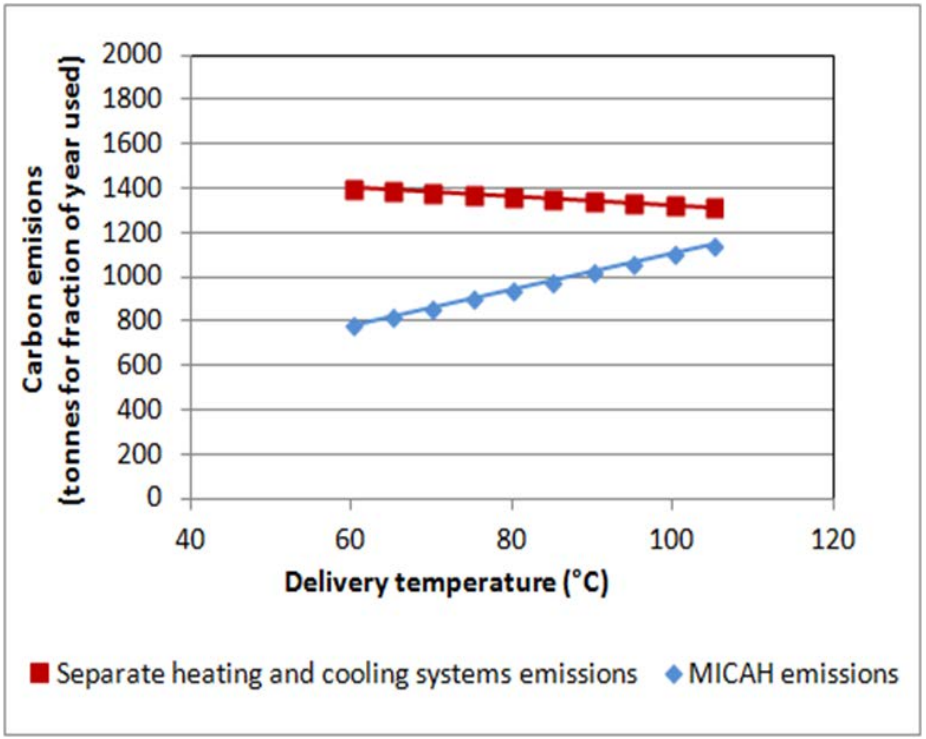
WP2.3 Data Centre Cooling, Waste Heat Recovery and Reuse

- Metropolitan Integrated Cooling And Heating – combined cooling and waste heat recovery
- A feasibility study funded by Innovate UK
- LU, Islington Council and LSBU
- Investigating costs and savings using a disused underground station
- Develop generic guidance/ benefits of LU waste heat recovery
- Other waste heat sources may also be used

Recovering Heat from Vent Shafts







Comparison of conventional cooling and heating carbon emissions with MICAH

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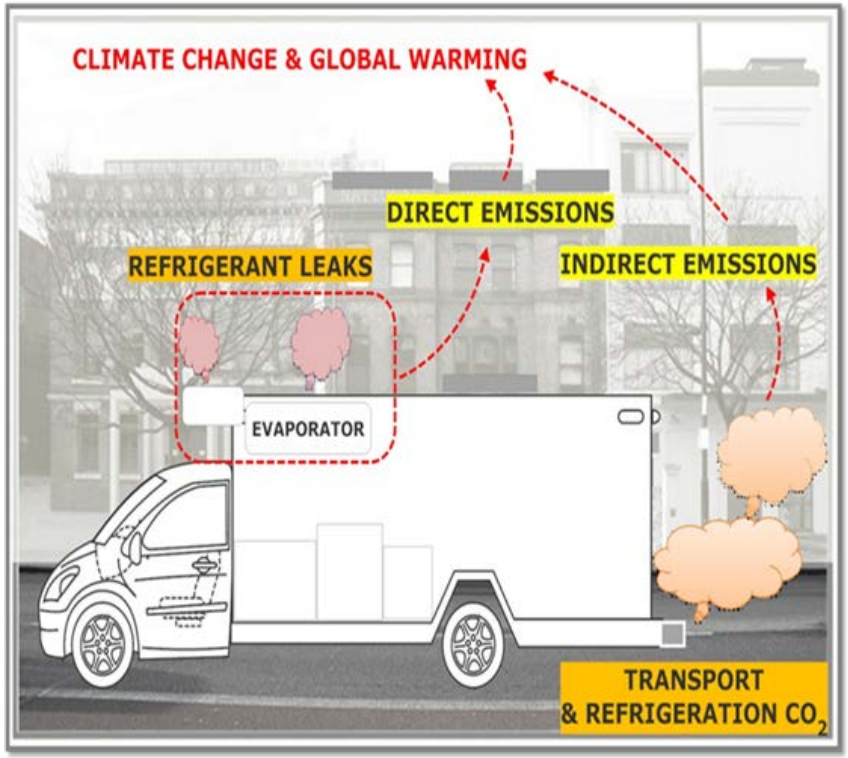
WP2.4 refrigerated road transport (RRT)

Background



Deliverables

- Develop a model to investigate real contribution of direct and indirect emissions
- Optimising system performance

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Data analysis – summary journey report

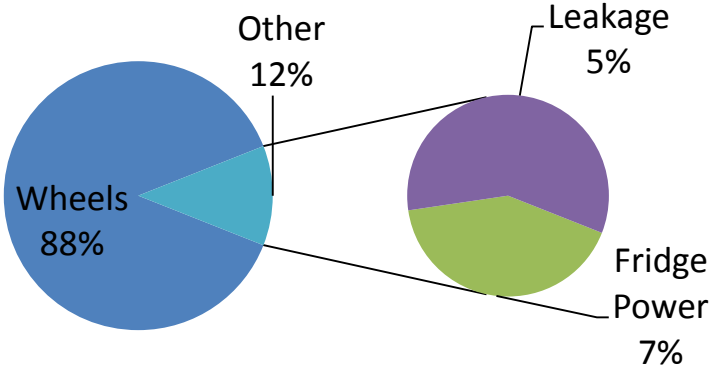
(18/12/2015 08:15 h – 18/12/2015 11:15 h) Duration – 3 hours, Distance - 25 km

FRIDGE OFF + Transport

+

FRIDGE ON + Transport

Carbon footprint



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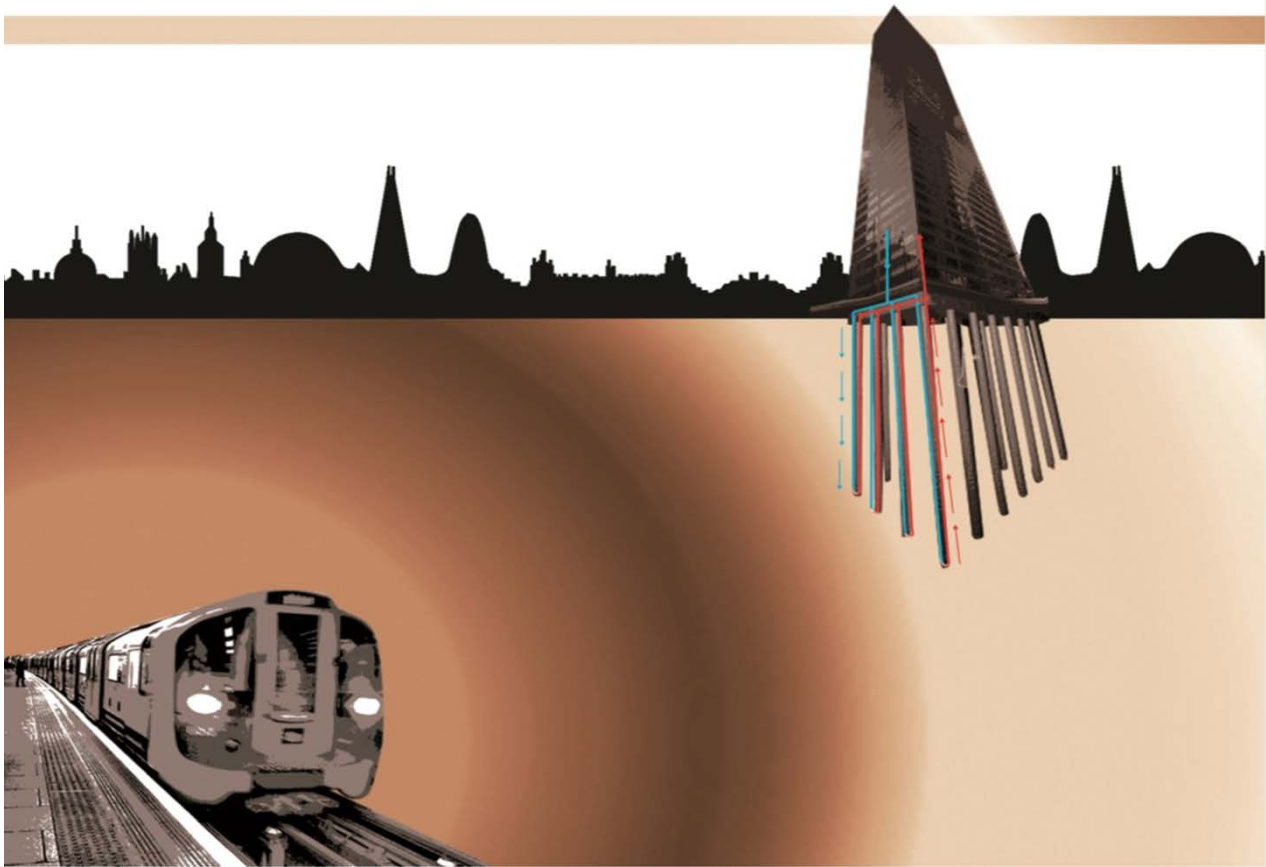
Work Package 2.5 - Integrated cooling, heating and storage

Deliverables

- To investigate the interactions of underground railway tunnels and ground heat exchangers
- To investigate the potential indirect use of waste heat from the tunnels to heat buildings above ground.



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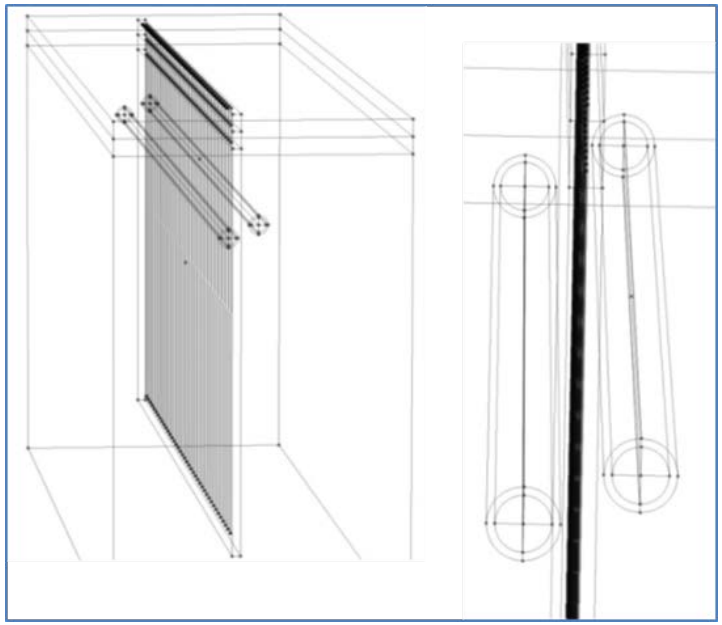
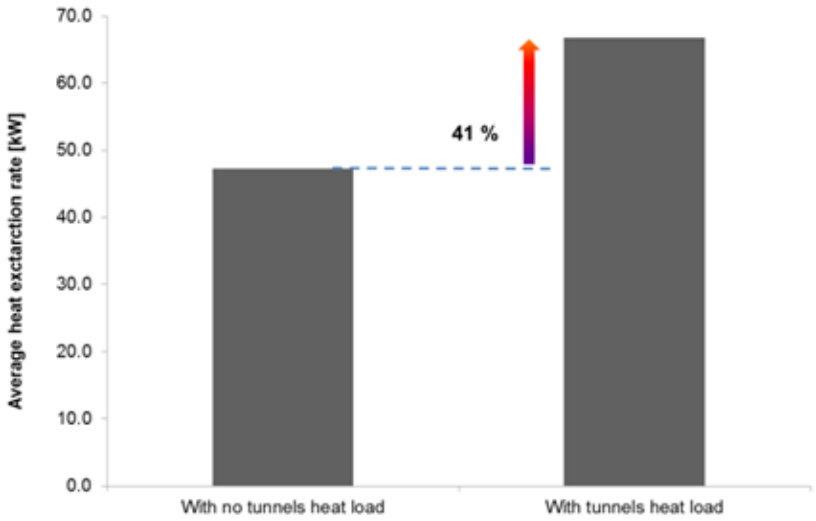
Some investigations and results

Ground heat exchangers built between multiple running tunnels

GHEs' heat extraction rate improved by 41 %





Upcoming Project: London Urban Sub-Terrain Energy Recovery - LUSTER

LUSTER will investigate the potential of heat energy recovery from urban sub-terrain structures, such as sewers, electricity cable tunnels and underground railway tunnels.

Project lead:
LSBU

Project start: September 2017

Duration: 18 months

Academic partner:
UCL

Industrial partners:
London Underground Ltd., Thames Water Ltd., REHAU, Energy Innovation Centre

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Recognition

- Supermarket Road map completed – under review
- Data centre roadmap draft completed - under review
- Breakfast meeting at Houses of Parliament (Nov 2016)
- SIRACH, Cork, November 2016
- 3 papers at ASHRAE conference, Las Vegas, January 2017
- 2 papers at CIBSE ASHRAE Technical Symposium, Loughborough University, April 2017
- Francis *et al*, Investigation of refrigerant leakage in commercial refrigeration, *International Journal of Refrigeration*(2017)
- Annex 44 workshop in Beijing at 5th IIR Conference on Sustainability and the Cold Chain (ICCC2018) - April 2018 Conference


Mail Online News

The Tube as you've never seen it before: Amazing picture of London underground workers is among the winners in science photo contest

- Photo, taken by Akos Revesz, won second place in Engineering and Physical Sciences Research Council contest
- Judging panel of the EPSRC science photo competition consider images that demonstrate research in action
- Categories of contest, which is in its third year, include 'People', 'Weird and wonderful', 'Eureka' and 'Innovation'
- The winning photos include images of computer chips, brain cells, mating Costa Rican frogs and a robot teacher