H-DisNet

CASE STUDY INNOVATIVE HEATING SOLUTION IN A HIGH-RISE BUILDING

INTRODUCTION

Increasing attention is focused on the environmental problems caused by burning fossil fuels, which produce greenhouse gases, primarily CO2. For example, the UK has set a target to cut its greenhouse gas emissions by at least 80% by 2050, relative to 1990 levels [1]. To achieve this target, a dramatic reduction in energy consumption will be required, and therefore, significant improvements in energy efficiency are necessary.

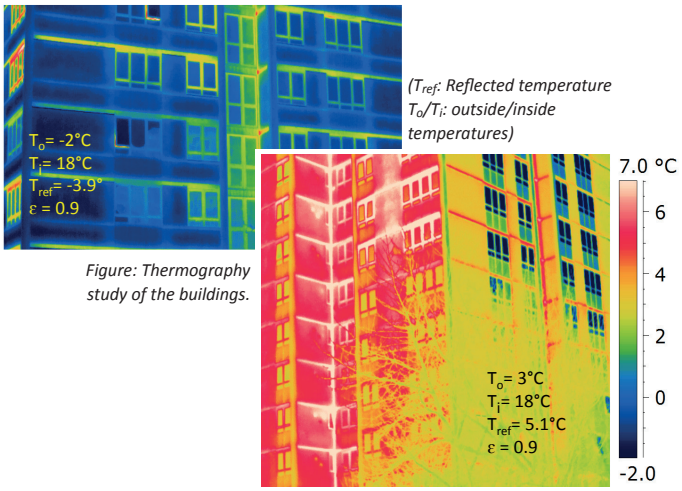
Heat is one of the most difficult sectors to decarbonise in the energy system [2]. Nowadays, heat demands are primarily met through the following three methods: gas boilers burning natural gas, electric heaters, and district heat networks. Although electricity can be recognised as a zero-emission energy resource, the life-cycle of electricity is not zero-emissions because the majority of the electricity generated from power generation systems is through burning fossil fuels.

(b) Type 2 buildings use electric heaters for heating

Figure: Pictures of the five high-rise buildings (a) type 1 buildings use central gas for heating.

KEY FINDINGS

- The annual space heating demand for one block is 312,321 kWh.
- 30g/s of TCF will provide 31 °C of supply air temperature to heat 810 m³ (300 m²) space to 20 °C (R.H: 50% to 70%) for building that used 20kWh/m²/year.
- High potential and demand to use a zero-emission heating solution like H-DisNet in the UK.



(T_{ref}: Reflected temperature T_o/T_i: outside/inside temperatures)

Figure: Thermography study of the buildings.

DESCRIPTION OF THE CASE STUDY

The case study towers are five 15-storey brick-clad towers built in the 1960s. Three towers are supplied with gas and electricity where hot water central heating systems and gas cookers are used (type 1 towers) while the other two are electrified and use night time electric storage heaters charged using off-peak electricity (type 2 towers). Originally built with brick and block infills, both towers had double glazing upgrades in the early 2000s. Additionally, the two electrified towers have also had insulated external cladding and internal wall insulation retrofitted. Roof and external floors were factored out of the last retrofit because of the difficulty and intrusive nature of the task, and also since walls of a high-rise building cover 90-95% of the external façade, making the roof and floor a relatively small segment of the total building skin. Each tower contains a total of about 30 one- and 60 two-bedroom flats of uniform layouts.

REFERENCE

[1] Act CC. Climate Change Act 2008. http://wwwlegislationgo-vuk/ukpga/2008/27/contents (2008). 2008.

[2] Chaudry M, Abeysekera M, Hosseini SHR, Jenkins N, Wu J. Uncertainties in decarbonising heat in the UK. Energy Policy. 2015;87:623-40.

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