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Factsheet T.2.2

In depth analysis of the case study in the Tallaght District Heating Scheme

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OTHER	Software, technical diagram, algorithms, models, etc.	☐

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1. INTRODUCTION

The Tallaght District Heating Scheme (TDHS) is Ireland's first large-scale, low-carbon district heating system, designed to provide sustainable and cost-effective heating to local buildings and communities. Developed as a pioneering project in the transition to renewable energy, the scheme utilises excess heat from data centres, alongside other renewable and low-carbon energy sources, to generate and distribute heat efficiently across a dedicated network. In its first year of operation, the TDHS has already distributed 3,770 MWh of heat and saved 1,100 tonnes of CO2. This document provides an overview of the current district heating system, detailing its energy generation sources, the energy distribution network, and the consumers benefiting from the scheme. Additionally, it outlines planned and potential upgrading measures aimed at improving efficiency, expanding capacity, and enhancing the sustainability of the system. By reducing reliance on fossil fuels and lowering carbon emissions, the TDHS serves as a model for future district heating projects across Ireland.

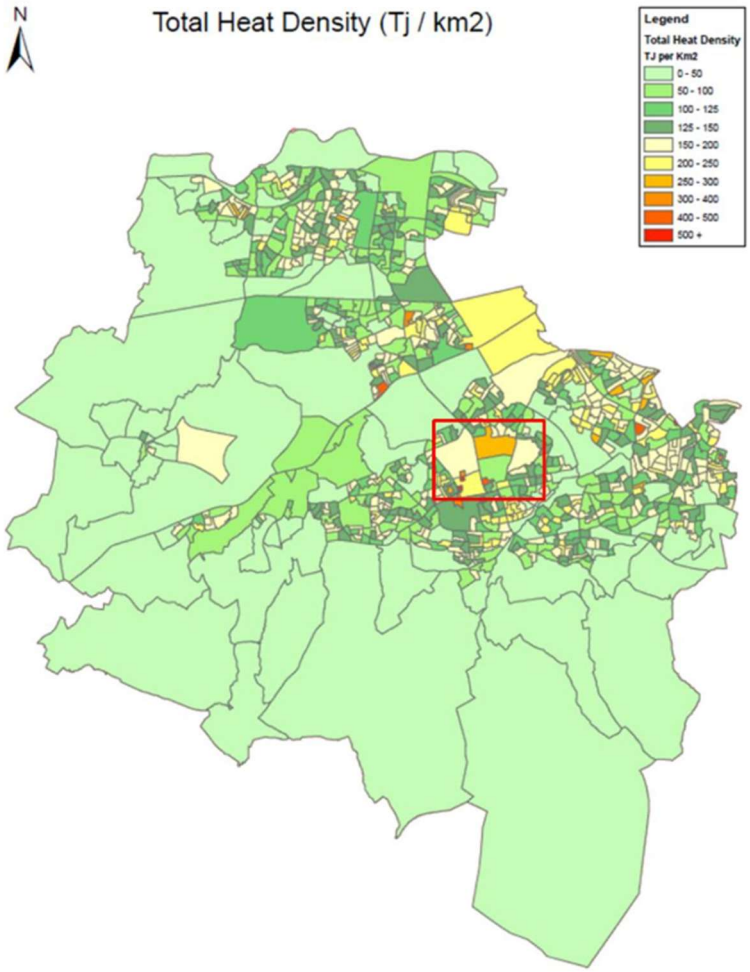

Figure 1 – South Dublin Spatial Energy Demand Analysis Map

2. THE DISTRICT HEATING SYSTEM (AS IS)

2.1 Energy generation

The thermal energy production of the Tallaght District Heating System consists of primary production units, secondary auxiliary systems, automation and control systems and electrical power systems.

The primary production of district heat is carried out with heat pump modules and a single electric back-up boiler. One heat pump module consists of two heat pump units connected in series. The capacity of the heat pump modules ranges from minimum capacity operation up to 3 MW of district heat production. The back-up production is covered with an electric boiler with a broad capacity range from a minimum load to 3MW maximum load. An electrical boiler is directly connected to the district heating circuit. The pumping of district heat water to the DH network and the pumping of water to the waste heat collector circuit are carried out with duplicate individual pumps.

Secondary Auxiliary Systems of the water treatment equipment consist of a water softener unit; chemical dosing units are utilised for corrosion prevention by oxygen removal and adjustment of the hardness and pH level. For district heating water, the dyeing agent is also added, which helps to detect a leak. With this method, both the DH network and customer heat exchanger leaks can be detected. Water treatment also includes mainstream filters and partial side-stream filters to remove particles from the water. The design includes one mainstream filter with a bypass option. The pressurisation system consists of an expansion vessel and pressurisation pumps. The expansion of the water volume in the network due to temperature changes is compensated with the expansion vessel, and a stable pressure is kept with pressurisation pumps at the suction of the district heating pumps. The sizing of the expansion is based on the dimensions of the future network. A space is made for extension of expansion to cover a bigger network volume due to possible material change, including thermal storage.

Automation and Control Systems consists of multiple individual programmable logic controllers (PLC). One PLC is dedicated to function as the main automation system, and the other PLCs, such as the heat pump modules and the electric boiler controls the production of the singular unit according to the design of the manufacturer of the unit. The overall control of the system is done with the main automation by controlling the pumps and valves and by giving start and stop commands and setpoints to the main units via the connection interface to their PLCs. Operational tasks can be carried out remotely from remote control rooms or locally from the Energy Centre control room via the SCADA system.

The electrical power system consists of a medium-voltage (MV) switchgear, primary transformers and low-voltage (LV) equipment.

The TDHS has already been granted for Thermal-storage Tanks (2 no. tanks of 200m^3 each).

2.2 Energy Distribution Network and Consumers

The service area is located in Tallaght, a suburb of Dublin within the remit of South Dublin County Council. The plant began operation in 2023 and provides heating to a total area of nearly 55,000 square meters.
There are six customer substations, each equipped with control panels and plate heat exchangers ranging in capacity from 143 kW to 1,600 kW. These systems are monitored and controlled for temperature, pressure, flow rates, and other operational parameters. With the exception of the Affordable Apartments, scheduled to be connected at the end of 2024 and expected to be occupied by residents during 2025, all connected buildings are public facilities.
Customer contracts are long-term. Charges are comprised of two components: a fixed charge, which applies regardless of energy usage and typically covers infrastructure, maintenance, and administrative costs, and a variable charge, which is based on actual heat consumption.
Each building substation includes a heat exchanger and a heat meter and serves as the demarcation point between the district heating network and the customer's secondary system.
The primary heat network is designed to operate with a supply/return temperature regime of 70°C/50°C. Currently, temperatures on the primary side are approximately 70°C/55°C, with thermal losses estimated at around 15%. The operating pressure on the primary side is 5 bar. The primary distribution network consists of 3.8 km of pipelines (1.9 km of trench length), all of which are pre-insulated. The network uses a combination of single and twin steel pipe systems of varying diameters, including DN200, DN150, DN100, DN80, and DN65. Larger diameter pipes (> DN100) are used for the main distribution route, while twin pipe systems are used for smaller customer branches (≤ DN100).

3. UPGRADING MEASURES

Recently, TDHS that operates under the HEATWORKS CLG fully owned by Soth Doublin County Council, has begun preparing a preliminary development plan to push the expansion of system.

It is stated that the development of TDHS is an ongoing process and is identified in two phases:

1. Phase 1 – Optimisation of existing heat-production capacity and pipe-network through addition of Thermal Storage to facilitate connection of more costumers.
2. Phase 2 – Optimisation of all available waste-heat from the datacentre through installation of an additional Heat pump and extend connection to more customers.

Within these phases is very useful to place the Thermal-storage Tanks to facilitate one of the key objectives of investment in optimisation measure shall enable a step-change from 'supply driven' DH system to an energy-efficient 'demand driven DH system'.
In EnableDHC, what-if analysis will be conducted to assess the benefits of expanding the system and how this will result in the overall performance of the plant, including heat network, particularly by placement of thermal storage in the Energy Centre.

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