BURNS & McDONNELL

ENERGY EFFICIENCY AND CLIMATE CHANGE ADAPTATION STATEMENT

DUB13 CAMPUS, DUBLIN, IRELAND

MARCH 2023

CONTENTS

Introduction

The objective of this report is to address point 1 (e) of the Further Information Request under Ref. SD22A/0420 issued by South Dublin County Council:

(e) The applicant is requested to provide a statement in accordance with Section 12.10.1.

In particular, the SDCC Development plan requests to provide details on:

- *How any on-site demolition, construction and long-term management of the development will be catered for;*

- *How energy and climate change adaptation considerations have been inherently addressed in the design and planning of the scheme.*

The Site

Located within an industrial area, where multiple companies including Microsoft, Amazon, Google, Cyrus One, Edge Connex and Digital Reality have operational data centers within the immediate vicinity of the site, with a further number under construction. The site is contained within lands zoned as Objective EE, "To provide for enterprise and employment related uses." in the South Dublin County Development Plan 2022-2028. The Development Plan identifies data centres as being open for consideration under the zoning.

On-Site Demolition

The site is undisturbed agricultural land, with a small existing residential single-house development with ancillary buildings facing New Nangor road. This small development is the only development on site, and it requires demolition. As the site is proposed to be used for a data centre development, the residential house does not serve a purpose for the proposed development. Furthermore, the structure is in poor condition and run down, and there is no architectural or even economical merit in refurbishing it.

Once this residential development is demolished, the materials resulting from the demolition will be carefully managed by the contractor using the appropriate disposal methods to avoid any damaging effect on the environment. Where possible, these materials will be recycled and reused, minimising the amount going to landfill.

Construction and Long-term Management

The construction methodology relies on off-site fabrication to minimise the impact on the site and its surroundings as well as to shorten the construction schedule. The building will have a pre-fabricated steelwork frame, and a lot of the data centre operations equipment will be prefabricated off-site and will only arrive on site when it is being installed. Not only does this minimise the impact on site, but it also minimises the waste produced if it was to be fabricated and assembled on site.

Construction elements such as wall panels will be demountable and can be re-used, thus minimising waste and increasing the usable lifespan. Similarly, construction materials such as the steel fins can be easily recycled.

The material being removed as part of the cut exercise during construction is reused on site to form the retaining walls and landscaping, hereby reducing waste that would have to disposed of as well as removing the need to transport it from site.

An active landscaping plan is proposed to enhance biodiversity. The SUDs and drainage strategy ensures that all surface water is retained on site. This water is directed to ponds on the site itself, ensuring that they will be full all year round, encouraging biodiversity.

Following the further information request by SDCC, the green infrastructure has been enhanced and the site has been adjusted and redesigned to retain the existing hedgerows. The existing biodiversity on the site will be maintained and enhanced not only around the building, but also by incorporating green walls to the building itself.

Furthermore, the culvert on the southwest of the site in the original scheme has been replaced by a bridge. This solution minimises the impact on the existing stream and allows for wildlife crossing underneath it without disruption.

Energy and Climate Change

Data Centres are recognized as a type of facility where the process power to IT Equipment and the cooling power required to maintain reasonable operating temperatures creates a significant amount of waste heat.

Warm air from the data halls is cooled by passing it through water-cooled air handling units. Most of the transferred heat is discharged to atmosphere via chiller units at roof level. Although the total quantity of heat is large, the temperature difference in the water circuits is about 7.7°C - in engineering terms "low-grade" which means it cannot be used as a direct energy export for heating buildings. It could have export potential for another process which uses low grade heat such as growing plants in polytunnels.

The chiller technology has the advantage that it does not consume water. Contrary to other cooling solutions, such as direct air or adiabatic cooling, this cooling solution does not rely on a constant water supply to be able to provide cooling. This is achieved by using outside air to cool a closed water loop.

Vantage DUB13 Data Centre Campus - System Description

The DUB13 Campus comprises a data centre with a total IT energy load of 20MW.

The cooling demand to data hall spaces is met through a chilled water hydronic system, generated by roof-mounted air-cooled chillers. Internal conditioning is met via computer room air handlers (CRAHs) connected to this system.

Each chiller is provided with an integral chilled water pump. Piping for the critical chilled water system is in a ring topology above the roof and is concurrently maintainable.

The total (peak) waste heat energy available has the potential to be a maximum of 25% of the active IT load, circa 5MW for the DUB13 campus. This heat output would be the peak condition, where the data center is running at full capacity in the warmest ambient conditions of the year.

Some of the data hall waste heat is used to heat the offices and support areas - typically 200-300kW as part of energy efficiency measures for the facility.

Although the data center is intended to be running continuously, the heat output available for recovery is seasonal. This is because the return temperature of the water will be a function of the ambient air temperature. When the ambient air temperature is low, the amount of heat will in turn be lower. Heat recovery potential is greater in summer than in winter - the inverse of demand for heat energy for a district heating system. Furthermore, to reduce the energy consumption to cool the data centre during the warmer months, the design aims to minimize heat gains through a careful choice of materials and insulation, thus requiring less energy to cool the building. Internal lighting will be provided by highly efficient, low energy LED lights, which minimize energy consumption and heat losses.

To ensure that the data centre can be upgraded as technology evolves, a plant replacement strategy has been developed as part of the design to allow for replacement of existing equipment to substitute it for more energy-efficient kit. Despite high-efficiency equipment being selected already such as direct drive EC fans, this will ensure the building can be upgraded to operate with less energy-intensive equipment as it becomes available.

To reduce the energy requirements and to comply with Nearly Zero Energy Building (nZEB) requirements in clause 12.10.1 of the development plan, provision for an array of PV panels has been made. This can generate on site renewable energy up to a peak of 73.15kW. The on-site renewable electricity generation will be back fed to the electrical general supply for the building, serving lighting, office area general services and office IT equipment. The total amount of panels will cover 150sqm per building and shall be located at the plant roof area.

Waste Heat Recovery

The development of heat networks (or district heating) is increasingly recognised as an important component in our future energy strategy and is a recommendation of the 2015 Codema report titled 'South Dublin Spatial Energy Demand Analysis'. The base data underlying this analysis dates back to 2014 and should be updated to take account of the significant changes in the energy profile and mix in the South Dublin area. It still is useful in anticipating the growth in demand across the county. Heat networks should aim to meet the following strategic aims:

- To reduce greenhouse gas emissions through the use of a wide range of low carbon and renewable heat sources.
- To improve security of energy supply by diversifying the energy sources for heating and reducing our dependence on fossil fuel imports.

- To offer a supply of heat that is good value and that contributes to reducing fuel poverty.

A major challenge of waste heat recovery is to deliver a high standard of service to customers, which requires a high-quality installation offering good reliability, a long life, low carbon intensity of heat supplies and low operating costs. The cost-effectiveness of the heat supply will also depend on achieving low-cost finance over a prolonged period of time and funders will also be looking for long term performance and reliability.

The principal ways in which the high-level strategic aims are achieved are through the following broad goals which need to be considered in each stage of the project:

- Correct sizing of plant and network
- Appropriate use of new technologies
- Achieving low heat network heat losses
- Achieving consistently low return temperatures and keeping flow temperatures low
- Use of variable flow control principles
- Optimising the use of low carbon heat sources to supply the network
- Delivery of a safe, high quality scheme where risks are managed and environmental impacts controlled

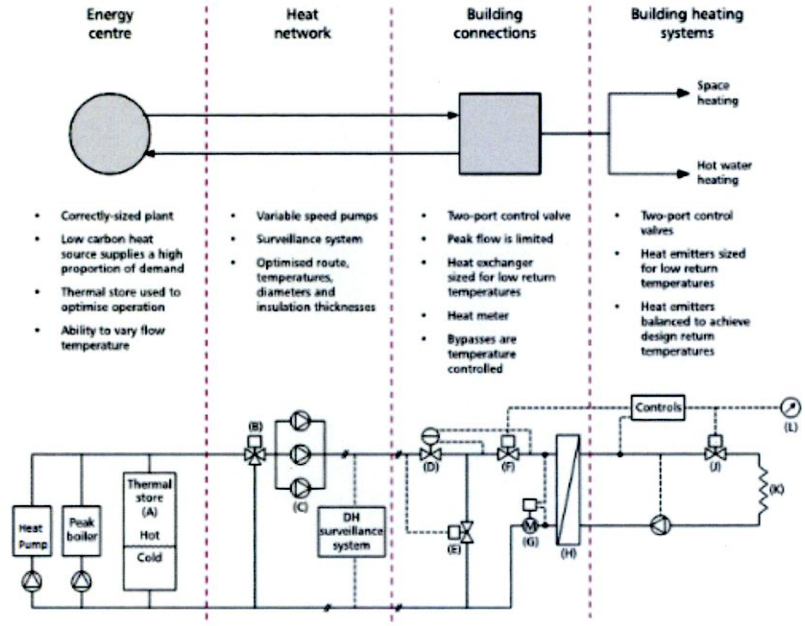

Figure 1: Illustration of typical features of an efficient heat network

Strategy for Waste Heat Recovery – Data Centres

Despite it not being possible to connect to a district heating system due to the lack of infrastructure at present, the design has been future proofed to connect to one should it be installed in the future.

Space has been allocated for a dedicated plantroom for the provision of plate heat exchangers. This would facilitate the future connection of flow and return district heating pipework from outside the site. The source side would be connected to the return line of the chilled water circuit serving data hall spaces. The user side would connect into the district heating network.

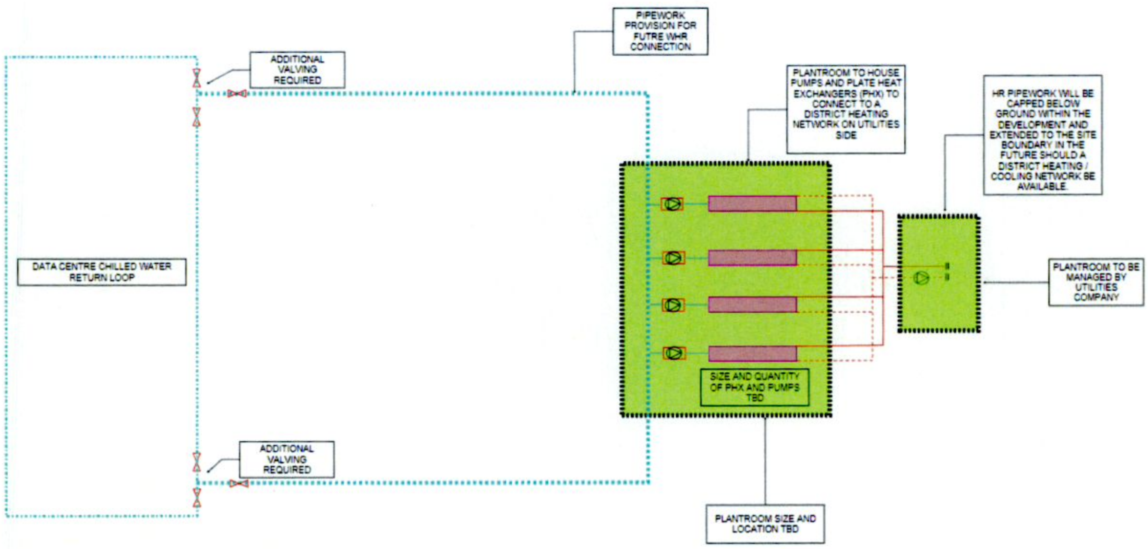

Figure 3: Data centre waste heat recovery loop

There is adequate space below ground to route the district heating pipework from outside the site to the district heating plantroom. Pipework will be installed from day one from the plantroom to the edge of the site, to facilitate the connection to the critical chilled water loop connected to a plate heat exchanger and thus eliminate the risk of intrusive works in the future to allow the heat recovery connection.

If the future district heating network does not get built, the proposed development will still use this waste heat as the primary heat source for space heating within the data centre buildings. A water source heat pump is used to upgrade the temperature of this water such that it is suitable for space heating.

Conclusion

The DUB13 design incorporates energy efficiency and climate change adaptation from planning into the design development.

Both the design and the construction methodology aim to minimize waste, transport and time on site to reduce the impact it has as much as possible. By manufacturing a lot of the structure and equipment off-site, the construction program is shortened and optimized, reducing the works to be done on site as well as unnecessary waste.

It also aims to reuse a lot of the cut from the site and incorporate it as part of the landscaping, further reducing waste.

Furthermore, it has a landscaping design that is aimed at not only maintaining the current biodiversity, but also enhancing it and ensuring the development has minimal impact. Trees and hedges are to be retained where possible, and a bridge solution is used to cross the existing stream rather than a culvert. The bridge is also designed so that wildlife can cross underneath it, without the danger of crossing the road.

In terms of energy efficiency, not only does the development already include measures such as the reuse of existing heat for the administrative part of the building, PVs for electricity generation or minimizing heat gains, but it is also future proofed. DUB13 is designed to allow for efficient replacement of existing equipment should the technology evolve and become more energy efficient.

Although the use of a waste heat recovery system for the data center development is currently not feasible, it can be achieved in the future once district heating infrastructure is installed. Provisions have been made at the design stage to install the additional underground pipework and include space allocations for dedicated plantrooms to house the heat exchangers. The heat output from the data center is likely to be seasonal, with the maximum output occurring during periods where the ambient air temperature is high.

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