Energy Statement

For the proposed development by Vantage Data Centers, Dublin Ireland.

Located at

Nangor Road, Baldonnell, Profile Park, GrangeCastle South Dublin D22

prepared by

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1. Introduction

We, Vantage data centers Ireland Ltd. are applying for permission for a period of ten years for development at this site of 8.7 hectares that is located within lands in the Profile Park, Grange Castle Business Park South ,Old Nangor Road, Baldonnel, Dublin 22.

The Proposed Development is to develop 3 no. two-storey data storage facilities with a gross floor area of 37,582 sqm associated with 2 Medium Voltage (MV) switchroom buildings of 16m2 each , and a 98MW gas powered Energy generation unit with a gross floor area of 678 m2 that supply and work as a Power Peaking unit in times of Eirgrid network failures. A pair of step-up transformers are also located south of the Power generation facility which distributes to a proposed Eirgrid Substation immediately South of Falcon Avenue.

The Site is supplied with electricity from ESB via a Network Substation to a centralized switch room on site via 2 alternative 20kV distribution power feeds to each of the data centres.

The proposed data storage facilities are referred to as Buildings DUB 11.1, DUB 11.2 and DUB 12.

The Proposed Development (as described and defined below) is to seek permission for a period of ten years for a development that will consist of the following various works, as follows:

Demolition of abandoned single storey dwelling on Old Nangor Road, Clondalkin, Dublin 22;

Construction of three no. two storey data storage facilities (Buildings DUB 11.2, DUB 11.2 and DUB12) and a gas fired power generation facility with transformers, switch rooms and gas regulation building.

The total building development with a gross floor area of **38,290 m2.**

Building DUB 11.1 will be constructed first and will be located to the centre of the site and will have a gross floor area of 14,031 sqm. It will include 11 no. emergency generators located at ground floor level within a compound to the West side of the data storage facility with associated flues that will be 25m in height. The facility will also include 11 no. Exhaust ventilation shafts which will be positioned in paired arrangement that will be located above the Western end of each emergency generator that will measure 16 m in height;

Building DUB 11.2 will be constructed second and will be located to the South of DUB 11.1 as an extension of the first building and will have a gross floor area of 10,636sqm. It will include 11 no. emergency generators located at ground floor level within a compound to the West side of the data storage facility with associated flues that will be 25m in height. The facility will also include 11 no. ventilation exhaust shafts that will be located above the Western end of each emergency generator that will measure 16m in height;

Building DUB 12 will be constructed last and will be located to the Northern part of the site and will have a gross floor area of 12,915 sqm. It will include 11 no. emergency generators located at ground floor level within a compound to the West side of the data storage facility with associated flues that will be 25m in height. The facility will also include 11 no. ventilation shafts which will be positioned in paired arrangement that will be located above the Western end of each emergency generator that will measure 16m in height;

Each of the three data storage facilities will includes data storage rooms, associated electrical and mechanical plant rooms, loading bays, maintenance and storage space, office administration areas, plant at roof level as well as a house generator for each facility that will provide emergency power to the admin and ancillary spaces. Each data storage facility will also include a diesel tank and a fueling area to serve the proposed emergency generators;

The maximum overall height of each data storage facility development apart from the flues is the roof of the Lift enclosure at 18.9m above the finished floor level; Flues which are paired will be 25metres tall in height from Finished floor level.

Construction of internal road network and circulation areas, Gas regulator (approximately 30sqm) at entrance; dedicated pedestrian footpaths, provision of 144 no. car parking spaces, 14 of which will be dedicated to EV charging and a cycle path with 44 no. cycle parking spaces being provided. The Two entry gates are separated to provide safe division from pedestrian/cycle and car access from large HGV and delivery and construction traffic in the phased development and ongoing maintenance of the data centers.

Single storey Switch room (16sqm for each switch room);
Medium Voltage (MV) connection (described in more detail below) that will include works to install new underground ducting and cable within a new trench that will extend c. 450m South from the proposed switchroom to the EIRGRID ESB Substation South of the application site to meet the existing distribution network within Profile Park. It will then connect via existing cabling in agreement with Eirgrid to the new ESB substation. The gas powered generation facility will have the capacity to provide equal energy to the amount consumed on site in the event of a local GRID network failure to support the local power infrastructure requirements.

Works on site within the first phase of construction include the proposals to divert a small section of the Baldonnel stream on the North of the site and provide suitable 100 and 1000 year flood mitigation and rainwater attenuation. This will be achieved through a combination of permeable Hard and soft landscaping and enhanced planting, and ecology sensitive LED lighting with boundary drop off as guidelines recommend for suitable for Bat roosting and foraging. Further civils works are associated with underground foul and storm water drainage network, and utility cables.

1.1. Technical Guidance Document Part L (2017)

The development consists of unheated operational space for a data storage facility and heated ancillary office space. With respect to The Building Regulations, Technical Guidance Document (TGD) Part L notes that spaces with installed heat capacity of less than $10W/m^2$ are exempt from meeting the requirements of the TGD Part L document. As such the data storage operational space is exempt from TGD Part L 2017.

The office space, is a fully air conditioned space and will meet the requirements of the TGD Part L - 2017. Building Energy Rating BER - A3 or higher is targeted for the office development with the utilization of Roof mounted air cooled free cooling chillers and roof mounted PV Panels to generate on site renewable electricity to be compliant with nZEB "Nearly Zero – Energy Buildings" requirements.

2. Data Processing Areas Electrical Design Elements

2.1. Utility Supply

The power requirements for the proposed development will be provided via a connection to a 110kV EIRGRID ESB substation and will be subject to a separate SID planning application. The substation will then provide a 20kV electrical power distribution at medium voltage throughout the site. The site distribution system supplies all electrical rooms where stepdown transformers are deployed to provide 400/230V electricity to all loads.

The gas fire power generation facility will generate 100MW at 11kV with a step up transformer to 20kV on site south of this building and then distribute to the EIRGRID substation and will be called upon for use on local network drops. This power generation unit does not provide power directly to the data centres. Power is only available from the EIRGRID ESB substation that is proposed South of Falcon Avenue.

The distribution system described above is chosen as it represents the safest, most efficient and most economical method for site wide electricity distribution and in agreement with EIRGRID ESB.

2.2. Transformers

To reduce electrical losses between HV/MV/LV conversions, the applicant will install low loss transformers which comply with the Ecodesign directive 2009/125/EC as a minimum.

2.3. Emergency Back-Up Generators

Standby power to each electrical room will be provided by containerized, diesel powered emergency back-up generators. These generators provide emergency back-up power in event of loss of the utility supply and therefore will be non-operational for the vast majority of time.

2.4. External Lighting

A site lighting report has been prepared to accompany the planning application. The external lighting will make use of high efficiency, low energy LED luminaires. The lighting design has been optimised to reduce glare, spillage or other light nuisance to ecology,adjacent sites and/or public roads.

Secondary external lighting in areas such as the generator compound will be operated via daylight detection to minimize hours of operation and thus keep energy usage to a minimum.

2.5. Internal Lighting

Internal lighting shall be provided by high efficient, low energy LED luminaires combined with presence detection controls or local switching where appropriate. The lighting design meets the illumination level requirements as outlined in I.S. EN 12464 part1. IS 3217:2013+A1:2017.

LED luminaires are also to be used for the emergency lighting installation, which is designed to comply with the requirements of EN 1838 and IS 3217:2013+A1:2017

3. Data Processing Areas Mechanical Design Elements

The data storage rooms (data modules) are cooled with air handling units that are provided with chilled water via roof mounted free cooling magnetic bearing chillers.

Chilled water is pumped around the building using variable volume pumps. Chilled water flow is limited by 2 port control valves to match the demand.

The system utilizes variable volume EC fans to match cooling capacity to load requirements from the data storage rooms.

Hot Aisle containment is used to separate supply and return air paths and maximize system efficiency by allowing elevated supply air temperatures.

3.1. Data Storage Room Environmental Conditions

The indoor Data Module thermal environment has been designed to meet the temperatures shown in the 2015 ASHRAE TC9.9 "Thermal Guidelines for Data Processing Environments." The recommended Class A1 range is:

Criteria	Recommended Range	Allowable Range	Design Range
Low end temperature	64.4°F/ 18°C	59°F / 15°C	71°F / 22°C
High end temperature	80.6°F / 27°C	89.6°F / 32°C	75°F / 23.8°C
Low end moisture	41.9°F / 5.5°C dewpoint	10% RH	41.9°F / 5.5°C dewpoint

It should be noted that the intent of this range is not to allow user selection of any condition within that range, but to allow the HVAC system to operate at its most efficient point to deliver conditions anywhere within the range.

3.2. Mechanical System

Cooling System

Chilled water will be produced by [premium efficiency] air-cooled chillers [located on the roof]. The chillers shall be [magnetic bearing, high-efficiency variable speed] air-cooled chillers with integral Free-Cooling economizers. The chillers will be selected for elevated supply and return temperature to maximise system efficiency. The chillers will have an integral economizer capability to allow the compressor energy to be reduced or eliminated as the outside ambient temperature decreases.

A primary, variable-speed chilled water pump is located immediately adjacent or integral to each chiller on the chiller platform. The chillers and pumps will be connected in parallel into a common chilled water piping system and the pumps will be controlled in a variable primary configuration.

The critical HVAC systems will be designed to be concurrently maintainable, meaning that every piece of equipment can be taken out of service for routine maintenance without disrupting the critical load. The maximum cold aisle rate of change shall be no greater than 9°F / 5°C DB/hr and 10% RH/hr. Airflow requirements shall be a minimum 158 cfm/kW / 75l/s/kW and a maximum air temperature differential of 20° F / 11.1° C delta T in an N+2

operating more or N (failure) mode. arrangement and 12.2° C delta T in an N arrangement.

Twelve (12) computer room air handling (CRAH) units in an N+2 arrangement will be provided for each data module. The CRAHs will be located in two (2) galleries on opposite sides of the data module in an N+1 arrangement per gallery. Each gallery shall contain a total of six (6) CRAH units, each consisting of a M5, MERV 8, or F7 filter, finned tube chilled water coil, and an electrically commutated motor (EC) fan/motor assemblies.

Supply air from the CRAHs will positively pressurize the CRAH gallery, and the air will then migrate through a perforated wall into the data module. The intent of the CRAH gallery and perforated wall is to allow for even air distribution into the data hall when there is only N CRAHs operating due to failure or preventative maintenance. The CRAHs will supply air from both sides of the data module. The CRAH's fan speed will be controlled over 4 multiple zones in the DM and shall be commanded based on an average return air temperature. The data module server racks will be installed on slab and the server fans will blow air into the contained hot aisles. The hot return air will return to the CRAH units through the return air ceiling plenum. The plenum will extend over the CRAH gallery, and a return air duct will extend from the CRAH up into the plenum.

Ventilation System

Dedicated outside air-handling units (DOAS) will provide outside air into each data module and MMR/MPOE/IDF rooms. The DOAS unit will be [air-cooled, direct expansion (Dx) type] to provide the necessary dehumidification of the outside ambient air and shall be provided in an N arrangement when humidification is not provided and N+1 arrangement when humidification is integral to the DOAS. During winter conditions and after dehumidification, [heat pump] to provide heating of the air. The ventilation units shall all be equipped with a total enthalpy wheel to recover heat before exhaust. The data module will be kept at a positive pressure by extracting the return pressurization through the corridors.

3.3. Direct Drive EC Fans

All air supply and extract systems serving the data module rooms are provided with high efficiency direct drive fans. The EC direct drive fan is the most efficient fan solution available to facilitate demand control. These fans are lighter in weight and require less power than a traditional centrifugal fan with variable speed drive (VSD) . Typically savings of 10-20% in power consumption is achievable with an EC fan versus a centrifugal fan.

3.4. Potential for Waste Heat Recovery

The waste heat form the data models will be used to heat the office areas, assisted by heat pumps.

The chilled water system offers the flexibility to reject heat into a local heat network by introducing heat exchangers into the system as a later date.

The above provision could supply heat energy to a future district heating scheme developed by others external to the site boundary. It should be noted that in order to benefit from the above heat recovery that district heating infrastructure external to the site including plate heat exchangers, pumps and distribution networks would need to be developed by others.

4. Offices & Ancillary Areas Mechanical & Electrical Design Elements

4.1. Mechanical Systems

Heating to the office area will be provided by heat pumps that will recover heat from the data module cooling system. This will allow the heat pump system to operate at higher efficiencies compared to air cooled systems operating at standard ambient conditions.

Cooling will be provided by roof mounted air-cooled free cooling chillers. The free cooling chillers will utilize compressor free cooling when the ambient conditions are satisfactory, thus maximizing system efficiency.

4.2. Ventilation Systems

The fresh air ventilation system for the office area will be served using energy efficient Heat Recovery Units which will recover waste heat from the office spaces and re-use to pre-heat the air with the HRU. This will reduce the overall energy consumption for this system.

4.3. Lighting

Internal lighting shall be provided by high efficient, low energy LED luminaires combined with presence detection controls or local switching where appropriate. The lighting design meets the illumination level requirements of CIBSE Code of Lighting and IS EN 12464-1.

LED luminaires are also to be used for the emergency lighting installation, which is designed to comply with the requirements of IS EN 1838 and IS 3217:2013+A1:2017.

4.4. PV Panels

Provision for an array of PV panels shall be made to generate on site renewable energy up to a peak of 73.15kW per building, to comply with Nearly Zero Energy Building (nZEB) requirements. 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.

END OF REPORT