Energy Statement

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

Located at

Profile Park, Grange Castle South Business Park, New Nangor Road 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 located within lands in the Profile Park, Business Park South, Grange Castle, Old Nangor Road, Baldonnel, Dublin 22. The Proposed Development is to develop two two-storey data storage facilities with a gross floor area of 37,582m^2. There will be two switch room buildings of 126 m^2 each, a step-up substation of 95m^2 , and a Gas Regulator compound with three buildings of 134 m^2 in total. A 96MW multifuel Power Generation unit will be provided on site in two buildings – North building with a gross floor area of 1,784 m^2 and South building with a gross floor area of 1,258 m^2. The Power Generation Unit will provide power to the EIRGRID network and ensure a reliable and secure availability of power to the Data Centre campus. The total area of the buildings will be 41,105 m^2. The campus is supplied with electricity from ESB via a new Network Substation to the South of Falcon Avenue to a centralized switching station on site with two alternative 20kV distribution power feeds.

2. Description

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 two two-storey data storage facilities (Buildings DUB 11 and DUB12) and a multifuel power generation facility with transformers, switch rooms and gas regulation building. The total building development has a gross floor area of 41,105 m2 .

2.1. DUB11 Datacenter

Building DUB 11 will be constructed first and will be located to the centre of the site and will have a gross floor area of 24,667m^2. There will be eight Data Modules with supporting power and cooling plant, built out to match customer demand. It will include 22 no. emergency generators double-stacked and located at ground floor level within a compound to the West side of the data storage facility with associated flues that will be 22.3m in height. The facility will also include 12 no. Exhaust ventilation shafts one for every two generators, that will be located above the Western end of each emergency generator that will measure 20m in height.

2.2. DUB12 Datacenter

Building DUB 12 will be constructed in the second phase and will be located to the southern part of the site and will have a gross floor area of 12,915 m^2. There will be four Data Modules with supporting power and cooling plant, built out to match customer demand. It will include 14 no. emergency generators double-stacked located at ground floor level within a compound to the West side of the data storage facility with associated flues that will be 22.3m in height. The facility will also include 7 no. ventilation shafts, one for every two generators, that will be located above the Western end of each emergency generator that will measure 20m 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 fuelling 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 21.56m above the finished floor level; Flues which are paired will be 22.3metres tall from Finished floor level.

2.3. External Works

The external works for the campus includes the construction of the internal road network and circulation areas, main and delivery entrances with control gates and barriers, dedicated pedestrian footpaths, provision of 137no. car parking spaces, 14no. of which will be dedicated to EV charging and 7no. dedicated disabled bays and a cycle storage with 66 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.

2.4. Power Plant and Infrastructure

The Medium Voltage (MV) connection (described in more detail below) will include works to install new underground ducting and cabling within a new trench that will extend c. 450m South from the proposed switch room to the EIRGRID ESB Substation South of Falcon Avenue. The incoming grid supply will terminate in a Switch substation of 252 m^2 in two buildings.

A 100MW on-site power generation plant will be constructed in two phases on the west side of the site to provide power to the EIRGRID network at times of peak demand. This means that the campus will have a robust guaranteed supply of power without placing additional strain on the local network. More detail on the power agreements is given in the Energy Strategy document.

The power plant will be constructed in two phases. Phase 1 will include the North building of 1,784 m^2 and a step-up substation between the two power plant buildings with three transformers and a control building of 95m^2. The South building constructed under Phase 2 will have a gross floor area of 1,258 m^2. Both buildings will be 10.60 m to the parapet and with flues 25m high.

2.5. Phase 1 Work

The first phase comprises the DUB11 datacenter, the AGI compound, the Switch substation, the North Power Plant and the step-up substation. Siteworks within the first phase of construction will include planting and landscaping along the North boundary and the construction of retention ponds and berms to the north of the Baldonnel Stream. The stream will be retained in its existing watercourse. The civil works are designed to include a comprehensive SuDS drainage scheme with swales and surface ponds to manage flood conditions. The extent of permeable paving is increased over the original application and green roofs are added over the office parts of the datacenters to aid rainwater disposal and retention. Sensitive LED lighting with boundary drop off is envisaged in accordance with recommended guidelines for Bat roosting and foraging. Further civils works are associated with underground foul and storm water drainage network, fibre and utility cables.

3. 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.

The Power Plant has an installed heat capacity of less than 10W/m2 and is exempt from the requirements of TGD Part L - 2017. Control rooms, offices restrooms and electrical rooms will be heated and may be air-conditioned

will be designed to meet the requirements of TGD Part L – 2017.

4. Data Processing Areas Electrical Design Elements

4.1. 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 multifuel 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 with temporarily power the VDC site during the phase 1 period where the utility supply has not yet ramped up to match the site demand. The fuel used for this temporary scenario and period will be HVO.. The generator sets are designed to run on natural gas or diesel. For resilience and to reduce the carbon footprint the units can accept a gas/hydrogen mix should this become available on the national grid. HVO fuel which is a second-generation bio-diesel is the preferred fuel for the units to run in the event of disruption of the gas supply. To ensure a robust supply and in accordance with EIRGRID standards, the power plant includes 72-hours of fuel storage on site aligned with CRU requirements for power export to the national grid.

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.

4.2. Transformers

To reduce electrical losses between HV/MV/LV conversions, the applicant will install low loss transformers which comply with the Eco-design directive 548/2014 as a minimum.

4.3. 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 most of the time.

4.4. 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.

4.5. Internal Lighting

Internal lighting shall be provided by highly 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 and 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

5. 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.

5.1. Data Storage Room Environmental Conditions

The indoor Data Module (DM) 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	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.

5.2. Cooling System

Chilled water will be produced by [premium efficiency] air-cooled chillers [located on the roof]. The chillers will 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 to 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 . The pumps will be controlled in a variable primary configuration, modulating the pump speed to match the building load, thus maximizing energy performance of the system.

Twelve (12) computer room air handling (CRAH) units 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 (N+2 per DM). Each gallery will contain a total of six (6No.) 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 assembly.

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 will 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.

5.3. 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 pre-cool the ambient outside air and provide the necessary dehumidification to maintain the required internal conditions. During winter conditions the ambient air will be pre-heated using low temperature hot water (LTHW) supplied by the roof mounted heat pump (described later). High efficiency total enthalpy recovery wheel will be provided to recover energy from the exhaust system before discharge.

5.4. 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 an efficient fan solution 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.

5.5. Potential for Waste Heat Recovery

The waste heat from the data modules will be used to heat the administration office areas, assisted by heat pump technology. The return water from the DM cooling process will be used to maximize the efficiency of the water sourced heat pump used for the admin block heating system.

However, the heat load of the site's integrated office areas is a very small percentage of the energy that is available from the Data Centre's cooling process heat rejection systems, and thus the chilled water system can also offer the potential to reject heat into a local heat network later should a there be a local demand in the future.

To ensure that the system has the flexibility to connect into such a system whilst also maintaining a live data centre, valved, and capped off connections will be provided on return water risers, ready for future connection to a district heating network

The above provisions could allow the supply of heat energy to a future district heating scheme developed by others, external to the site boundary.

At present there are no available projects within reasonable proximity to the site location for connecting this potential low grade heat energy, however provision is made only in design and would need to be installed later should this become a requirement in the future.

6. Offices & Ancillary Areas Mechanical & Electrical Design Elements

6.1. 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.

6.2. 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.

6.3. Lighting

Internal lighting shall be provided by highly 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.

6.4. 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