Grange Energy Centre

Response: Ireland 2040 Our Plan
Draft National Planning Framework

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About Grange Energy Centre

Grange Energy Centre is a planned combined heat and power plant located within Grange Castle Business Park in South County Dublin. There are several large manufacturing plants and data centres within the business park. In addition to producing vital power for business continuity, there is a unique opportunity to provide low-carbon heat for servicing the heating and/or cooling needs of nearby energy users. This would enhance the profile of Grange Castle Business Park and the surrounding area as a location of choice for industry, particularly for data centres. The legal entity of Grange Energy Centre is Grange Backup Power Ltd.

Strictly Confidential

Executive Summary

Grange Energy Centre (GEC) is a planned combined heat and power plant located within Grange Castle Business Park in South County Dublin. There are several large manufacturing plants and data centres within the business park. GEC will produce vital power directly for business continuity, along with heat, steam and cooling for the needs of nearby energy users.

GEC wish to ensure that the policy initiatives at EU and national level, as well as commitments in the Energy Policy White Paper, the commitments on Climate Action and the many benefits from local cogeneration and district heating solutions are acknowledged and integrated within the National Planning Framework.

There is a real opportunity for South Dublin County Council (SDCC) in partnership with GEC to enhance the service value proposition offering and attractiveness to Foreign Direct Investment (FDI) companies considering location in Ireland. It is another unique selling point in the arsenal of reasons to locate in Ireland and provides a competitive energy solution to one of the critical investment criteria considerations. This can be achieved by facilitating and/or investing in the provision of direct power, steam, heating or cooling supply to both existing and potential future occupants of the business park and surrounding areas. By utilising waste heat and steam, it reduces our dependence on imported energy and helps build a 'circular' economy.

Sustainability and environmental concerns are now a key corporate social responsibility (CSR) consideration in making an investment decisions. Ireland is at a competitive disadvantage when it comes to the key metrics of CO_2 emissions and absolute cost of electricity (see Figure 2 in this report).

It is important that local distributed power generation is encouraged and supported, consistent with EU best practice. This has significant benefits environmentally and from a system efficiency perspective. It is a well-recognised and accepted concept. The CO_2-intensity of direct power supply from GEC is more than 50% lower per unit than importing power from the grid. Allowing direct access between a generator and a dedicated localised end-user provides for an efficient direct supply of electricity without losses. It also reduces the need for expensive network reinforcements to carry electricity via long-range transmission lines. It also increases security of supply and the resilience figures of reliability to data centre facilities.

GEC is located in one of the most populous and energy-intensive areas in the country. There is sufficient consumer demand within reasonable proximity of GEC to justify the supply of excess heat from GEC to surrounding homes and businesses.

It is widely recognised that Dublin development is suffering from a lack of power. There is a risk that Dublin will be viewed as being closed for large demand consumers and other FDI including data centres; this situation calls for the urgent introduction of direct lines to facilitate distributed, decentralised power generation for business parks only, which is consistent with EU legislation. This legislation on direct lines has not been fully transposed into Irish law, and hence requires an amendment to the 1999 Electricity Act. Such an amendment will facilitate distributed, decentralised power to large demand consumers within the confines of the particular business park only and not

to the domestic consumer. The implementation of this will act as an example for other business parks around the country and further enhance Ireland's reputation as a leading location for foreign direct investment. It will also provide a competitive advantage in securing FDI against other member states.

It is recommended that the government include the "direct line" opportunity as a planning principle within the NPF to support sustainable local energy generation (local power and heat, steam and cooling) for business parks only within its geographic confines and boundaries

The direct use of power combined with the efficient use of excess heat from GEC presents a unique and visionary opportunity to enhance the profile of GCBP and the surrounding area as a preferred location for industry, particularly for data centres. It is good for jobs, good for business and investment, good for climate change, good for Ireland Inc and is consistent with intent and spirit EU legislation.

Contents

List of Figures

1 Introduction

The National Planning Framework (NPF) consultation is an important opportunity to set out and improve on environmental commitments and national climate change actions over the coming decades, particularly as it is applied to the development of South County Dublin.

Grange Energy Centre (GEC) fully support the stated strategic outcome for "A Strong Digital Economy" supported by sustainable energy infrastructure and district heating.

Ireland is very attractive in terms of international digital connectivity, climatic factors and current and future renewable energy sources for the development of international digital infrastructures, such as data centres. This sector underpins Ireland's international position as a location for ICT and creates added benefits in relation to establishing a threshold of demand for sustained development of renewable energy sources. There is also greater scope to recycle waste heat from data centres for productive use, which may be off-site.

GEC endorses the "Key future growth enablers for Dublin" which includes improving sustainability in terms of energy, waste and water, to include district heating and water conservation.

GEC wish to ensure that the policy initiatives at EU and national level, as well as commitments in the Energy Policy White Paper, the commitments on Climate Action and the many benefits from local CHP and district heating solutions are acknowledged and integrated within the NPF.

1.1 About Grange Energy Centre

Grange Energy Centre (GEC) is a planned combined heat and power plant located within Grange Castle Business Park in South County Dublin. There are several large manufacturing plants and data centres within the business park. In addition to producing vital power for business continuity, there is a unique opportunity to provide low-carbon heat and steam for servicing the heating and/or cooling needs of nearby energy users. This would enhance the profile of Grange Castle Business Park (GCBP) and the surrounding area as a location of choice for industry, particularly for data centres. The legal entity of Grange Energy Centre is Grange Backup Power Ltd.

GCBP is a South Dublin County Council-owned Business Park promoted in association with IDA Ireland to attract major strategic investment to South Dublin. Located in Clondalkin, the Park is approximately 3km west of the M50 Orbital Motorway.

GCBP has the capacity to attract large scale industries of regional and national significance, due to the availability of large plot sizes, infrastructure and corporate park environment.

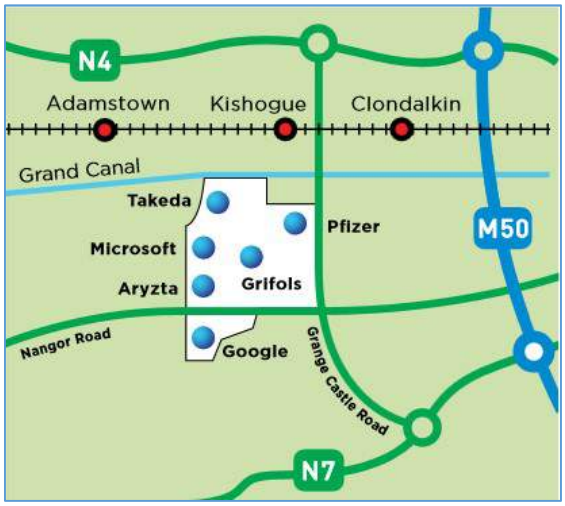

Figure 1: Location of Grange Castle Business Park *(SDCC)*

2 Energy Policy to Integrate within the National Planning Framework

GEC wish to ensure that the policy initiatives at EU and national level, as well as commitments in the Energy Policy White Paper, the commitments on Climate Action and the many benefits from local CHP and district heating solutions are acknowledged and integrated within the NPF.

2.1 EU Policy and Legislation

Heating and Cooling (H&C) accounts for around half of the EU energy use. According to the available scenarios, it will also remain the largest energy demand driver in the long-term. District heating and cooling represents around 10% of energy supply in the EU. In Ireland, the quantity of energy supplied via district heating or cooling is negligible at present.

A wide-ranging package of measures are proposed[1] by the European Commission under the "Clean Energy for All" (also known as the "Winter package"), which involves revisions to the Energy Efficiency Directive (EED), the European Performance of Buildings Directive (EPBD), the Renewable Energy Directive (RED) and a range of further measures around energy markets.

2.1.1 Energy Efficiency Directive (EED)

The EED[2] proposes a new binding energy-efficiency target of 30% energy use reduction over the period 2021-2030. The Energy Efficiency Obligation Scheme (EEOS) in particular (outlined in Article 7 of the EED) is expected to contribute at least half of the energy savings, and builds on the scheme already in place under previous measures. Energy savings in the operation of district heating and cooling infrastructure are expected to play a large part in meeting these targets.

Cogeneration is a vital part of the EED as is clearly set out in the priorities and policy guidance therein:

[1] https://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition

[2] Energy Efficiency Directive 2012/27/EU

"High-efficiency cogeneration and district heating and cooling has significant potential for saving primary energy, which is largely untapped in the Union… Member States shall adopt policies which encourage the due taking into account at local and regional levels of the potential of using efficient heating and cooling systems, in particular those using high-efficiency cogeneration."

2.1.2 Heating & Cooling in the RED[3]

There are specific measures to promote heating/cooling in the RED (as revised under the winter package). Member States will be required to carry out an assessment of their potential of renewable energy sources and of the use of waste heating and cooling.

To promote district heating and cooling, several measures are outlined in article 24 of the RED, as follows:

- measures to allow customers of district heating or cooling systems which are not 'efficient district heating and cooling', to switch suppliers or install their own system.
- measures to ensure non-discriminatory access to district heating or cooling systems for heat or cold produced from renewable energy sources and for waste heat or cold. This non-discriminatory access shall enable direct supply of heating or cooling from such sources to customers connected to the district heating or cooling system by suppliers other than the operator of the district heating or cooling system.
- require electricity distribution system operators to assess at least biannually, in cooperation with the operators of district heating or cooling systems in their respective area, the potential of district heating or cooling systems to provide balancing and other system services, including demand response and storing of excess electricity produced from renewable sources and if the use of the identified potential would be more resource- and cost-efficient than alternative solutions.
- designate an independent authority to ensure that the rights of consumers and the rules for operating district heating and cooling systems are clearly defined and enforced.

2.1.3 Private Wire and the Electricity Directive

It is important that local distributed generation is encouraged. This has significant benefits environmentally and from a system efficiency perspective.

At the moment a generator within a business park is prevented under the 1999 Electricity Act from supplying an adjacent power consumer via direct line (also known as "Private wire"). Allowing direct access between a generator and a dedicated localised end-user provides for an efficient direct line supply of electricity without losses. It also reduces the need for expensive network reinforcements to carry electricity via long-range transmission lines.

The obligation on EU member state governments to allow energy generators to directly supply end users is outlined in the 2009 Internal Market in Electricity Directive[4]:

"Member States shall take the measures necessary to enable: all electricity producers and electricity supply undertakings established within their territory to supply their own premises, subsidiaries and eligible customers through a direct line"

[3] Renewable Energy Directive 2009/28/EC on the promotion of the use of energy from renewable sources
[4] Internal Electricity Market Directive 2009/72/EC

It is recommended that the government include this sensible "direct line" opportunity as a planning principle within the NPF to support sustainable local energy generation.

'2.1.3.1 Legislation on Direct Lines

The EU recognises the changing electricity environment and is encouraging of embedded generation as an integral part of smart networks. The Energy Efficiency Directive guidance notes highlight the objectives of the Directive and it states that

> *'The Electricity Directive encourages Member States to deploy Smart Grids, which should be built in a way that encourages decentralised generation and energy efficiency.'*

However, when it comes to specifics it deals with demand response in balancing and reserves and with cogeneration as shown below:

> *'Access and participation of demand response in balancing, reserve and other system services markets is promoted, requiring that the technical or contractual modalities to promote participation of demand response in such markets'*
>
> '*Cogeneration, like distributed generation, can provide significant grid efficiency improvement through avoided grid losses. Member States may therefore want to encourage high-efficiency cogeneration to be sited close to areas of demand by reducing connection and use-of-system charges, to encourage high-efficiency cogeneration to be located close to areas of demand. '*

Both of these options are open to Grange Energy Centre (GEC) and if the generator was on the consuming site there would be no issue. Since they are not we have to look at the existing legislation to see how GEC proposals might be accommodated within the existing legislative framework.

On the face of it, it would seem that EU legislation is supportive of customers being supplied through direct lines. The 2009 Directive provides that

> *"Member States shall take the measures necessary to enable:*
>
> *(a) all electricity producers and electricity supply undertakings established within their territory to supply their own premises, subsidiaries and eligible customers through a direct line;*
>
> *(b) any eligible customer within their territory to be supplied through a direct line by producer and supply undertakings.*

Existing tenants in the Grange Castle Business Park, as an eligible customer should be allowed to get a supply from GEC under (b) above. GEC will need a supply licence as well as a generation licence. However, the definition of 'direct line' does not facilitate this interpretation.

> *"direct line' means either an electricity line linking an isolated production site with an isolated customer or an electricity line linking an electricity producer and an electricity supply undertaking to supply directly their own premises, subsidiaries and eligible customers."*

The EU legislation allows member states to approve Direct Lines where the customer has been refused a connection and this has been incorporated into Irish law (see attached). Direct Lines (under EU and Irish law can be used to supply multiple customers as seen by the definition above.

The 2009 EU Directive introduced the concept of a closed distribution network (Article 28). This concept has not been transposed into Irish law but it will have to be.

This would be more appropriate and consistent with EU legislation for the following reasons:

1 by definition it is 'within a geographically confined area' and

2 it cannot be used to supply domestic customers. Grange would fit into part B of the definition which is:

> *'a system which distributes electricity within a geographically confined industrial, commercial or shared services site and does not … supply household customers, as a closed distribution system if:*
>
> *a) For specific technical or safety reasons, the operations of the production process of the users of that system are integrated or*
>
> *b) That system distributes electricity primarily to the owner or operator of the system or their related undertakings'*

We propose to amend Article 37 by providing for closed distribution systems as an addendum to the direct line provision. This could be quite simple. See proposals for wording highlighted in yellow in the excerpt from the Act below.

'2.1.3.2 Electricity Act 1999 (excerpt) and proposed amendment.

Direct lines.

37.—(1) Where access to the transmission or distribution system for holders of licences or authorisations or eligible customers is refused by the Board due to lack of capacity the Commission may permit the holder of the licence or authorisation or eligible customer to whom such refusal is made to construct a direct line not connected to the transmission or distribution system for the purpose of facilitating the supply of electricity for which the application for use of the transmission or distribution system concerned was made and refused.

(2) A permission to construct a direct line granted by the Commission under this subsection shall require the person to whom the permission was granted to comply with such technical and other conditions, including those which may be necessary to ensure that direct lines are compatible with the transmission or distribution system, to such extent as the Commission may specify in the permission.

(3) The owner of a direct line constructed under subsection (1) may allow the direct line to be used for the transport of electricity to other eligible customers.

(4) (a) Where there is a connection made between a direct line and the transmission or distribution system of the Board, on the application of the Board, the Commission may direct the owner of a direct line constructed under subsection (1) to transfer the ownership of the direct line to the Board on such terms, including terms as to compensation, as may be agreed between the Board and the owner of the direct line.

(b) In default of agreement between the Board and the owner as to compensation, such compensation shall be assessed under the provisions of the Acquisition of Land (Assessment of Compensation) Act, 1919, and for this purpose the Board shall be deemed to be a public authority.

'2.1.3.2 Proposed Amendment

(5) A person may apply to the Commission for permission to construction a direct line for use in a closed distribution system. That is *a system which distributes electricity within a geographically confined industrial, commercial or shared services site and does not … supply household customers, as a closed distribution system if:*

> *a) For specific technical or safety reasons, the operations of the production process of the users of that system are integrated or*
>
> *b) That system distributes electricity primarily to the owner or operator of the system or their related undertakings'*

The Commission may specify conditions for operation of the direct line. The Commission will determine the geographical boundaries of the closed distribution system.

Direct lines in closed distribution systems may not be used to supply domestic customers. Direct lines in closed distribution systems may not be connected together.

2.2 National Policy

Ireland has one of the lowest shares of DH in Europe at less than 1% of the heat market[5]. Of Ireland's total final consumption of energy 39%[6] is used to meet heat demands, and this heat is primarily supplied by individual oil and gas boiler systems.

Replacing every individual fossil fuel based heating system in the country with a sustainable alternative is an overwhelming task, but using centralised high efficiency DH networks in suitable areas can greatly contribute to the integration of low carbon energy sources in the heating sector. It is estimated that 75%[7] of the average household's final energy consumption is used for space and water heating.

[5] EcoHeatCool estimates Ireland's DH sales to be 0.1PJ/year. Source: EcoHeatCool (2006) Possibilities with more district heating in Europe.
[6] SEAI. (2015) Energy in Ireland 1990-2014.
[7] SEAI. (2013) Energy in the Residential Sector 2013.

2.2.1 Commitments in Energy Policy White Paper

The 2015 Energy Policy White Paper[8] has made the following commitments which have not been implemented as yet and should be adopted in the NPF including:

- develop a policy framework to encourage the development of Combined Heat and Power (CHP)
- develop a policy framework to encourage the development of district heating
- develop a comprehensive heating strategy to reduce the carbon intensity of the heating sector in the period beyond 2020
- engaging with local government on.. energy efficiency initiatives and clean energy options, integrating energy options, scoping the opportunities for demand and supply related local energy action through integrating energy issues into local area planning, and bringing stakeholders together to find locally appropriate solutions that bridge the gap between demand and supply (e.g. …district heating solutions).

2.2.2 Commitments on Climate Action

The National Policy Position[9] on Climate Action and Low Carbon Development in 2014 set an objective to deliver "an aggregate reduction in CO2 emissions of at least 80% (compared to 1990 levels) by 2050 across the electricity generation, built environment and transport sectors".

3 Supporting Business Parks in South County Dublin

It is a top policy priority for South Dublin to promote enterprise and employment and the Grange Castle Business Park is the flagship location for encouraging foreign direct investment and fostering indigenous industry and employment.

This priority is emphasised categorically in the South County Dublin Development Plan 2016-2022:

"The economic growth of the State and Region over the last two decades has been strongly dependent on Foreign Direct Investment (FDI) and this is expected to continue. Winning: Foreign Direct Investment 2015 - 2019, the Industrial Development Authority of Ireland's (IDA) strategy, seeks to attract up to 900 additional investment projects to Ireland. It is important that South Dublin County seeks to protect and enhance the factors that make the region competitive for economic investment and that provision is made to accommodate investment at suitable locations. There is also an increased focus at Government level on strengthening entrepreneurship and enabling indigenous enterprises to access international markets as part of the export led growth strategy. The Development Plan has a role to play by ensuring that a clear and consistent framework exists for development, by making space for growing Irish businesses and by ensuring that policies and objectives are supportive of business."

Low carbon energy supply, security of supply and top class infrastructure are very important in supporting on the delivery of this priority.

[8] DCCAE, 2015. Ireland's Transition to a Low Carbon Energy Future 2015-2030
[9] 2014, Department of Communications, Climate Action and Environment. National Policy Position on Climate Action and Low Carbon Development;

There is a great opportunity in South County Dublin and other regions to develop district heating and cooling infrastructure to enable industrial heat users and data centres to avail of low-carbon energy-efficient utility services.

Data centres have a very large cooling load. Any cooling option that allows for turning off fans, chillers or air conditioners at a data centre site will be given serious consideration by the site operator. International examples of best practice show how data centres use district cooling to control the temperatures of the data halls and improve their energy-efficiency. The Stockholm Data Parks initiative is the most applicable example for Grange Castle Business Park. An inward investment package is offered by the government and is targeted towards new data centres of >5MWe capacity. The aim is to provide infrastructure for rapid deployment, and a key part of that offering is cooling as a service (CaaS) from the district cooling network. The local utilities have committed to provide a cost-effective cooling service via the DH network.

There is a real opportunity for SDCC and the IDA in partnership with local energy providers such as GEC to enhance the service offering and attractiveness for inward investment at GCBP. This would be by facilitating and/or investing in the provision of direct power and heating or cooling supply to both existing and potential future occupants of GCBP and surrounding areas.

The opportunity for waste heat recovery is very much recognised and supported by SDCC who own Grange Castle Business Park. The County Development Plan includes specific objectives as follows:

"It is the policy of the Council to support the development of low carbon district heating networks across the County based on technologies such as combined heat and power (CHP)…. The Council recognises that there is much potential for the capturing and utilisation of waste heat generated by premises that are currently generating un-used heat, which could be captured and re-used on-site or by premises on adjoining and nearby sites...".

There is a wider context for the whole South Dublin region, and the spatial energy demand analysis (SEDA) carried out in 2015[10]. This identifies areas of high energy demand density throughout the local authority area, and promotes joined up spatial planning of energy networks to optimise energy efficiency. In total the residential energy use is estimated to cost €161 million per year in the SDCC area and the commercial sector €174 million per Codema estimates.

There is also high energy density usage identified at the Clondalkin Industrial Estate and the Western Industrial Estate, to the west of Grange Castle and the Clonburris SDZ. The energy usage of Clondalkin Industrial Estate and Western Industrial estate is a fraction of that required at Grange Castle Business park.

The analysis identifies Low Carbon District Heating Areas of Potential with an identified heat density above 250 TJ/km2 as a priority. Grange Castle is one such identified area

[10] South Dublin County Council / Codema 2015, South Dublin Spatial Energy Demand Analysis

4 Grange Energy Centre supporting Climate Change Action

The proposed CHP plant at Grange would be classified by the CER as high-efficiency CHP subject to the necessary local energy network being in place to supply consumers with their required power, heat and cooling needs.

The CO_2-intensity of GEC is more than 50% lower per kWh than importing energy from the grid, without even considering any of the primary energy savings (PES) benefits of CHP (See below graphic).

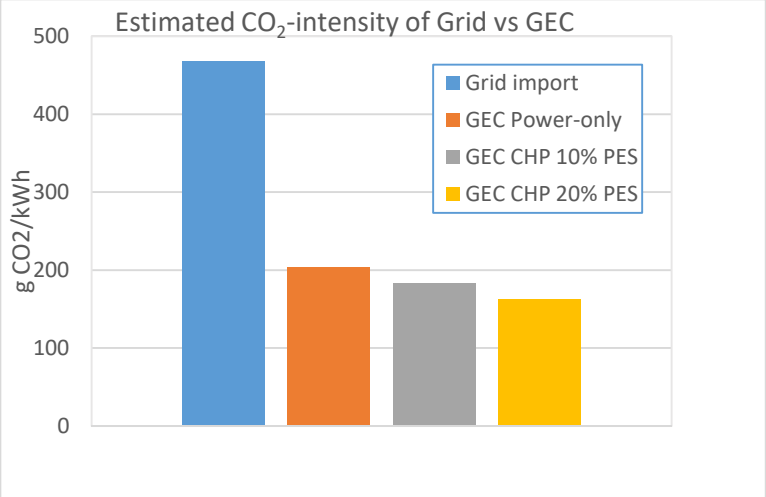

Figure 2: CO2 savings versus grid with different primary energy savings levels (BioXL)

GEC is located in one of the most populous and energy-intensive areas in the country. There is sufficient consumer demand within reasonable proximity of GEC to justify the supply of excess heat from GEC to surrounding homes and businesses. Doing so would allow GEC to become a low-carbon, sustainable energy supplier with significant environmental and financial benefits.

Technical assessment carried out by independent consultants for GEC have assessed an overall thermal base load of ~ 49 MWth within a reasonable geographic proximity of GEC. This is based on supplying steam to nearby pharmaceutical plants, cooling to adjacent data centres and the supply of heating to a new development with c. 9,000 houses and mixed commercial buildings at Clonburris.

5 Supporting Inward Investment in Business Parks and Data Centres

Ireland is an attractive place for foreign direct investment and maintaining this status is a key concern for South Dublin County Council. According to the South Dublin County Council Development Plan[11]:

"The economic growth of the State and Region over the last two decades has been strongly dependent on Foreign Direct Investment (FDI) and this is expected to continue... It is important that South Dublin County seeks to protect and enhance the factors that make the region competitive for economic investment and that provision is made to accommodate investment at suitable locations."

[11] http://www.sdcc.ie/services/planning/development-plan/plan-2016-2022

Sustainability and environmental concerns are now a key corporate consideration in making an investment in the Irish economy, or elsewhere as the case may be.

Ireland is at a competitive disadvantage when it comes to the key metrics of CO_2 emissions and absolute cost of electricity. We note in particular that other EU member states actively highlight their advantage in this regard (See figure below).

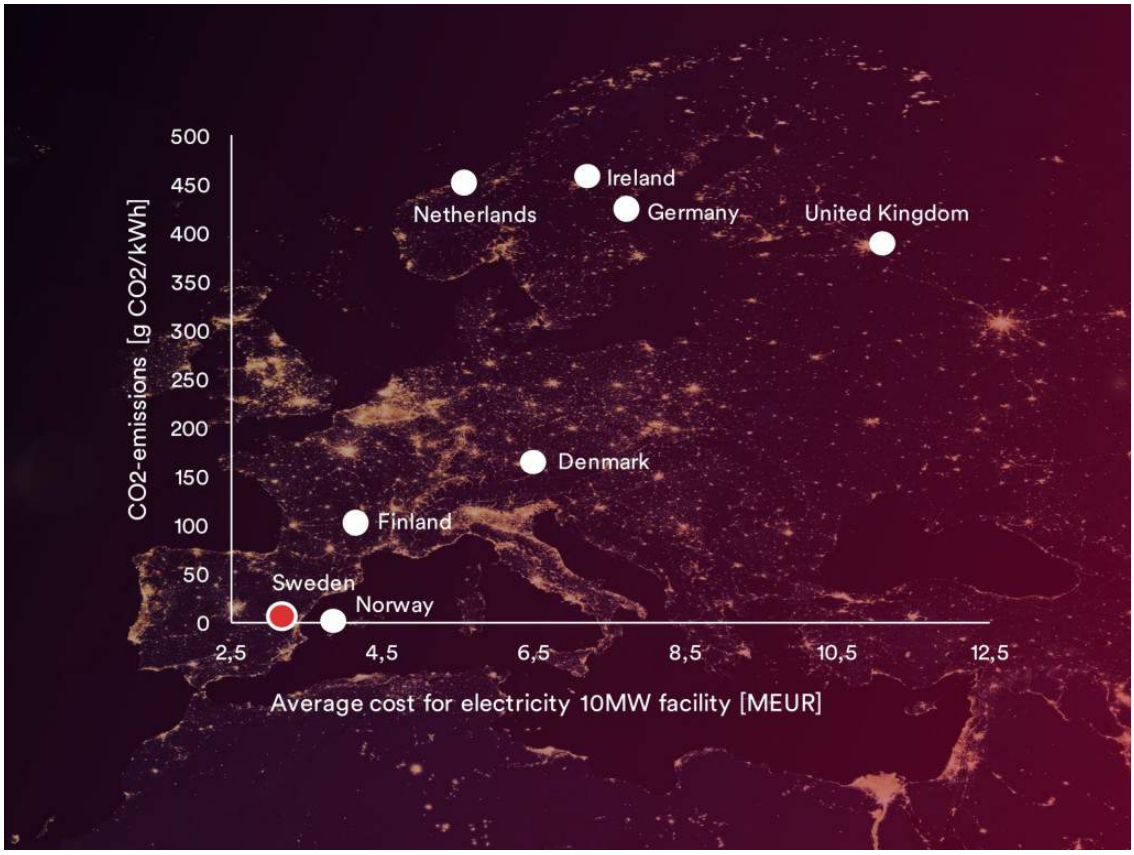

Figure 3: CO_2 and Cost Comparisions for Attracting Data Centre Investment (Node Pole)

At the moment, a generator within a business park is prevented under the 1999 Electricity Act from supplying an adjacent power consumer via direct line. Allowing direct access between a generator and a dedicated localised end-user provides for an efficient direct line supply of electricity without losses. It also reduces the need for expensive network reinforcements to carry electricity via long-range transmission lines.

It is recommended that the government include a practical “direct line” possibility as a planning principle within the NPF to support sustainable local energy generation.

The direct use of power combined with the efficient use of excess heat, steam and chilling from GEC presents a unique opportunity to enhance the profile of GCBP and the surrounding area as a location of choice for industry, particularly for data centres.

The implementation of this at GCBP will act as an example for other business parks around the country and further enhance Irelands reputation as a leading location for foreign direct investment.

5.1 International Best Practice in Data Centre Cooling

There are plenty of international examples where data centres use district cooling or onsite CHP for cooling. Many of these are at smaller scale, for example there are number of case studies described in the RenewIT project[12], including data centres: Mediapro in Barcelona, CHIC in Germany or Ancona Hospital in Italy.

Some relevant examples are highlighted below, particularly where it is on a larger scale and as part of a government inward investment programme. The Stockholm Data Parks initiative is the most applicable example for Grange Castle Business Park.

The Swedish government has made dramatic cuts to taxation of electricity for data centres. From January 2017, energy tax for data centres was lowered dramatically by 97%, resulting in the lowest price for electricity in Europe.

In addition to this very attractive financial incentive, the use of district heating and cooling is an important factor for siting data centres.

District cooling is also used at several data centres in Helsinki. Further examples can be found in Denmark.

5.1.1 Sweden: Stockholm Data Parks initiative

The Stockholm Data Parks initiative is designed around using the district heating and cooling network to improve the energy efficiency of data centres located in the city.

There are over 30 data centres connected to Fortum Varme's district energy networks and involved in the recovery of useful heat, and the data parks initiative plans to take further advantage of this synergy between district energy networks and data centres.

An inward investment package is targeted towards new data centres of >5MW_e capacity. The aim is to provide infrastructure for rapid deployment, and a key part of that offering is cooling as a service (CaaS) from the district cooling network.

The City of Stockholm has agreed to provide selected sites for sale or lease. Planning consent is in place or applied for construction. Local utility providers have committed to provide power, cooling as a service, heat recovery and dark fibre.

For example, in Data Park Kista, there are existing and proposed locations identified as data centre sites (Figure 4). They can be serviced by heating and/or cooling network from the adjacent Fortum heating/cooling plant.

[12] http://www.renewit-project.eu/case-studies/

Figure 4: Proposed Data Centre Sites at Data Park Kista (Stockholm Data Parks)

An innovative pricing incentive has been developed for CaaS, which essentially offers free cooling once the load exceeds 10MW$_{th}$. (See price curve in Figure 5).

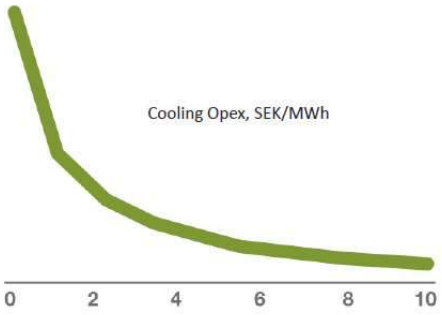

Figure 5: District Cooling Price Curve (Stockholm Data Parks)

5.1.2 Sweden: Node Pole Alliance

The Node Pole is a regional initiative between local governments and businesses in nearby cities to attract international investments into the region. The name Node Pole is a word play upon the regions location within the Arctic Circle and the region being a hub for data traffic. It has received very large inward investments around Lulea where Facebook have already constructed two large data centres.

The structure and ownership of the Node Pole alliance has changed recently. It is now owned by power companies Vattenfall and Skellefteå Kraft. Further information is available at www.thenodepole.com.

5.1.3 Norway: Lefdal mine

Norway has a concerted effort underway to attract large-scale data centres to the region. Energy Norway is identifying sites to attract inward investment[13].

Distance to a district heat network is listed as one of the criteria to support the favourable location of a datacentre in Norway. This is due to the opportunity to reject heat to the DH network. If a heat pump is used, the rejected heat temperature can be increased to levels where the data centre is a net contributor of energy to the DH network.

[13] Energy Norway, 2016. Locations for Data Center Enterprises (DCE) in Norway

There are some good examples of data centres using “free” cooling from seawater in Norway.

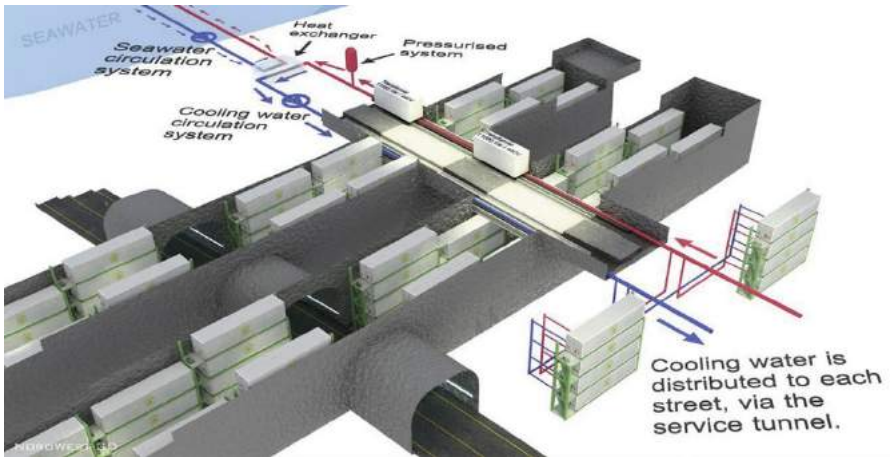

Figure 6: Innovative cooling with seawater distribution at Lefdal (www.lefdalmine.com)

In the Lefdal Mine Datacentre in Nordfjord cooling water is taken from the fjord lying next to the data centre. When taken from an appropriate depth, favourable water temperature can be held stable throughout the year. This is one of the world’s most energy efficient data centres. The cooling solution will lead to a PUE ranging from 1.08 to 1.15.

A similar cooling solution is chosen by Green Mountain data Centre at Rennesøy near by Stavanger.