An Taisce
The National Trust for Ireland

Commission for Regulation of Utilities
The Exchange
Belgard Square North
Tallaght
Dublin 24

Sent by email to: electricityconnectionpolicy@cru.ie

7th July 2021

Re. CRU proposed Direction to the System Operators related to Data Centre grid connection

A Chara,

In light of the serious issues with the security of Ireland's electricity supply and the rapidly increasing energy demand of data centres, An Taisce welcomes the CRU's current review of policies for connecting data centres to the grid and wishes to make the following submission.

1. Energy Demand, Climate and Renewable energy

Data centres are the built embodiment of the internet and data storage, housing rows of servers that rely on vast amounts of energy. Accounting for a considerable portion of electricity demand and the associated greenhouse gas emissions (GHG), data centres are identified as having the "*fastest growing carbon footprint from across the whole ICT sector*".[1] Given the intensity of data centres' energy usage, industry providers tend to select locations in Northern Europe where the cool and temperate climate is the preferred environment for development. However, this leads to these high energy consumers forming geographical 'clusters' and subsequently driving up local and national energy demand.

Ireland already hosts an enormous and disproportionate amount of Western Europe's data infrastructure, to the point where Ireland has been called the "data centre capital of Europe" due to its favourable climate and attractiveness for Foreign Direct Investment (FDI).

According to Host in Ireland's latest Biannual Report published in May 2021,[2] there are 70 data centres in operation using 900MW with a further eight under construction expected to use an additional 250MW. It is noted in the consultation paper that "C*onnection Agreements are already in place for over 1,800 MW of MIC [maximum import capacity] for data centres, with up to 2,000 MW of additional requests received*". An Taisce considers such a demand

[1] Whitehead, B., Andrews, D., Shah, A., Maidment, G. (2014) 'Assessing the environmental impact of data centres part 1: Background, energy use and metrics'. *Building and Environment 82*, pp. 151-159.
[2] https://www.hostinireland.com/report#:~:text=Publication%20Date%2011th%20May%202021&text=Host%20in%20Ireland%20is%20an,location%20to%20host%20digital%20assets.

on the national grid to be disproportionately high, considering Ireland's "*current demand peak of around 5,500 MW*".

This proliferation of data infrastructure has largely gone unchecked, and data centres now consume 11% of Ireland's total grid-generated electricity. It is noted in the consultation paper that data centre demand (from existing and proposed connections) is projected to account for 25-33% of Ireland's electricity demand by 2030. Estimates by the Irish Academy of Engineers indicate the issue to be even more pressing, with an increase to 31% by 2027 projected.[3]

Significant progress in decarbonising Ireland's electricity supply notwithstanding, we consider that the current and projected rate of data centre energy and grid connection requirements is inconsistent with national climate and environmental policy objectives. According to the Irish Academy of Engineers, data centres will add between 1.5 and 3 million tonnes of CO_2 to Ireland's overall greenhouse gas emissions by 2028.[4] This trajectory is not conducive to the achievement of Ireland's legally binding climate targets.

Furthermore, by increasing overall energy demand in Ireland through the uninhibited development of data centres, we are actively diluting the end benefit of renewable energy that has been added to the grid over the past 20-30 years. The substantially increased demand on the grid due to data centre connections will increase the overall amount of electricity required from renewable sources to meet our 2030 target, therefore potentially causing Ireland to miss binding targets, both in terms of renewables share and emissions reduction.

Crucially, An Taisce notes the precarious condition of the national electric grid, and the need for review of data centre grid connections due to their implications for Ireland's energy security. We note in particular that:

> *"The CRU is concerned that continuing to allow data centres to connect in accordance with current arrangements will significantly impact the ability of the electricity system to meet the reasonable demands of all consumers including data centres."*
>
> *"According to the most recent draft GCS, it may not be possible to secure sufficient generation capacity with the necessary certainty to meet the projected rapid increase in electricity demand in the coming years and it is evident to the CRU that additional intervention is necessary now to ensure that security of supply is maintained."*
>
> *"Due to the rapid, disproportionate impact the increase in data centre connections has compared to other sectors of large energy user industries, the supply security and financial risk to the energy consumer is increased."*

[3] http://iae.ie/wp-content/uploads/2019/08/Data-Centres-July-2019.pdf

[4] Ibid.

It is noted that this "*risk is exacerbated by recent outages and drop-offs in the delivery of successful Capacity Remuneration Market (CRM) related generation projects, resulting in a significant increase in supply risk in the short term*".

An article in the *Irish Times* on 1st July 2021 (attached as an appendix) highlighted that 'emergency plans' are being devised by the Government for Dublin's electricity supply following concerns raised by grid operators with regard to potential power outages, should the current growth trajectory of 'power hungry' data centre development continue. While Ireland's wind energy portfolio grows steadily, the closure of power plants such as Huntstown, Co. Dublin and Whitegate, Co. Cork has exposed a concerning gap between electricity supply and the ever-growing demand. Calls to temporarily introduce fossil fuel-based electricity stations to make up this widening margin have grown louder following the eight system alerts since last November. The need for 'emergency plans' could easily extend to regions outside of Dublin as electricity demand grows, including from additional data centres.

Considering Ireland's reliance on intermittent wind (on-shore) has yet to be robustly supplemented by other renewable energy sources, such as solar or offshore wind energy, the increase in electricity demand may largely be met by fossil fuels. With the exception of emergency back-up fossil fuel generators that are already established, An Taisce deems it unacceptable to bring more fossil fuel-generated power on stream as we advance towards meeting Paris Agreement targets.

2. Consideration of Alternatives

It is noted that the mitigation options considered in this report were limited to a 'do nothing' scenario, a 'Moratorium on Data Centre Connections', and a number of 'Connection Measures'. We concur with the CRU that the risks associated with the do nothing scenario are not acceptable.

However, we also consider that, while a total moratorium on grid connections for data centres may not be feasible, there is greater scope for a combined alternative approach which would see greater restriction on the approval of grid connections. We would recommend a partial moratorium on connection agreements in highly grid constrained areas as well as greater specificity in the criteria for processing connection applications.

2.1 Partial Moratorium for Grid Constrained Areas

A partial moratorium on data centre grid connections could be enacted to cover regions facing serious grid constraints and concerns regarding energy security, namely the Greater Dublin Area (GDA) at present. Similar data centre moratoriums have been enacted globally, demonstrated by Amsterdam and Haarlemmermeer recently lifting a year-long ban on data centre development within these zones. The partial moratorium on data centres in an Irish context could follow the approach taken in the province of Flevoland in the Netherlands, where regional authorities plan to study the impact of large data centres on the local

community and infrastructure during its moratorium, before agreeing to any more facilities being built in the region.[5]

In placing a moratorium on data centre grid connections within the GDA, and additional grid constrained areas if needed, the potential worst-case scenario impacts of these developments on energy supply and security can be minimised.

Following this, it is also recommended that additional criteria (alongside or amending those already proposed in the consultation document) accompany the moratorium when determining connection applications.

2.2. On-Site Generation and/or Renewable Energy Contribution

An Taisce submits that any on-site generation capacity (beyond existing back-up generators) should not be fossil fuel based as this would exacerbate lock to fossil fuels and undermine progress towards binding climate targets.

We would recommend that new data centre developments should only be considered for connection to the grid if they provide a new, directly linked supply of renewable energy or match their energy consumption with a commensurate or greater dedicated contribution to Ireland's renewables supply elsewhere in the country.

2.3 Flexible Demand

An Taisce broadly welcomes the inclusion of data centre flexibility in response to overall energy demand and supply as a criterion for connection. We would recommend that the related measures and/or technologies utilised by data centres in other jurisdictions as noted by the CRU be further elaborated and moreover, examined in an Irish context so as to better ascertain which measures would be appropriate in meeting the proposed criterion for flexible energy demand here.

Recent studies have shown the benefits of adopting such measures to reduce data centre energy consumption and increase flexible demand, with one such measure being intelligent management in cloud computing data centres. Using this technology data centres can alter workload management, for example, consolidate virtual machines, with each presenting a specific workload, onto a set of reduced physical servers so that idle resources are powered down. Also, rescheduling or postponing workloads to a future time period to reduce utilisation can contribute to workload management. Similarly, migration, where workloads are geographically moved (virtually) to other data centres under less constraint, can also manage energy demand (however, the host centre must also be compatible with the same technology).[6]

[5] Moss, S (2021) 'Updated: Dutch province of Flevoland enforces temporary data center moratorium', *Data Center Dynamics*, 15 June.
[6] Basmadjian, R., (2019) Flexibility-based energy and demand management in data centers: a case study for cloud computing. *Energies*, 12(17), p.3301.

Other measures of intelligent management in cloud computing include hardware management such as frequency scaling which allows the scaling down or up the frequency and voltage of processors, with the ability to scale to lower frequencies during low/medium utilisation periods to reduce the power demand of servers. Other hardware management measures include improved cooling systems, energy optimisers, etc. Following recent studies examining cloud computing potential, it was found these technologies can provide up to 33% overall energy savings and up to 50% power demand reduction during demand-response periods in some cases.[7]

We note the following excerpt from the consultation document:

> "*Without mitigation, these objectives [decarbonisation, local and regional security of electricity supply, protection of end user costs] will be difficult to achieve in the context of rapid demand growth of data centres; the typically large energy use of each data centre; and the current low level of flexibility of data centres with regard to their demand."*

We consider that the inclusion of more specific flexible demand criteria for future data centre grid connections will be vital for the successful mitigation of data centre impacts, reduction of energy demand and alleviation of their pressure on the national grid.

2.4 District Heating

In addition to the demand management grid connection criteria proposed, An Taisce recommends the inclusion of additional measures such as a district heating criterion under which applications that integrate the recapture of 'waste heat' through district heating systems are prioritised for connections (subject to compliance with the other criteria).

We draw attention to the following excerpt from the consultation paper:

> *"The CRU considers that data centres, as the single largest homogenous demand driver, now need to be flexible and to demonstrate this by providing solutions to enable further grid integration while respecting the ultimate need to maintain security of supply and protect the public interest."*

It is our interpretation that such "solutions" may extend to downstream measures such as heat recovery - in a way that maximises electricity taken from the grid by data centres and ultimately works toward a more circular economy for energy. In light of these circumstances, An Taisce recommends prioritising for connection applications data centres with integrated district heating schemes. This could also help alleviate pressure on the grid from electricity-derived heating demand.

Heat which would otherwise be dissipated as waste as a result of cooling or other data centre processes can be harnessed for end-users to meet their heating needs. While there is increasing recognition being placed on the need for data centres to become energy

[7] Ibid.

'prosumers' by generating renewable energy, downstream strategies have been largely overlooked. Research has emerged which reveals that data centres can have a waste heat recovery potential of up to 68%.[8] In countries such as France and Denmark, low-grade heat is being captured and distributed through a network of insulated pipes to provide a source of low-carbon heat to nearby offices and homes.[9]

Despite this potential, Ireland has one of the lowest district heating portfolios in Europe.[10] Policy focus has been turned toward heat pumps to begin to replace the dependence on imported oil and gas to meet national heating needs. This transition, although positive from a climate perspective, is bound to place additional strain on the electric grid as heat becomes more centralised and grid-focused.

The Tallaght District Heating Scheme serves as a working example of how this can be achieved in an Irish context. The first not-for-profit utility company in Ireland, 'Heatworks' will deliver waste heat from a data centre in Tallaght through a district heating network to the nearby technical institute and, at a later phase, apartment buildings.[11] It can therefore serve as a guide for the navigation of future heat recovery projects where the absence of a 'middle man' between data centres and end-users is fulfilled by community-driven enterprise.

Please acknowledge our submission and advise us of any further consultation periods.

Yours sincerely,

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[8] Huang, P., Copertaro, B., Zhang, X., Shen, J., Löfgren, I., Rönnelid, M., Fahlen, J., Andersson, D., Svanfeldt, M. (2020) 'A review of data centres as prosumers in district energy systems: Renewable energy integration and waste heat reuse for district heating', *Applied Energy, 258*, p. 114109.
[9] Gartland, D (2018) 'Developing District Heating in Ireland', *Sustainable Energy Authority of Ireland*, 16 March.
[10] https://www.seai.ie/publications/2016_RDD_79._Guide_District_Heating_Irl_-_CODEMA.pdf
[11] Gartland, D (2018) 'Developing District Heating in Ireland', *Sustainable Energy Authority of Ireland*, 16 March

Electricity supply concerns spark emergency plans for Dublin

Power to be generated in North Wall in response to grid alerts and winter fears

About 9 hours ago

Arthur Beesley

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The Government is taking steps to provide emergency power generation in Dublin because of serious constraints on the electricity network that have raised concern about supplies next winter.

The push to bring in temporary generators in the autumn follows a series of system alerts since November in which grid operators warned about supply levels.

To facilitate the move, the Coalition is steering a legislation through the Dáil so emergency generators can bypass planning laws. “The Government has approved amendments to the Planning and Development Act . . . to ensure temporary generation could be permitted in a timely manner if required,” said the Department of Environment, Climate and Communications.

According to a senior electricity market source, the ESB plans to install temporary generators at the North Wall in Dublin on a brownfield site. “Within the industry, we’re all very exercised about it, and understandably so. It’s going to be a very hard winter,” the source said.

The ESB declined to comment.

The moves follow the shutdown of big power plants at Huntstown, Co Dublin, and Whitegate, Co Cork, which are closed for repairs that will take months to complete.

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Tight margins

“Simultaneous outages of two large generators increase the risk of tight margins this winter, if these do not return as planned by November,” said EirGrid, operator of the national grid.

EirGrid added that it was working with the Commission for Regulation of Utilities and the department to “proactively explore a variety of options (including potential temporary generation and other measures) to mitigate any issues and manage the demand and supply balance in order to maintain system security”.

Power demand has grown sharply in recent years in line with economic growth and a big rise in energy demand from power-hungry data centres.

Although successive governments have seen data centres as a good source of foreign direct investment, the regulator wants curbs on new developments. It warned recently that “consumers were facing rolling blackouts” if the current system for connecting new data centres to the grid was not changed.

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Rising electricity demand has coincided with the closure of older power stations as the State increases its reliance on windmills to meet climate targets.

Below optimum

There have been eight system alerts since November, three on the all-island network that the State shares with Northern Ireland and five that were confined to the North. Such alerts are issued when the level of surplus power above market demand is lower than optimum to cover any contingencies.

“As generators close and others age, margins are forecast to become tighter until new, efficient generation projects are built and connected to the system,” EirGrid said.

The department said the need for “more conventional gener was recognised. “This will be needed to ensure continued se electricity supply while supporting the growth in renewable generation from wind and solar energy,” it said.

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"It is expected that the majority of new conventional generation capacity will be gas-fired – primarily to replace peat-, coal- and oil-fired generation capacity that is being phased out over the coming years. While this new generation capacity will be reliant on fossil fuels, it will only run when needed – for instance during times of low wind. Its primary function will be to support the operation of the electricity system and ensure security of supply."

The regulator acknowledged "challenges" responding to significant demand growth and the retirement of existing generating stations. It also cited challenges "resulting from our global leadership position in accommodating intermittent wind energy" on the grid.

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