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Library & Research Service

Spotlight

Data centres and energy

No. 2 of 2024

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Abstract

Ireland hosts a thriving and growing data centres sector. The energy footprint of these services has grown rapidly, and due to AI are set to grow further, causing some concern about the stress they place on electricity supply, grid infrastructure, and challenges to Ireland's climate action ambitions for energy decarbonisation. In this *Spotlight* the scale of data centres in Ireland is explored, including brand new data on their electricity consumption and forecasts for future demand. Finally, private wires, power purchase agreements and the future of regulations for transparency about their environmental footprint are described.

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Summary

Ireland has emerged as a leading host for data centres in Europe. We are all digital consumers, and the processing and safe storage of data from all sectors of life are considered to be part of Ireland's critical infrastructure. However, by necessity data centres are very large consumers of electrical power. There have been significant technological gains in power efficiency, yet there is a direct relationship between the scale of the digital landscape we use and depend upon, and the electricity and other energy sources that data centres require. Furthermore, the proliferation of artificial intelligence (AI) programming is necessitating an much-accelerated demand in data services.

There is currently no single agency or government arm responsible for data centres, where they are planned/approved or oversight of their operation. There is no central open geographical data source describing the locations or summarising the activities of the country's data centres.[1] Information about their operation and impact is very disparate, and naturally commercially sensitive information is not in the public realm, including detail on prices paid for energy/electricity supply.

The key issue is that climate action ambitions for Ireland are centred around the decarbonisation of our energy. The majority of Ireland's greenhouse gas emissions-reducing targets map on to clean and renewable energy, coupled with electrification of domestic, business and industrial power needs. The speed at which renewable electricity power generation is coming onstream is being far outstripped by the rate of growth of power demand by the data centres sector, and this is true not just in Ireland but globally too. Companies that build and operate data centres do take this challenge seriously, and are amongst the leading procurers of renewable energy.

In this *Spotlight*, the data centres sector in Ireland is described and the latest statistical data (for 2023) on the electricity they consume is presented, providing an overview of the scale of the challenge of their energy needs. The use of power purchase agreements and future policy decisions on private electricity infrastructure is described, concluding with an overview of new EU-led requirements on energy and efficiency data and reporting for the data centres and IT sector.

Key issues

- Ireland is a key data centre market, with very strong future services demand growth, especially in light of advances in AI.
- The latest (2023) data show that data centres consume 21% of all metered electricity from the grid, increasing from 18% in 2022.
- Not only are the current electricity demands high, the current connection agreements in place but not yet drawn down are larger still.
- In the past three years, the increase in electricity consumption by data centres is in the order of 1 GWh, year-on-year. This is virtually outpacing new renewable electricity sources such as domestic solar PV and onshore windfarms.
- Ireland's key climate action ambitions for both decarbonised electricity generation and wider electrification of transport, business and industry mean that there are competing demands on the aging grid infrastructure and the electricity power supply. The rate at which renewables are developing is not keeping up with demand.

[1] Datasets - data.gov.ie

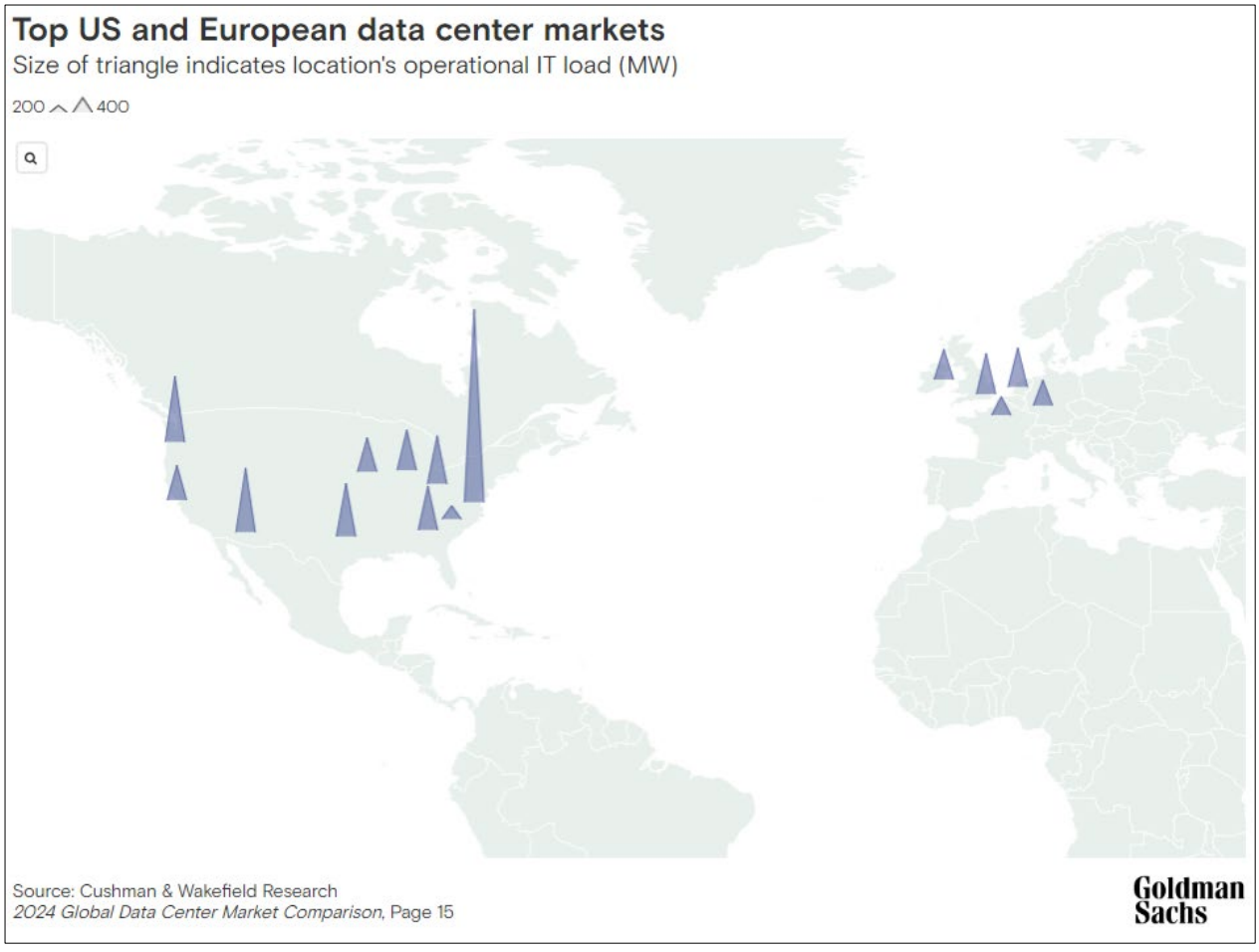
- There will be a need for large energy users such as data centres when the full build-out of offshore renewables is met, circa 2030 and beyond.
- New policy decisions are needed on private wire connections to the electricity grid, and data centre-associated companies pursuing private renewable electricity generation projects off the grid.
- Decisions on new connections to the electricity grid and the gas network need to be balanced against the wider climate action targets with respect to decarbonisation of electricity generation, and, the economics of the ICT sector in Ireland.
- Ireland must soon transpose the EU Energy Efficiency Directive 2023/1791 with requirements on transparency for sustainability credentials of the data centres sector.

Introduction

Ireland, and Dublin in particular, is recognised as an up-and-coming global data centre hub. It is not *the* dominant hub in Europe – the group term 'FLAP-D' being Frankfurt, London, Amsterdam, Paris and Dublin is used by market analysts to describe the biggest capital hubs for ICT infrastructure in Europe. Dublin/Ireland is notable amongst these, due to the recent and rapid growth in data centres here, and, because Ireland has attracted the world's leading technology multinationals to establish their European bases.

Describing the energy demand, Dublin's data centres market is ranked at 16th place globally for IT operational power load, by the Cushman and Wakefield 2024 Global Data Center Market Comparison.[2] For a global context, the map (Figure 1) below displays the top five European hubs–Frankfurt, London, Amsterdam, Paris and Dublin–and the top ten United States locations, described in terms of their operational power load in megawatts (MW). Dublin represents 738 MW, ranking behind London and Amsterdam, but ahead of Paris and Frankfurt in terms of power load. The EU markets are comparable to many in the US. Virginia, US has the largest power load of 4694 MW (over six times that of Dublin.)

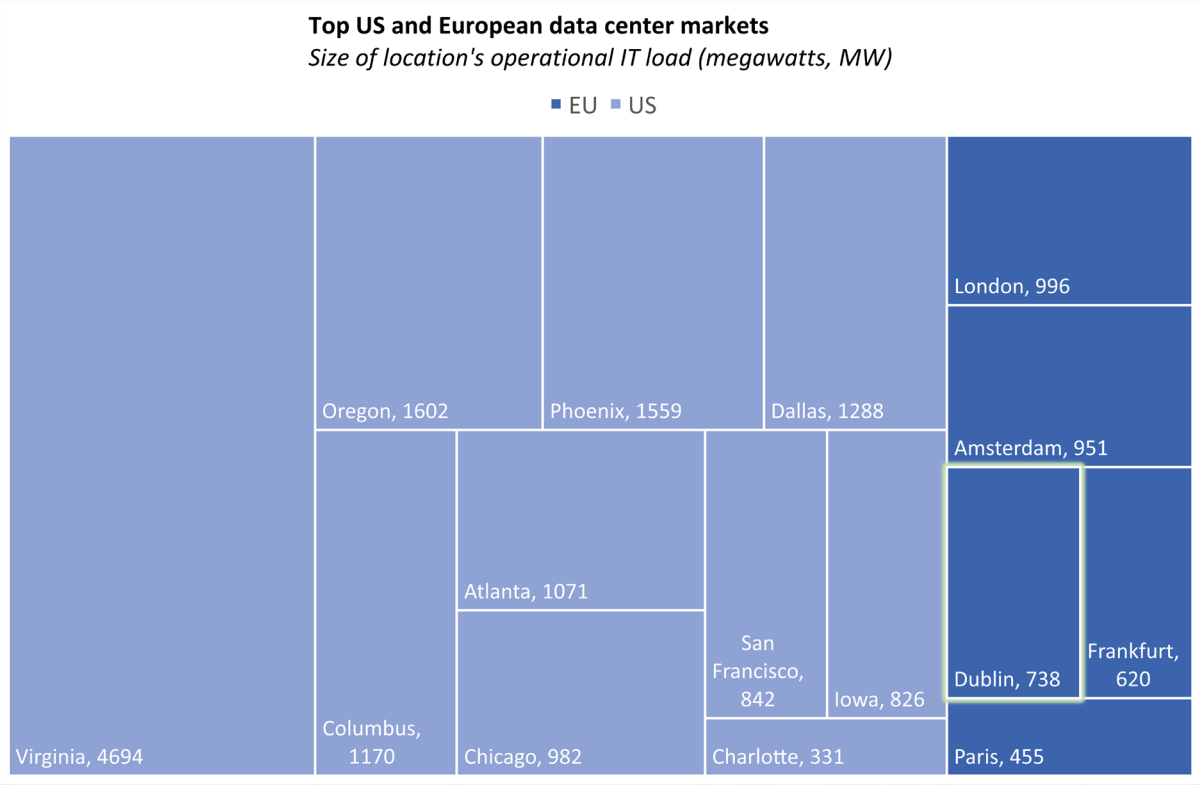
Figure 1 Map of the relative sizes of data centre market hubs, in terms of energy load (megawatts, MW), for top five hubs in Europe and top ten in the US.



Source: AI is poised to drive 160% increase in data center power demand (goldmansachs.com)

[2] 2024 Global Data Center Market Comparison (cld.bz)

Figure 2 Treemap of the top 10 US and top 5 EU data centre markets, with Dublin highlighted.



Source: After AI is poised to drive 160% increase in data center power demand (goldmansachs.com)

Whilst there is a lot of commentary about 'data centres', often in technical and market analysis they are described under an umbrella term of 'ICT infrastructure' to encompass the ICT sector such as data centres, their hardware therein, connectivity networks and fibre optics, power transmission networks, and the operating companies themselves. As demand for all things connected to the internet has grown, so too has the need for data centres and ICT infrastructure. In 2022 in Ireland, 82% of all information and communication electricity demand came from data centres.[3]

The increasing presence of data centres globally has catalysed debate due to concerns about the scale of their energy consumption and impacts on security of energy supply, the competence of the infrastructure they draw on, their environmental impact such as energy-associated greenhouse gases (GHG) emissions and water demand, and energy costs. In 2022 the Government Statement on the Role of Data Centres in Ireland's Enterprise Strategy stated that "data centres are core digital infrastructure and play an indispensable role in our economy and society."[4]

A data centre's critical requirements are: non-interrupted operation and no loss of secure data storage, a stable electricity power supply, and the ability to optimise the ICT equipment under stable operating conditions (the primary ones being temperature control, usually cooling of the operational environment due to the heat generated by that equipment). In Ireland, there has been a rapid expansion of data centres in the last fifteen or so years. There are many contributory factors to this growth, but very broadly they include a combination of (in no particular order):

[3] Energy-in-Ireland-2023.pdf (seai.ie)

[4] government-statement-on-the-role-of-data-centres-in-irelands-enterprise-strategy.pdf

- Ireland's temperate climate ('goldilocks' conditions that are efficient to operate in),
- the national and EU legal landscape,
- communications infrastructure and subsea internet connectivity, to UK, continental Europe and North America,[5]
- economic/taxation factors that attract small-medium and globally dominant technology companies and their workforces.

These have created a cumulative growth effect with associated industries specialising in building, maintaining, powering, and servicing data centres. Uniquely, Dublin has attracted a range of sizes of data centres, from 'hyperscale' describing the largest (and more demanding in terms of their operation and uptime) associated with technology-sector multinational companies, to mid-size and smaller and hybrid centres. This clustering effect is significant; as larger companies build and operate their own centres; the smaller operators will co-locate and use a mixture of centre ownership and leasing.

[5] There are now numerous undersea cables. Hibernia Atlantic connects the US, Cork, and Dublin through several routes. EXA Atlantic - Submarine Networks provides high capacity subsea cable access from Ireland to the US; the Emerald Express runs from Long Island to Dublin Submarine cables: Preserving the Mid-Atlantic's telecommunications superhighway (midatlanticocean.org)

Data centres: what, where and how

Amazon defines a data centre as “a physical location that stores computing machines and their related hardware equipment. It contains the computing infrastructure that IT systems require, such as servers, data storage drives, and network equipment. It is the physical facility that stores any company’s digital data.”[6] The EU adopt the definition (2.6.3.1.16. of Commission Regulation EU 2022/132) as "a data centre is defined as a structure or a group of structures used to house, connect and operate computer systems/servers and associated equipment for data storage, processing and/or distribution, as well as related activities."[7]

There is no Irish legal definition for a “data centre” and a search for the term “data centre” does not return any results on the Irish Statute Book.[8] Section 49 (not yet commenced[9]) of the *Planning and Development Act (2018)*[10] defines Communications and Data Infrastructure as a development comprising the following: “A facility consisting of one or more than one structure, the combined gross floor space of which exceeds 10,000 square metres, used primarily for the storage, management and dissemination of data, and the provision of associated electricity connections infrastructure.” Currently, irrespective of size, all data centre building and expansion planning applications in Ireland are submitted to the relevant local authority. However, upon commencement of Section 49 a planning application for a data centre above the specified size shall be classed as a Strategic Infrastructure Development,[11] and will be lodged directly with An Bord Pleanála not the local authority.[12]

Recent reports state that there are currently 82 data centres in Ireland, and there are a further 14 currently in the planning process and under construction[13] (cited in some media reports and attributed to market analyses by Bitpower). There is flux in this number, with some movement on what is counted as a single centre where there are multiple operations under one roof, or multi-tenant locations, or where there is close or co-location of a large energy user and a data centre. Of those, the Environmental Protection Agency (EPA) report that there are approximately just 13 data centres with a licence for industrial emissions and a handful currently seeking licenses.[14] In the Dublin/M50 region there are notable campuses that home numerous data centres, including Blanchardstown Corporate Park, Mulhuddart, Clonee, Grange Castle Campus, Parkwest Campus, and Profile Park Campus. In the map below, the locations of 69 data centres are shown in the Dublin region. There are a handful in/around Galway and Cork. This map is a snapshot, does not display every data centre, but does show a number of clusters in the Dublin region.

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[6] What is a Data Center? - Cloud Data Center Explained - AWS (amazon.com)

[7] Publications Office (europa.eu)

[8] Irish Statute Book

[9] Irish Statute Book

[10] Planning and Development (Amendment) Act 2018, Section 49 (irishstatutebook.ie)

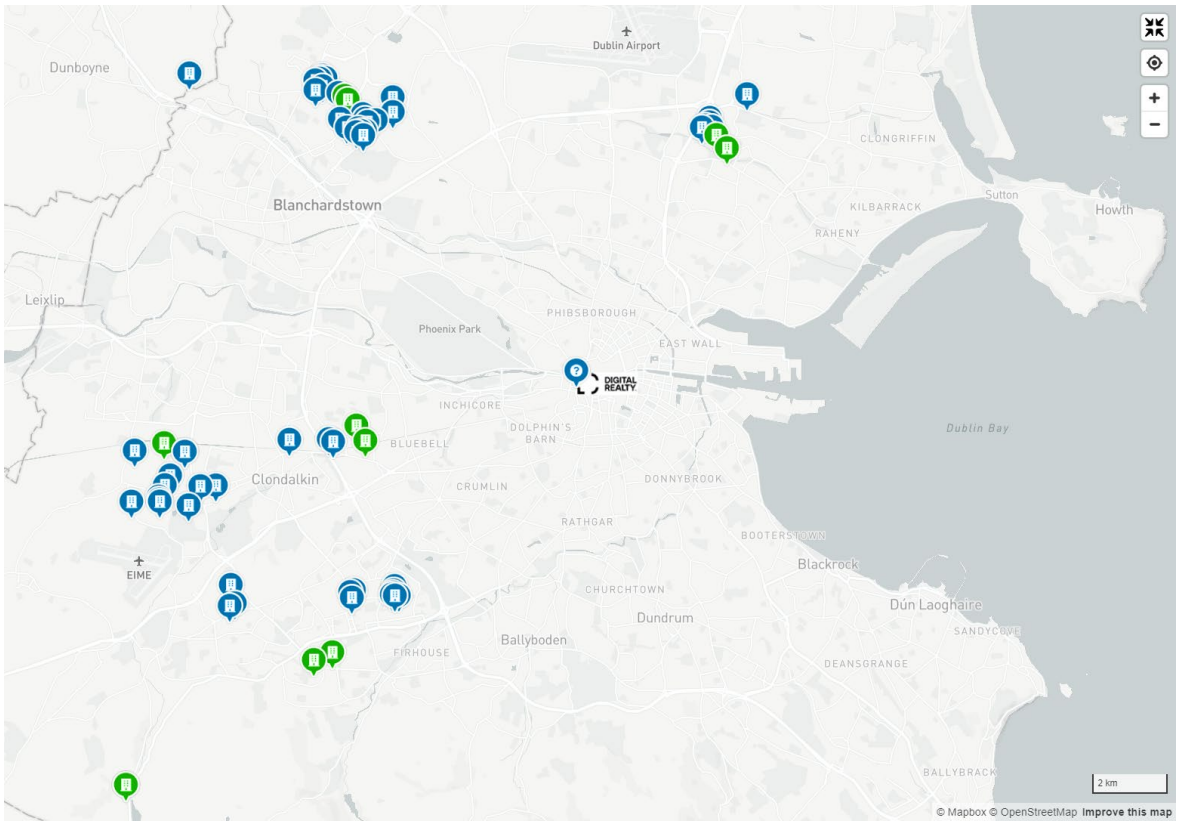
[11] 7th Schedule SID (Applicant): Definition of SID | An Bord Pleanála (pleanala.ie)

[12] Permitting Irish Data Centres – What You Need to… | Mason Hayes Curran (mhc.ie)

[13] https://open.spotify.com/episode/7m8OZ2gb7tNU75uXhMZYsT?si=C2Kf77voR4CUpyEq62trnQ; Digital Dashboard (bitpower.ie)

[14] Personal communication, EPA. April 2023.

Figure 3 Map of data centre locations (displaying 69 sites here) in the Dublin region.



Source: Dublin Data Centers (datacentermap.com)

Size and classification

There are various classification systems for data centres (some terms used are not formally defined, and not all are described here.) Data centres are described in terms of their power capacity (power in watts, or millions of watts mega-watts MW) rather than the land area footprint. The Irish data centre sector is comprised of roughly equal numbers of small (0–5 MW), medium (5–15 MW sized), and large (greater than 15 MW) sized data centres and the average designed power capacity being 15.3 MW.[15] There are 25 small data centres, 30 medium sized data centres and 27 large data centres described by Bitpower in June 2023.

The term 'hyperscale' is used to describe a large built-for-purpose centre, usually owned by the company using it, and often with on-site power generation. As of July 2023, 77% of the designed power capacity of the Dublin region data centres is classed as hyperscale.[16] It is not clear how many hyperscale data centres there are in Ireland, it is probably in the order of ten or fewer. In Ireland, these include centres in operation for Microsoft, Amazon, Google, and Facebook/Meta.[17] The other three types of data centres are termed colocation wholesale, colocation, and private.

Data centres are certified into four classifications called tiers. The highest is described as Tier 4 for data centres that have their own on-site backup electricity generation to ensure uninterrupted operation. This tier classification requires 99.9% uptime (or 26 minutes of downtime per year).

[15] Digital Dashboard (bitpower.ie)

[16] Operational Scale Snapshot, Digital Dashboard (bitpower.ie)

[17] Bitpower_Report_Substance_pdfA (seai.ie)

Most Irish data centres are Tier 3, a few are Tier 4.[18] The term hyperscale and Tier 4 is not interchangeable, *i.e.* a large centre does not necessarily mean it has the most power back-up capacity. They are further described below in terms of analysis of the Irish data centres market.

Connection to the electricity grid

The main gateways for a new data centre are approvals for the following: (1) a connection offer at the initial stages – this from either EirGrid or ESB Networks (ESBN) (EirGrid are responsible for the transmission system and ESBN are responsible for the distribution network.) Between them there are responsible for offering and regulating the connection to the electricity supply grid;[19] (2) the building planning applications, (currently) with the relevant local authority; (3) the second stage of the connection offer with EirGrid once planning permission is granted; and (4) and the licensing of industrial emissions, by the Environmental Protection Agency (EPA), *only* applicable in the case where there is on-site power generation that form a source of industrial emissions of greenhouse gases, where there is combustion of fuels in installations with a total rated thermal input of 50 MW or more. The EPA has a role in licensing data centres insofar as they are categorised for industrial emissions licensing[20] in line with the Industrial Emissions Directive.[21] Notably there is no description or category for data centres within this Directive; data centres are the concern of the Directive and the EPA only with respect to licensing the industrial emissions that result from site-specific power generating infrastructure. Tangentially, some data centres are also licensed by the EPA with respect to wastewater discharge.

Depending on the planned power demand and the location, a data centre will form a connection agreement with either EirGrid (the transmission system operator) or ESBN (the distribution system operator). The power supply capacity in the Dublin region is greatest, so a relatively large, large energy user, may get a connection agreement directly from ESBN (suggested to be in the order of 40 or 50 MW or smaller), and the largest power users will connect via EirGrid. Conversely, a relatively small connection away from the Dublin region might require an EirGrid connection agreement (in the order of 30 MW or larger).[22]

Market analysis

Bitpower is a prominent market research company based in Ireland and is frequently referenced in reports on the data centre industry in Ireland. Most of this information is gathered through voluntary reporting by directly surveying the industry players. Below is the current dashboard it has on the data hosting industry (dated July 2023). The analysts report a "tripling of capacity since reporting began" in 2017.[23] It is notable that in this dashboard, the 82 operational data centres are reported to represent 1261 MW of power. This is significantly larger (close to double) compared to the 738 MW reported by the Cushman and Wakefield 2024 Global Data Center Market Comparison.[24] The difference is somewhat explained by operational, rather than built-out, power capacity.

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[18] Ireland Data Center Market Size & Share Analysis - Growth Trends & Forecasts (2023 - 2028) (researchandmarkets.com)

[19] Data Centre Offer Policy Information Note (eirgrid.ie)

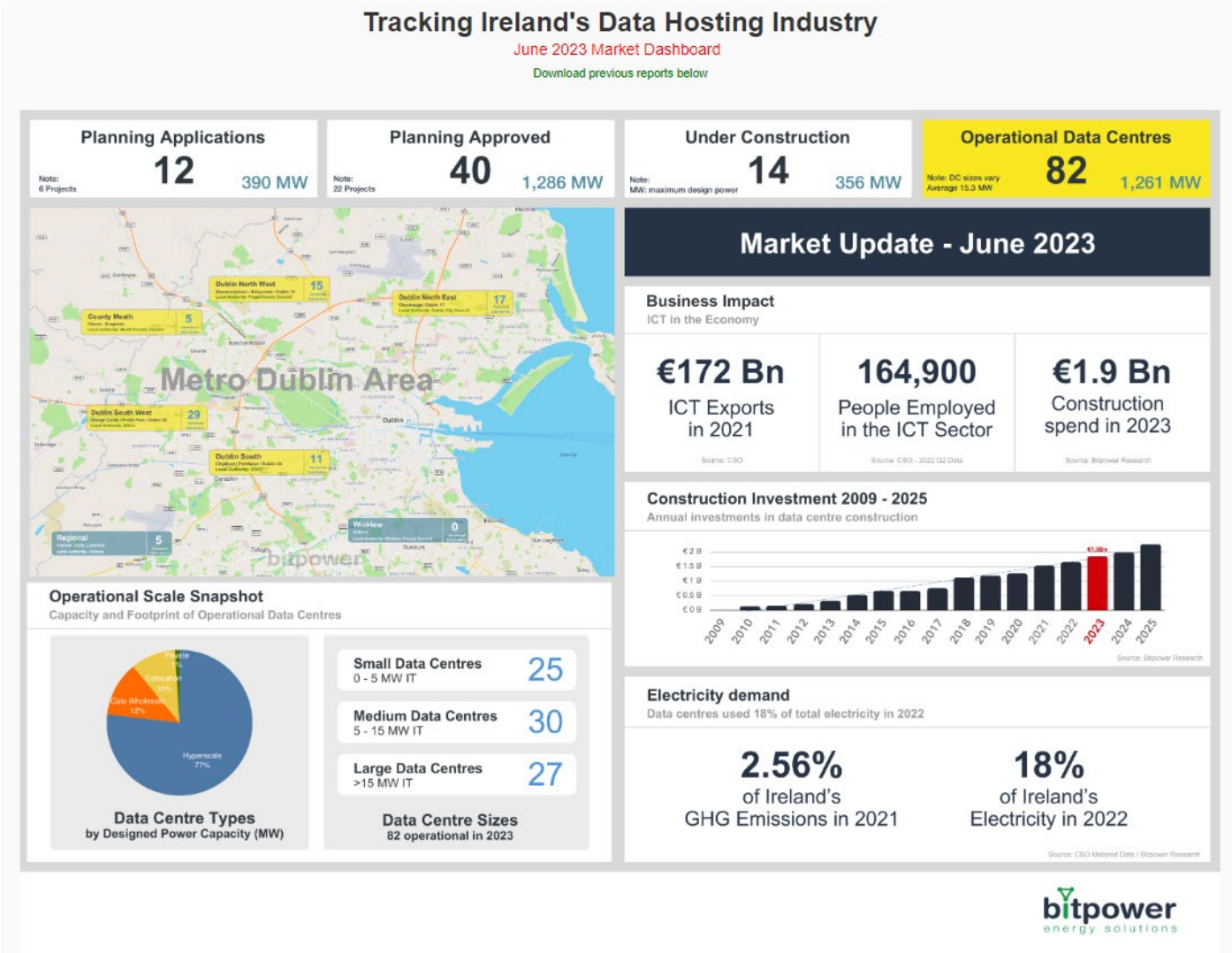
[20] Industrial Emissions Licensing (IED) | Environmental Protection Agency (epa.ie)

[21] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02010L0075-20110106

[22] Based on personal communication – refer to author.

[23] Digital Dashboard (bitpower.ie)

[24] 2024 Global Data Center Market Comparison (cld.bz)



Source: Digital Dashboard (bitpower.ie)

Bitpower's dashboard provides a useful overview of Ireland's data centre industry today. The last comprehensive review publication is from 2017 and is a Bitpower analysis supported by the industry group Host In Ireland.[25]

One report, Ireland Data Center Market Size & Share Analysis - Growth Trends & Forecasts (2023 - 2028),[26] describes the variety of Irish data centre sizes or tiers. The tier classification for data centres is defined in part by the stability of their power supply and operational uptime. There are four tiers, Tier 4 being the most robust. Tier 4 data centres have their own on-site backup electricity generation to ensure uninterrupted operation. This tier classification requires 99.9% uptime.

[25] Bitpower_Report_Substance_pdfA (seai.ie)

[26] Ireland Data Center Market Size & Share Analysis - Growth Trends & Forecasts (2023 - 2028) (researchandmarkets.com)

According to this report, Tier 3 is the preferred/commonest type in Ireland. Further, the breakdown of the sector by tier is set out below (do note this is from 2022 so might be already outdated):

> "Tier 3 data centers are the most preferred in Ireland and registered at an IT load capacity of 164.61 MW in 2022. The capacity is expected to grow from 447.25 MW in 2023 to 1,080.85 MW in 2029, registering a CAGR of 15.84%. A Tier 3 data center has redundant and dual-powered servers, storage, network links, and other IT components. SMEs generally prefer using at least a Tier 3-rated system. SMEs are a vital component of the Irish economy, comprising 99.8% of active enterprises and 67.5% of all persons employed. End users such as BFSI and media and entertainment focus on hyperscale facility colocation. As of 2022, there were around 25 Tier 3 data centers in the country, and around 11 upcoming data centers are under construction with Tier 3 specifications.
>
> Tier 4 data centers are the second most preferred data centers, mainly by large enterprises, as they provide 99.99% uptime. Cost constraint is the major drawback leading to the low adoption of Tier 4 facilities. However, with data traffic generation, the upcoming facilities will have Tier 4 certification since this tier enables the site infrastructure to sustain unplanned failures that would otherwise adversely affect the critical load. Tier 4 facilities are expected to hold a market share of 22.4% by 2029, up from 2% in 2023 and 66 MW by value in 2022.
>
> Tier 1&2 data centers are the least preferred due to their expected uptime of 99.671% (28.8 hours of downtime annually). These data centers are commonly utilized by micro businesses that want a cost-effective solution for their data storage needs. However, due to lower functionality, even SMEs are focusing on adopting wholesale colocation services under Tier 3 facilities. Tier 1 &2 DCs are expected to showcase the least growth through the forecast period."

Source: Ireland Data Center Market Size & Share Analysis - Growth Trends & Forecasts (2023 - 2028) (researchandmarkets.com)

Structure Research is another market analysis company and reports on data centre activities globally. All results relating to Ireland on its research pages are behind a paywall but some of the headlines give a snapshot of reports on some of the energy agreements by prominent tech companies.[27]

Data centres licensed for Industrial Emissions by the EPA

Some of the larger data centres have installed on site back-up power generation. Typically using diesel, natural gas or in some cases hydrotreated vegetable oil (HVO),[28] these onsite generators are usually designed for emergency and backup electricity generation rather than to operate for a length of time. It is difficult to quantify the size or potential emissions from all of these backup generation facilities, because the majority of them do not require permitting. The EPA have an online Licence and Enforcement Access Portal (LEAP), which is searchable.[29] Classified under licensees of Industrial Emissions; there are data centres with licenses to generate electrical power

[27] You searched for ireland - Structure Research | Cloud, Hosting & Data CentresStructure Research | Cloud, Hosting & Data Centres

[28] Amazon Data Centers Using HVO Fuel (certaireland.ie)

[29] Environmental Protection Agency (epa.ie)

onsite, and they must hold a licence for this where the combined thermal input capacity (generation capacity, sum of individual installations) exceeds 50 MWth (Mega Watt Thermal). Communication from EPA is that "in 2023, the EPA issued 13 energy related Industrial Emissions licences to data centres for the operation of electricity generators for use in limited circumstances, with limited hours of operation" and "all these facilities were previously registered with the EPA under the Medium Combustion Plant Regulations." [30] Note that not all company licensees are easily identifiable as data centre operator or the company for whom they host data.

Scale of the ICT services sector in Ireland

In 'The Role of the ICT Services Sector in the Irish Economy', a Quarterly Bulletin of March 2023 by the Central Bank of Ireland, "one fifth of corporation tax revenue in 2021" is attributed to the ICT services sector. As shown in Figure 4 below, Ireland is ranked number one globally by the OECD for ICT value added (based on the latest available data, year 2011.)[31] This metric, ICT value added, is the difference between the Information and Communication Technology sector gross output and intermediate consumption. In layman's terms, the sector is far bigger than the country consumes, it is an "ICT exporter". These OECD data are now 13 years out of date and in that time the ICT services sector has grown significantly, and the employment numbers have almost doubled.[32] Citing one key economic indicator, the gross value added (GVA) is reported by the Central Statistics Office (for 2019 data)[33] and is described by the Central Bank of Ireland: "The ICT services sector in Ireland has grown significantly in size and importance over time. The sector accounted for just under 18 per cent of total gross value added (GVA) in 2021, up from 9 per cent in 2010. The ICT sector's share of GVA in Ireland is around three times that of the euro area."

It was reported in 2022 that "Ireland's technology sector accounts for €52 billion (16%) of gross value added and employs 140,000 people – equivalent to 6 per cent of total national employment with 40 per cent growth over the last five years."[34] However it is evident that there has been significant growth since 2021 even, so these figures are likely outdated.

[30] Personal communication from EPA.

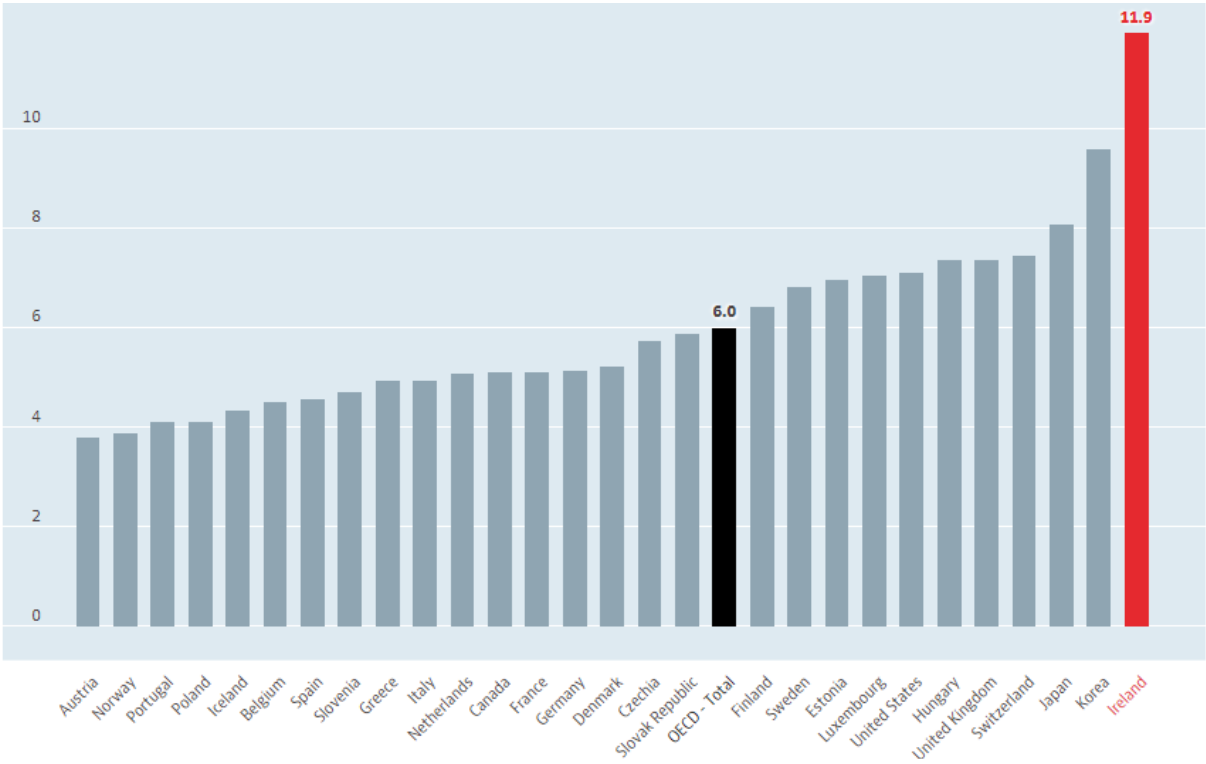
[31] Information and communication technology (ICT) - ICT value added - OECD Data OECD (2024), ICT value added (indicator). doi: 10.1787/4bc7753c-en (Accessed on 08 February 2024)

[32] The Role of the ICT Services Sector in the Irish Economy (Conefrey, Keenan, O'Grady and Stauton) (centralbank.ie)

[33] Information and Communications Technology: A Value Chain Analysis 2019 - Central Statistics Office

[34] 'Data centres are core digital infrastructure" government-statement-on-the-role-of-data-centres-in-irelands-enterprise-strategy.pdf

Figure 4 ICT value added by country, Ireland ranks top by the OECD (2011 data)



Source: [Information and communication technology (ICT) - ICT value added - OECD Data]

Energy usage by data centres

When describing the energy usage of data centres, the available data are mainly for electricity consumed by metered supplies. Other energy sources, such as hydrocarbon-based fuels for off-grid generators, or gas supply, are not widely available. It is hoped that in future, the networked gas consumption data for data centres will be made available.

According to the SEAI 'Energy in Ireland' report for 2023, "data centres are currently the dominant driver of increased electricity demand in Ireland."[35] The most energy-intensive aspect of data centre operations occurs when almost all electrical power supplied is converted into waste heat through a cooling system to keep components below critical temperatures.[36] In terms of their sustainability, there are efficiencies in operating larger-scale centres where the cooling technologies can underpin more computer servers at once. The SEAI report that "cooling is responsible for only a small proportion of total electricity use by data centres, at approximately 14%."[37] There is potential to capture waste heat.

One indicator for the amount of energy required for energy consumption for cooling buildings is 'heating degree days' and 'cooling degree days'. Cooling degree days (CDD) index is a weather-based technical index designed to describe the need for the cooling (air-conditioning) requirements of buildings to keep to a base temperature of 21°C, the chart below shows that Ireland had the lowest number (negligible) of CDD measured across the EU.[38]

[35] Energy-in-Ireland-2023.pdf (seai.ie)

[36] Data-Centres_Insights-Series.pdf (ucd.ie)

[37] Heating-and-Cooling-in-Ireland-Today.pdf (seai.ie)

[38] Heating and cooling degree days - statistics - Statistics Explained (europa.eu)

Figure 5 Average cooling degree days for the EU. Ireland ranks as the lowest (meaning less energy is typically required for cooling.)

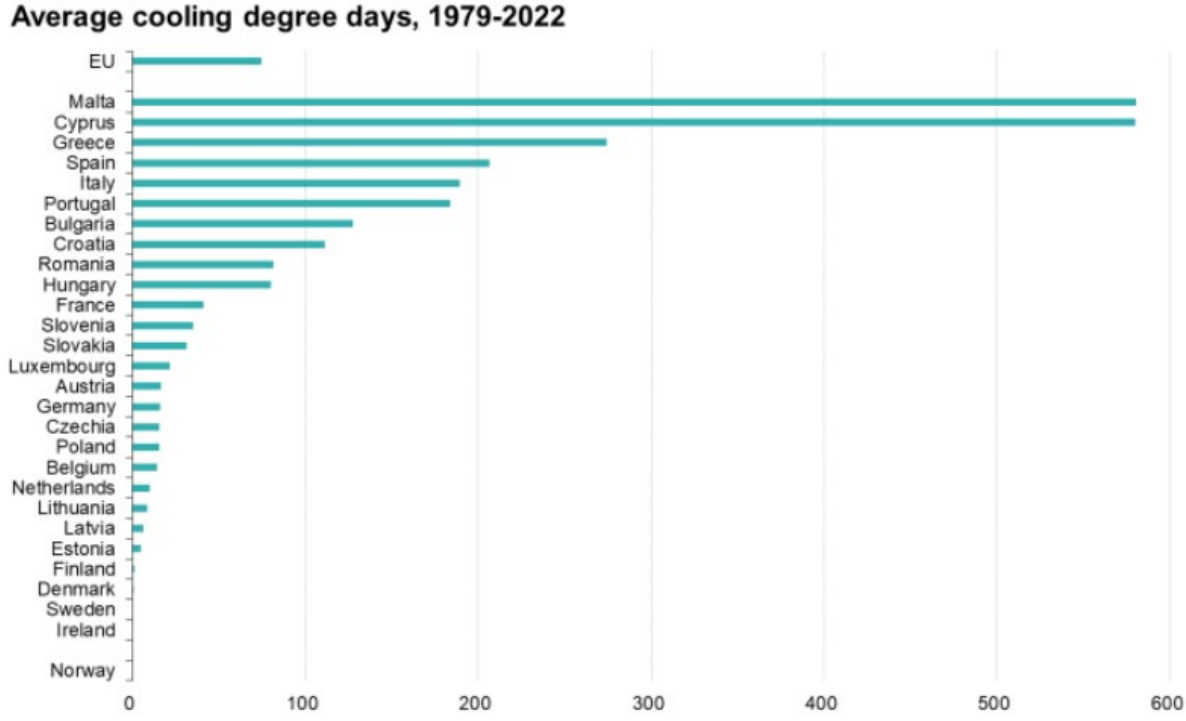


Figure 5: Average Cooling Degree Days, 1979-2022 *Source:* Eurostat (nrg_chdd_a)

Source: Heating and cooling degree days - statistics - Statistics Explained (europa.eu)

Key metrics explained

Typically, the leading multinational companies with data centres in Ireland publish their environmental credentials annually, with a variety of information including the energy consumption by data centres. For example, Google, in its latest 2023 Environmental Report,[39] does include detail of its Irish data centre operations, and in it describes how by comparison with its global data centre operations, the sustainability credentials of the Irish operations have slipped. Similarly, Meta published its 2023 Sustainability Report[40], as did Microsoft[41] and Amazon.[42] Unfortunately, the resolution of information is variable, and extracting a country-based picture from them alone is difficult.

Six key energy metrics are described in one industry CPD course 'Guide to Environmental Sustainability Metrics for Data Centers'.[43] They are in Figure 6 below. These are a useful overview

[39] https://www.gstatic.com/gumdrop/sustainability/google-2023-environmental-report.pdf

[40] https://sustainability.atmeta.com//asset/2023-sustainability-report#page=1

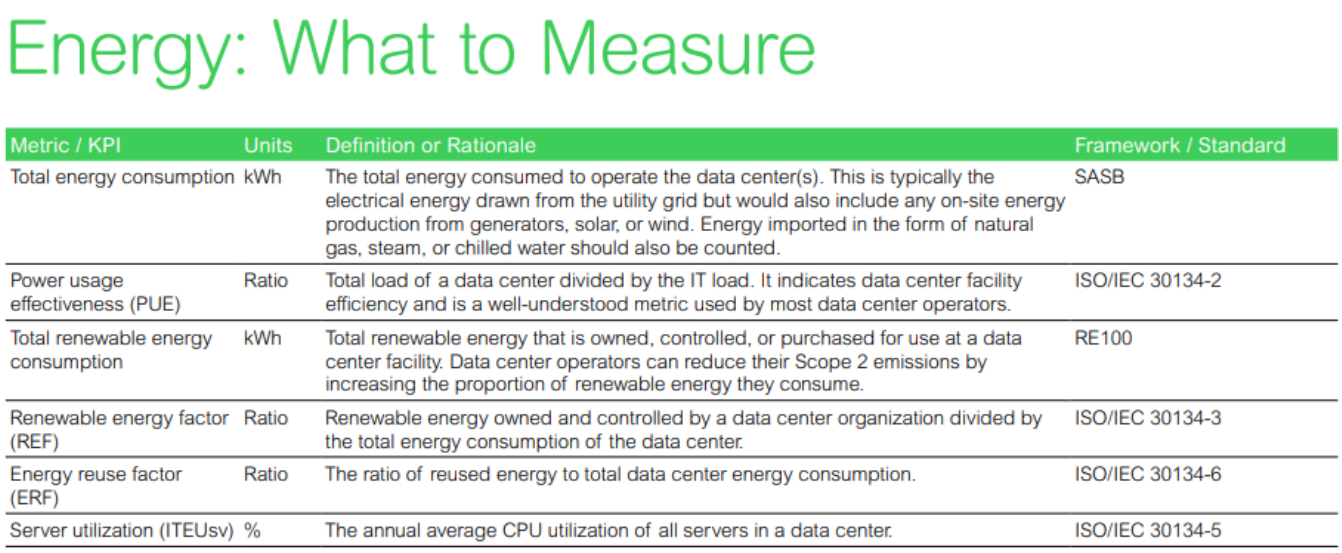
[41] https://aka.ms/SustainabilityReport2024

[42] https://sustainability.aboutamazon.com/2023-sustainability-report.pdf

[43] Data_Center_Sustainability_Action_Plan.pdf (datacenterdynamics.com)

of some of the key metrics discussed on the topic. For some there are applicable International Organization for Standardization (ISO) and/or International Electrotechnical Commission (IEC) standards. A company can apply to be accredited by its national standards authority, in Ireland this is the National Standards Authority of Ireland (NSAI). Accreditation requires a documented and auditable record that are periodically verified by the national agency. It is possible that data centre operating companies in Ireland either hold or are seeking accreditation(s). One metric is the total renewable energy consumption, for which there is no standard. The RE100 group is an initiative group of companies committed to 100% renewable electricity, and its members include many of the major ICT and other companies associated with data centres.[44]

Figure 6 Six key data centre sustainability and energy indicators



Metric / KPI	Units	Definition or Rationale	Framework / Standard
Total energy consumption	kWh	The total energy consumed to operate the data center(s). This is typically the electrical energy drawn from the utility grid but would also include any on-site energy production from generators, solar, or wind. Energy imported in the form of natural gas, steam, or chilled water should also be counted.	SASB
Power usage effectiveness (PUE)	Ratio	Total load of a data center divided by the IT load. It indicates data center facility efficiency and is a well-understood metric used by most data center operators.	ISO/IEC 30134-2
Total renewable energy consumption	kWh	Total renewable energy that is owned, controlled, or purchased for use at a data center facility. Data center operators can reduce their Scope 2 emissions by increasing the proportion of renewable energy they consume.	RE100
Renewable energy factor (REF)	Ratio	Renewable energy owned and controlled by a data center organization divided by the total energy consumption of the data center.	ISO/IEC 30134-3
Energy reuse factor (ERF)	Ratio	The ratio of reused energy to total data center energy consumption.	ISO/IEC 30134-6
Server utilization (ITEUsv)	%	The annual average CPU utilization of all servers in a data center.	ISO/IEC 30134-5

Source: Data_Center_Sustainability_Action_Plan.pdf (datacenterdynamics.com)

Data Centres Metered Electricity Consumption reported by the Central Statistics Office

This *Spotlight* is published at the same time as the latest available data from the Central Statistics Office (CSO). In recent years it has received metered electricity consumption data from ESB Networks, and has produced statistical data a quarterly breakdown of metered electricity consumption by data centres, for the years 2015 to 2023 (with the 2023 dataset published 23 July 2024).[45] In recent previous years, the year-on-year increase in electricity consumption by data centres has been about 30% (see Table 1, below.) **In 2023, data centres consumed 21% of all metered electricity, compared to 28% used by all residential dwellings.** Over eight years, since 2015 when data were first collected, there has been a **five-fold increase** in the electricity consumed by data centres in Ireland.

The methodology for collecting this data needs some explaining. The meters associated with these data centres and other large energy users have been identified with the help of ESB, however it is not the case that the centres are self-reporting or that a definitive list of data centres has been supplied and used to extract the data. Essentially, they 'jump out' of the whole dataset based on the scale of use and are cross-checked against addresses of known sites. Whilst this approach

[44] RE100 Members | RE100 (there100.org)

[45] Data Centres Metered Electricity Consumption - CSO - Central Statistics Office

might be adequate for reporting on a few dozens of facilities, it is not a systematic approach and could lead to smaller centres being missed and/or misidentified in this statistical report. Ideally, the need is for a centralised database and record of the MPRNs for data centres. The CSO do not have access to a georeferenced data link between addresses/Eircodes and MPRNs. The SEAI have a web published list of 196 members of its large industry energy network, but data centres are not classified as such.[46]

Table 1 Quarterly electricity consumption by CSO-identified data centres, 2015 to 2023 (published 23 July 2024)

Table 2 Data Centres Metered Electricity Consumption by Quarter 2015-2023, in gigawatt hours (GWh) (Note:1 GWh = 1000 MWh)							
Year	**Jan-Mar**	**Apr-Jun**	**Jul-Sept**	**Oct-Dec**	***Total***	**Year on year percentage increase**	**Absolute increase year on year (GWh)**
2015	290	303	316	329	*1,238*	n/a	
2016	340	360	385	395	*1,480*	20%	242
2017	406	433	449	472	*1,760*	19%	280
2018	490	526	573	591	*2,180*	24%	420
2019	578	600	638	672	*2,488*	14%	308
2020	690	721	765	851	*3,027*	22%	539
2021	921	986	1,035	1,068	*4,010*	32%	983
2022	1,193	1,286	1,335	1,456	*5,270*	31%	1,260
2023	1,496	1,553	1,624	1,661	*6,334*	20%	1,064

Source: https://data.cso.ie/table/MEC02. Released 23 July 2024.

The CSO report five key findings[47] in these data:

- Electricity consumption by data centres increased by 20% between 2022 and 2023.
- The percentage of total metered electricity consumption used by data centres rose from 5% in 2015 to 21% in 2023.
- In 2023, urban households accounted for 18% and rural households for 10% of total metered electricity consumption.
- Quarterly metered electricity consumption by data centres increased steadily from 290 Gigawatt hours in the first quarter of 2015 to 1,661 Gigawatt hours in the fourth quarter of 2023. This was an increase of 473%.
- Total metered electricity consumption rose by 24% between 2015 and 2023 *(total, not for data centres alone.)*

[46] Our Members | Large Industry Energy Network | SEAI

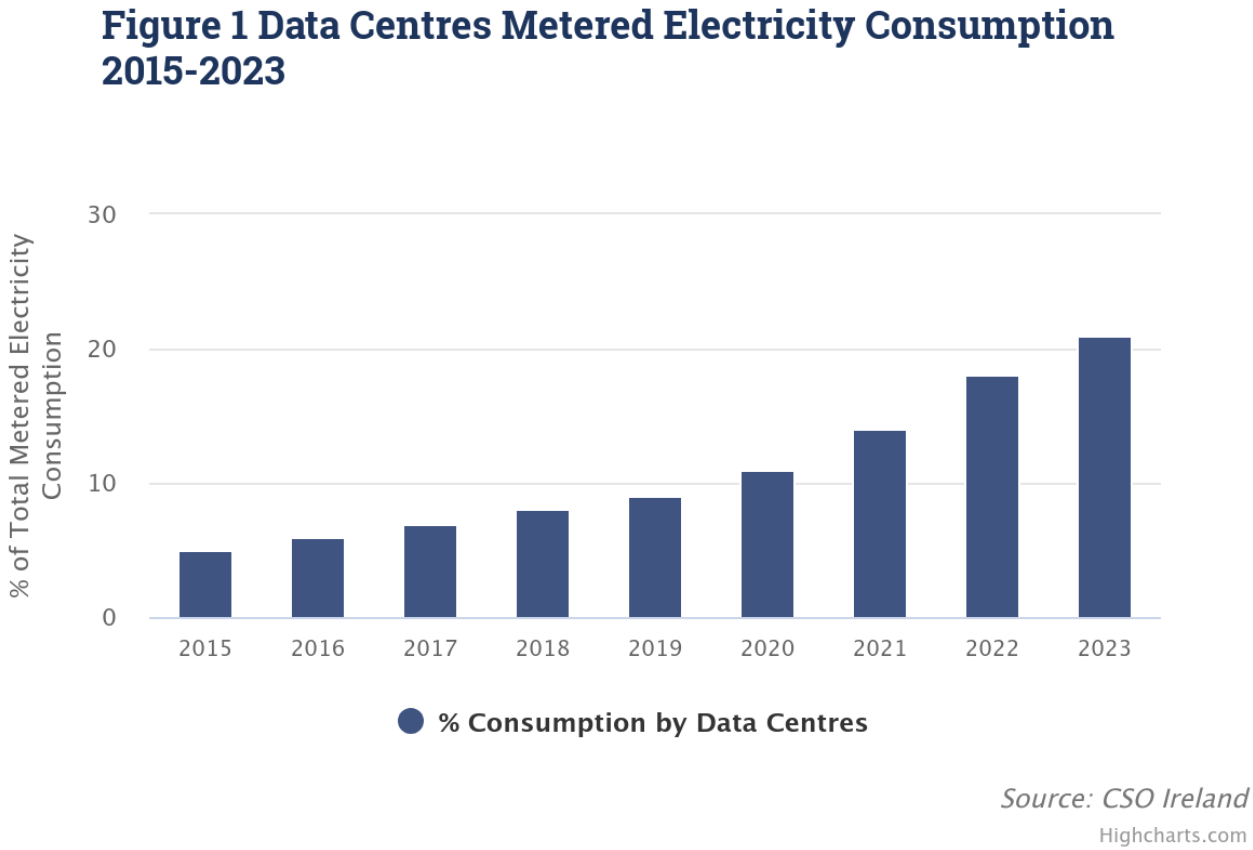
[47] Key Findings Data Centres Metered Electricity Consumption 2023 - Central Statistics Office

Figure 7 below is from the CSO and describes the proportion of electricity consumption by data centres, relative to the whole metered electricity supply (namely all users, including domestic and business and all large energy users). The latest available data is for 2023 and shows that 21% of all metered electricity was consumed by data centres. The total metered consumption is 30,581 GWh in 2023.[48] It is noteworthy that in the last year, the installation of solar renewable electricity generation by households and businesses in Ireland has dramatically increased, with households now generating 1,185 MW of electrical power.[49] In this dataset, the overall metered supply has decreased in 2023 compared to 2022. Whilst the *proportion* of electricity use by data centres compared to the whole metered consumption has increased by just a few percentage points in 2023, the absolute increase is about 1 GW in just one year (see Table 1 above.). Thus, the amount of electricity generated by solar coming onstream in that short time has been immediately 'used up' by the single year's increase in the data centre electricity consumption. It appears as if the rate of increase in energy demand has slowed a little when looking at the percentage, but the absolute metered electricity consumption has not – it is slightly less than the increase seen in 2022 but higher than that in any other year since 2015 for when the earliest data are available. If the rate of increase in electricity consumption is in the order of 1 GWh, year-on-year, it is probable that the projected rise of data centre electricity use will see data centres become the single biggest group user of electricity within the decade.

48 https://www.cso.ie/en/media/csoie/releasespublications/documents/ep/datacentresmeteredelectricityconsumption/2023/P-DCMEC2023TBL1.xlsx

49 Reports | Irish Solar Energy Association

Figure 7 Metered electricity consumption by data centres in Ireland, for years 2015 to 2023, as a percentage (%) of total metered supply.

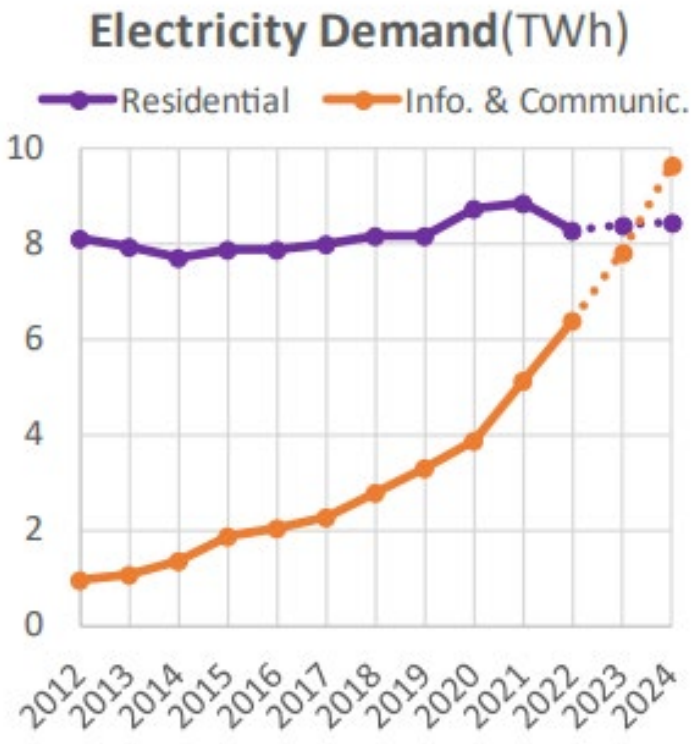


Source: Key Findings - CSO - Central Statistics Office

The SEAI have projected that in 2024, the electricity consumption by the information and communication sector (of which the data centres share is 82%) data centres will overstake that of residential users, as detailed in Figure 8 below.[50]

[50] Energy-in-Ireland-2023.pdf (seai.ie)

Figure 8 Measured (2012–2022) and forecast (2022–2024) electricity demand by Information & Communications, and Residential consumers.



Source: Energy-in-Ireland-2023.pdf (seai.ie)

Forecast for growth by EirGrid and current and new connections

EirGrid has projected that data centre demand will be a key driver of electricity demand in Ireland for the foreseeable future. The figures given on electricity and power are being frequently revised even in the space of one or two years, and the context is revaluated with each statement from the operators. EirGrid formally sets out its forecast position in the most recent Generation Capacity Statement 2023–2032 (published January 2024).[51] It states that "by 2032, 30% of all electricity demand is expected to come from data centres and other new large energy users." Other drivers for electricity demand are significant electrification of heat and transport, as well as industrial growth.

In November 2021, following a consultation process, the Commission for Regulation of Utilities (CRU) issued formal assessment criteria for new data centre electricity supply connections.[52] These directions are to both EirGrid and ESBN. In EirGrid's latest capacity statement (for 2023-2032) it states "as per the directive from the Commission for the Regulation of Utilities in November 2021, data centre projects that do not currently have connection agreements will be assessed on new criteria. Offers of new connections will be contingent upon the ability of the data centre applicant to bring onsite dispatchable generation (and/or storage) with a capacity equivalent to or greater than their demand."[53] In Figure 9 below, the table of transmission system data connection status (as of November 2021) below sets out that scale of the **'connected' and 'contracted' projects (as at the time of the 2021 CRU paper) with EirGrid are not subject to the new criteria set out in the CRU direction paper CRU/21/124**; this applies only to those in the application stages. The vast majority of the 'application stage' status projects are with EirGrid not with ESBN. It is this portion that are subject to the new connection criteria. The three main criteria for processing connection applications are:[54]

- location relative to existing levels of grid "constraint";
- the level of dispatchable electricity generation or storage that the data centre intends to install;
- the data centre's ability to reduce its electricity demand, including by using its own generators or storage assets.

In essence the CRU has pushed back the connection criteria to rely upon the facility's on-site power generation and storage capacity. In effect, for example a new 50 MW data centre, which does not have an existing connection agreement, will need to bring 50 MW of dispatchable capacity via on-site generation. These power inputs range in sustainability from on- or near-site renewables, battery storage, or HVO, gas/diesel powered backup generators. Only the latter is realistic for reliable round-the-clock supply at scale, and in turn that would require industrial emissions licensing from the EPA. The alternative is for private wire electricity transmission (see below).

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[51] EirGrid SONI GCS 2023-2032

[52] CRU21124-CRU-Direction-to-the-System-Operators-related-to-Data-Centre-grid-connection-.pdf (divio-media.com)

[53] EirGrid SONI GCS 2023-2032

[54] The CRU's Three Criteria for the Connection of… | Mason Hayes Curran (mhc.ie)

Figure 9 Transmission system data centre grid connection status described by Eirgrid as at November 2021

Transmission System			
Greater Dublin Region		**Outside Dublin Region**	
Connected	427.5 MVA	**Connected**	0 MVA
Contracted	839.4 MVA	**Contracted**	57 MVA
Live Offer	0 MVA	**Live Offer**	0 MVA
Application Stage	1199.21 MVA	**Application Stage**	788.2 MVA
On Hold	55.5 MVA	**On Hold**	225 MVA

Table 1: Transmission System Data Centre Grid Connection Status as of November 2021 Source EirGrid

Source: CRU Direction to the System Operators related to Data Centre grid connection processing, Decision CRU/21/124, November 2021. CRU21124-CRU-Direction-to-the-System-Operators-related-to-Data-Centre-grid-connection-.pdf (divio-media.com)

It is noteworthy that the amount of **power agreed under already contracted connections is not yet fully taken up**. In this latest capacity statement EirGrid state that "In Ireland, there is presently approximately 2000 MVA of demand capacity that is contracted to data centres and other new technology loads at the transmission level [agreed with EirGrid], and approximately a further 300 MVA contracted at the 110 kV distribution level [agreed with ESBN]."[55] By contrast in its 2019 statement EirGrid commented that "the typical load currently drawn by these customers (1000 MVA) is approximately 35% of their contracted Maximum Input Capacity."[56]. In the government statement on the role of data centres in 2021, its stated that "EirGrid predicts that if all contracted capacity were connected, data centres would make up between 25% and 33% of Ireland's electricity demand by 2030. These **forecasts are based on data centre projects already contracted to, and [not yet] connected to, the electricity system, which are all located in the Greater Dublin region**."[57] It can be inferred that a large proportion of those data centres that had a contracted status in 2019 to 2021 have since converted to a connected status in that timeframe.

International Energy Agency (IEA) overview

According to the IEA, globally, "estimated global data centre electricity consumption in 2022 was 240-340 TWh, or around 1-1.3% of global final electricity demand. This excludes energy used for cryptocurrency mining."[58] In comparison, "in 2018, data centres accounted for 2.7 % of the

[55] EirGrid SONI GCS 2023-2032

[56] EirGrid-Group-All-Island-Generation-Capacity-Statement-2019-2028.pdf

[57] government-statement-on-the-role-of-data-centres-in-irelands-enterprise-strategy.pdf

[58] Data centres & networks - IEA

electricity demand in the EU-28."[59] The IEA report that the increase in energy use by data centres is not directly proportional to the amount of data processed; "Since 2010, data centre energy use (excluding crypto) has grown only moderately despite the strong growth in demand for data centre services, thanks in part to efficiency improvements in IT hardware and cooling and a shift away from small, inefficient enterprise data centres towards more efficient cloud and hyperscale data centres." It references Ireland as a notable country where the growth in data centres is having a marked impact on the overall electricity consumption, alongside Denmark. With specific references to named companies, the IEA offers a global view of their electricity consumption for data centres that their "combined electricity use by Amazon, Microsoft, Google, and Meta more than doubled between 2017 and 2021, rising to around 72 TWh in 2021."[60]

[59] Directive (EU) 2023/… of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast) (europa.eu)

[60] Data centres & networks - IEA

Alternatives to the electricity grid

Faced with limitations in connections to the current single transmission and distribution national grid, alternatives are being explored. The concept of a data centre co-locating to its own renewable electrical power generation plant is not a new one. Presently, all electricity generation is supplied to the single grid system, including 'green' energy from new renewable sources such as onshore or offshore wind, and solar. Many companies have expressed their intention to build out renewable power generation, but in Ireland the key limitation is the legislation on building and owning parts of the electricity grid privately.

There are recent media reports that the data centres sector has voiced the need to connect to the national gas network and generate power onsite through a gas connection, if faced with limitations in electricity supply. One industry report[61] stated that there have been 11 data centres connected to the gas network; "facilities were looking to rely solely on natural gas from the country's gas network in lieu of an EirGrid connection – known as 'islanded' facilities." This alternative, although a stable and networked energy supply, would serve to simply increase the use of non-renewable hydrocarbon based fuels for electricity generation, counter to the climate goals of the industry and the state.

Private wire connections

Currently, a private electricity transmission connection that is between two parties and off the national grid is not currently legal in Ireland. Privately owned electricity wires could facilitate 'off-grid' energy generation, storage and usage models that are not currently facilitated, such as energy parks and the co-location of generation and demand.[62] A public consultation on private wires (both at the transmission and distribution level) opened in August 2023 and is currently in the review stage[63] and policy formation is underway.[64] Amongst the possibilities set out in the consultation is for 'islanded' data centres that are primarily powered via privately owned electricity infrastructure and have their own backup supply and/or storage and are off the national grid altogether. Some of the other scenarios envisaged requiring private wires are for proximal or co-located data centres with an onshore renewable energy generation site such as a solar and/or wind farm, or a distant private wire connection such as for an offshore wind generation site, or a green energy park. A private line would describe a connection from A to B such as in the first two scenarios. A private network would describe the energy park model.

The concept of an energy park is co-location of generation and demand. There is potential for energy parks away from constrained parts of the national grid. The Bord na Móna Energy Park is one such energy park proposed[65] in the midlands and it is envisaged that around 200 MW of power could be provided on site for large energy users on site.

Beyond the consultation stage, there is work in in progress (planned for end 2024) to develop the final policy and necessary legislation for private lines and private networks, which may need to be

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61 11 data centers in Dublin set to rely on Ireland's gas network for power - DCD (datacenterdynamics.com)

62 Private Wires – A Public Consultation | Mason Hayes Curran (mhc.ie)

63 36f7ea43-3eff-4543-aa3d-2450b80ee2ee.pdf (www.gov.ie)

64 www.gov.ie/pdf/?file=https://assets.gov.ie/297829/cca61c23-24fb-4af3-8117-408fed5a5772.pdf#page=null

65 Energy Park Overview - Bord Na Mona (bnmenergypark.ie)

coordinated on a phased basis. 'Private Wires – Guiding Principles for Policy Formulation' was published July 2024[66] as a framework for policy development, and are below:

1. The objective of any change is to accelerate decarbonisation, and promote the deployment of electricity infrastructure, renewable generation and storage;
2. The National Electricity Grid is a crucial piece of national infrastructure and will remain in public ownership;
3. Any change must complement other policy objectives including security of supply, the offshore wind strategy, the hydrogen strategy, industrial policy and the national climate objective;
4. The National Electricity Grid will remain the primary way to connect generators and consumers of electricity. Where grid-based solutions are available these will be preferred to Private Wires;
5. Private Wires cannot undermine the financing of the National Electricity Grid. Those with a Private Wire must pay the full cost of the service they have sought from, or is provided to them, by the National Electricity Grid;
6. Private Wires will be built to the same technical and safety standards as the National Electricity Grid and will be capable of being taken in charge by the System Operators;
7. Private Wires will not be permitted to undermine the efficient development of the National Electricity Grid; and
8. Private Wires will have to be developed within appropriate planning and environmental assessment requirements, and the consent of landowners. Private Wire developers will not have wayleave or other powers to use land.

Power Purchase Agreements

One key mechanism for the sustainability credentials is use of power purchase agreements (PPAs), sometimes called corporate power purchase agreements (CPPAs) or renewable power purchase agreements. This is a contract between a supplier and a user (such as a data centre operator) whereby they are buying a certain amount of power for a fixed duration, with a specified energy source for example, purchasing the total yield of a solar or wind farm. In this way the energy end user can know it is using a given amount of renewables, rather than reliance on a mixture of renewables and fossil-fuel based electricity generation via the grid. These agreements are a form of hedging a price for supply and vary from short- to long-term, and are sometimes a factor in the development of renewables providing the security of finance.

The government in Ireland issued a roadmap paper on a framework for PPAs in March 2022.[67] This followed a decision to set a target of 15% of the renewable capacity supplied by support from CPPAs in the 2019 Climate Action Plan (there is no new or revised target in the 2023 Plan.)[68] There is no requirement at the moment for data centres to adopt PPAs or to reach a certain

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67 https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwiMhPPl0suEAxWwYEEAHQO-A98QFnoECCkQAQ&url=https%3A%2F%2Fassets.gov.ie%2F220107%2Fed5977f3-76a4-42c4-b2b7-dd5c4c4d7002.pdf&usg=AOvVaw3j-7TnmoGqgBxc2_q-3nb6&opi=89978449

68 94a5673c-163c-476a-921f-7399cdf3c8f5.pdf (www.gov.ie)

proportion of electricity from renewable sources (although the new CRU connection criteria will probably result in this); yet data centres are so keen to source their electricity from renewable sources that they would account for all of this target straight away as and when generation supply comes online.[69] (Indeed Microsoft's CPPAs of 2022 amount to 28% of this target.)[70] Some companies are reporting on their agreements in communicating their sustainability credentials and ESG. It is not possible to uncover what price (or tariff per kWh) is paid through these agreements, they are confidential. In its analysis on PPAs, Baringa reported in 2020 that "there is pent up demand for CPPAs among data centres and other LEUs [large energy users] with hard decarbonisation targets and experience of doing CPPAs in other markets. These corporates have experience pricing in the €30/MWh range in Europe but may contract in the €50/MWh in SEM as this level approaches parity with wholesale prices."[71] A few of the most recent and key CPPAs in Ireland are described below (these have happened since that 2020 analysis by Baringa, and are based on press releases):

- Google (2023) – 58 MW from Tullabeg Solar Farm Co. Wexford, with Power Capital Renewable Energy.[72]
- Amazon (2022) – 115MW from Ardderroo onshore wind farm, Co Galway; 23MW Esk wind farm in Co. Cork; 90MW Meenbog farm in Co. Donegal.[73]
- Microsoft (2023) –30 MW from Lenalea Wind Farm near Letterkenny, Co. Donegal.[74]
- Microsoft (2022) – three agreements with Statkraft, Energia Group, and Power Capital Renewable Energy, combined 900 MW from solar and onshore wind renewables.[75]

The International Energy Agency (IEA) publishes a summary of the PPAs by globally leading companies. The chart (Figure 10 below) displays the relative size of off-take under PPAs held by leading technology companies in the period of 2010 to 2022, displayed in terms of power (in MW) attributed to solar (light blue) and wind power (darker blue). Amazon, Google and Facebook are the top three. These are global data and not available at country level on the IEA website.[76] In that decade, 8 GW of power was purchased in total by Amazon under PPAs. It is evident that PPAs are only meeting a small fraction of the electrical power needs of even the most advanced power-purchasing companies.

In contrast to the data centre share of electricity consumption being 18% in 2022, Bitpower report that the amount of greenhouse gases (GHG) emissions by data centres was 2.56% in 2021. To explore this, consider that the electricity generation for the country is reaching something like 35 to

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[69] "On the demand side, projected data centre (DC) energy requirements alone are in excess of the 15% CPPA target by 2030, but over-reliance on DCs carries risk and should be avoided. DCs are the 'low-hanging fruit' that can be pursued first, but CPPA reforms to unlock broader large energy user base should be pursued to leverage the full corporate demand for green energy." Corporate PPA policy in Ireland, Baringa, December 2020 Slide library (seai.ie)

[70] Microsoft signs 900MW PPAs for Ireland, 28% of nation's target for 2030 - DCD (datacenterdynamics.com)

[71] Slide library (seai.ie)

[72] Google's clean energy progress in Ireland (blog.google)

[73] Amazon announces new project in Ireland as part of commitment to be 100% powered by renewable energy (aboutamazon.eu)

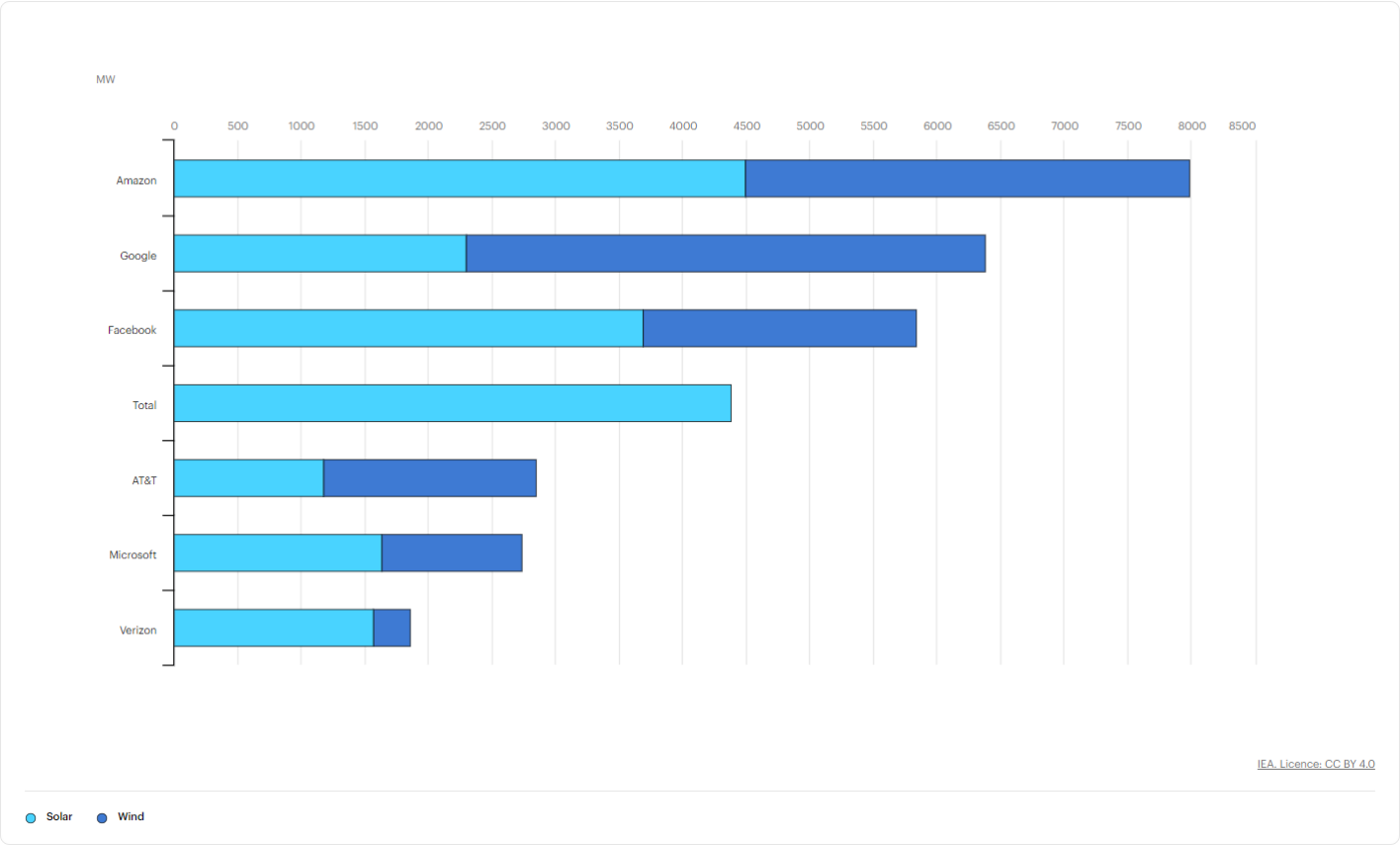
[74] Power purchase deal inked with Microsoft for Lenalea wind farm | SSE Renewables

[75] Microsoft announces renewable energy contracts that contribute almost 30% of Ireland's corporate power purchase agreement target by 2030 - Power Capital

[76] Information has been requested from SEAI.

40% from renewables (mostly wind), leaving up to 60% to be generated by fossil fuels. There is no binding target for the proportion of electricity generation from renewable sources (the renewable energy share-electricity, 'RES-E'), but the stated target for 2020 was 40%, and the 2030 target is now 80%.[77] Bitpower reported that data centres contributed 2.56% of total GHG by using 18% of electricity in 2021/2022.[78] Electricity generation accounted for 28% of the country's energy related GHG emissions in 2022[79], that figure equates to data centres contributing to something in the order of 5% of energy-related GHG emissions in 2022. The question remains what is the latest and projected data for GHG emissions apportioned to data centres in Ireland from the mix of renewables via CPPAs and use of the national grid.[80]

Figure 10 Top corporate off-takers of renewable power purchase agreements, 2010–2020



Source: IEA, Top corporate off-takers of renewable power purchase agreements, 2010-2020, IEA, Paris https://www.iea.org/data-and-statistics/charts/top-corporate-off-takers-of-renewable-power-purchase-agreements-2010-2020, IEA. Licence: CC BY 4.0 Top corporate off-takers of renewable power purchase agreements, 2010-2020 – Charts – Data & Statistics - IEA

[77] Renewables | Energy Statistics In Ireland | SEAI

[78] Digital Dashboard (bitpower.ie)

[79] https://www.seai.ie/data-and-insights/seai-statistics/key-statistics/co2/#comp00005cb739ab0000000fb1246e

[80] Cannot be calculated without knowing what the share of electricity generation source of total GHG is, rather than just what the share of energy related GHG is.

Reporting on energy efficiency

Although the ESG reporting of companies[81] is a welcome addition, clearly the picture of the overall energy demands of data centres is not complete. The CSO data on metered electricity consumption is an excellent indicator of the trends in the energy consumption over time. It is anticipated that future data on metered gas supply to data centres will be complimentary to this. However, there are gaps in understanding what electrical power is generated on-site, and quantifying the GHG emissions associated with them.

In recognition of the growing impact of expanding data centres sector in numerous member states, the EU has set out reporting criteria, described below. Data centre operators will be obliged to monitor, gather and report information and key performance indicators set out in the Regulations to the European database by 15 September 2024, by 15 May 2025, and each subsequent year.[82]

EU reporting requirements for data centres energy: Energy Efficiency Directive 2023/1791

The EU recently evaluated options for assessing the energy and sustainability of the data centres sector. Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast)[83] sets out **new requirements for member states in relation to data centres.** It is not yet transposed but does set a May 2024 deadline for reporting under Article 12 (see below).[84] Some relevant parts of the Directive are below (emphasis added by the author):-

(85)The ICT sector is another important sector which receives increasing attention. In 2018 the energy consumption of data centres in the Union was 76,8 TWh. This is expected to rise to 98,5 TWh by 2030, a 28 % increase. This increase in absolute terms can also be seen in relative terms: within the Union, data centres accounted for 2,7 % of electricity demand in 2018 and will reach 3,21 % by 2030 if development continues on the current trajectory. The Union's Digital Strategy already highlighted the need for highly energy-efficient and sustainable data centres and calls for transparency measures for telecommunication operators on their environmental footprint. To promote sustainable development in the ICT sector, particularly of data centres, **Member States should require the collection and publication of data which are relevant for the energy performance, water footprint and demand-side flexibility of data centres, on the basis of a common Union template**. Member States should require the collection and publication of **data only about data centres with a significant footprint**, for which appropriate design or efficiency interventions, for new or existing installations respectively, can result in a considerable reduction of energy and water consumption, an increase in systems' efficiency promoting decarbonisation of the grid or in the reuse of waste heat in nearby facilities and heat networks. **Data centre sustainability indicators could be**

[81] See also: Environmental, Social and Governance (ESG), and Sustainable Development (oireachtas.ie), Spotlight publication by the Library & Research Service, 2023.

[82] Adoption of EU Wide Scheme Rating the Sustainability of Data Centres - WILLIAM FRY

[83] Directive (EU) 2023/… of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast) (europa.eu)

[84] Directive - 2023/1791 - EN - EUR-Lex (europa.eu)

established on the basis of that data collected, taking also into account already existing initiatives in the sector.

A threshold or specification for the size or "significant footprint" of a data centre is set out in Article 12 to be **at least 500kW**.

Sustainability indicators might be those that are already key metrics forming part of energy management reporting or accreditation under licence reporting requirements or ISO/IEC standards, for example.

(86)The **reporting obligation applies to those data centres, which meet the threshold set out in this Directive.** In all cases and specifically for onsite enterprise data centres, the reporting obligation should be understood as referring to the spaces and equipment that serve primarily or exclusively for data-related functions (server rooms), including the necessary associated equipment, for example, associated cooling, lighting, battery arrays, or uninterruptible power supplies. Any IT equipment placed or installed in primarily public access, common use or office space or supporting other corporate functions, such as workstations, laptops, photocopiers, sensors, security equipment, or white goods and audiovisual appliances should be excluded from the reporting obligation. The same exclusion should also apply to server, networking, storage, and associated equipment that would be scattered across a site such as single servers, single racks, or Wi-Fi and networking points.

(87)**The collected data should be used to measure at least some basic dimensions of a sustainable data centre, namely how efficiently it uses energy, how much of that energy comes from renewable energy sources, the reuse of any waste heat that it produces, the effectiveness of cooling, the effectiveness of carbon usage and the usage of freshwater.** The collected data and the sustainability indicators should raise awareness among data centre owners and operators, manufacturers of equipment, developers of software and services, users of data centre services at all levels as well as entities and organisations that deploy, use or procure cloud and data centre services. **The collected data and the sustainability indicators should also give confidence about the actual improvements following efforts and measures to increase the sustainability in new or existing data centres.** Finally, those **data and indicators should be used as a basis for transparent and evidence-based planning and decision making**. The Commission should assess the efficiency of data centres on the basis of the information communicated by the obligated data centres.

Specifically Article 12 of 2023/1791 headed 'Data centres' sets out the directive requirements for member states with a deadline of 15 May 2024[85]

1. By **15 May 2024 and every year thereafter,** Member States shall require owners and operators of data centres in their territory with a power demand of the installed information technology (IT) of **at least 500kW**, to make the information set out in Annex VII publicly available, except for information subject to Union and national law protecting trade and business secrets and confidentiality.

[85] https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32023L1791&qid=1709114576581#d1e3491-1-1

2. Paragraph 1 shall not apply to data centres used for,or providing their services exclusively with the final aim of, defence and civil protection.

3. **The Commission shall establish a European database on data centres that includes information communicated by the obligated data centres** in accordance with paragraph 1. The European database shall be publicly available on an aggregated level.

4. Member States **shall encourage owners and operators** of data centres in their territory with a power demand of the installed IT equal to or **greater than 1 MW** to take into account the best **practices referred to in the most recent version of the European Code of Conduct on Data Centre Energy Efficiency**.

5. By 15 May 2025, the Commission shall assess the available data on the energy efficiency of data centres submitted to it pursuant to paragraphs 1 and 3 and shall submit a report to the European Parliament and to the Council, accompanied, where appropriate, by legislative proposals containing further measures to improve energy efficiency, including establishing minimum performance standards and an assessment on the feasibility of transition towards a net-zero emission data centres sector, in close consultation with the relevant stakeholders. Such proposals may establish a timeframe within which existing data centres are to be required to meet minimum performance.

Waste heat

The Directive 2023/1791 Article 26 also states that with regard to waste heat from data centres, "Member States shall ensure that data centres with a total rated energy input exceeding 1 MW utilise the waste heat or other waste heat recovery applications unless they can show that it is not technically or economically feasible in accordance with the assessment referred to in paragraph."[86] Further, Article 26 (7) d: "a data centre with a total rated energy input exceeding 1 MW level in order to assess the cost and benefit analysis, including, but not limited to, technical feasibility, cost-efficiency and the impact on energy efficiency and local heat demand, including seasonal variation, of utilising the waste heat to satisfy economically justified demand, and of the connection of that installation to a district heating network or an efficient/RES-based district cooling system or other waste heat recovery applications. It is not clear (ahead of publication of the general scheme) whether the government Heat Bill listed in the latest Legislation Programme[87] will provide for this. The SEAI have examined the potential for low-grade heat recovery from data centres,[88] concluding that there is 30 GWh/year of potential heat recovery from twenty data centre sites in Ireland.

Data centres reporting consultation

The European Commission published draft legislation titles the 'first phase of the establishment of a common Union rating scheme for data centres.[89] The EU opened the draft for feedback in late 2023.[90] The draft specifies the sustainability indicators and energy reporting metrics and reporting mechanisms envisaged under 2023/1791. The Department for Environment, Climate and

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[86] https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32023L1791&qid=1709114576581#d1e4433-1-1

[87] https://www.gov.ie/pdf/?file=https://assets.gov.ie/291080/12cf4585-fb09-4db0-afe6-989331aca3fb.pdf#page=null

[88] PowerPoint Presentation (seai.ie)

[89] https://ec.europa.eu/info/law/better-regulation/

[90] Data centres in Europe – reporting scheme (europa.eu)

Communications submitted its written feedback ion January 2024[91] which is broadly receptive to the Directive requirements but states concerns about the timeframes:

> "Energy Efficiency Directive Article 12 (data centres) Public Consultation Response from the Department of the Environment, Climate and Communications Ireland welcomes the intention of the Energy Efficiency Directive to reduce overall energy consumption. Our industry engagement on energy and climate policy has demonstrated a willingness of Irelands enterprise sector to drive and deliver a green transition. In relation to Article 12 (data centres), as outlined in the associated cover letter, considering the importance of data centres in Ireland both in terms of economic policy and total electricity demand, Ireland will need additional time to engage across government departments, agencies and industry representatives to adequately consider the impacts of implementation of the draft act proposed and provide a comprehensive response. As part of the public consultation, it is anticipated that the appropriate data centre industry representatives and market participants are in a better position to respond in detail to the proposed information to be collected, the list of key performance indicators to be monitored, measured and communicated as well as on the proposed measurement methodologies. In terms of the member state responsibilities, the Irish authorities will investigate the feasibility of creating an overview of the data centres specified in Article 12 (1). Currently, there is no state register of data centres in Ireland, including kW rating of IT power demand or state register of enterprise, colocation or co-hosting data centres. However, experience from the Article 11 (formally Art 8) mandatory energy audits demonstrated that it is difficult to establish obligated entities without an accessible approach to identify them. How Ireland will organise the transfer of data centre data to the EU database and how data centres shall make the information publicly available will therefore need to be confirmed after further consultation across government departments, agencies and the industry representatives. Ireland will also need to carefully consider the potential use of the exception for information subject to Union and national law protecting trade and business secrets and confidentiality. In that regard, requiring indicators for the average of very large data centres in operation to be made publicly available may lead to confidentially concerns within the industry due to the small number of such data centres in operation. As stated above, while Ireland will need additional time to adequately consider the impacts of implementation of the draft act proposed, the authorities will look to respond as quick as is feasible. Ireland is also happy to keep the relevant European Commission representatives up to date on developments and progress as required. Nonetheless, Ireland recommends that the timescale for the delegated act should be revised, considering these concerns."

European Code of Conduct for Energy Efficiency in Data Centres

Launched in 2008, the Joint Research Council (JRC) established a voluntary group the 'European Code of Conduct for Data Centres' (EU DC CoC).[92] It comprehensively sets out best practice guidelines for its 500+ members.[93] The list of members is reported but cannot be filtered by

[91] Feedback from: Department of Environment, Climate and Communications (europa.eu)

[92] Data Centres Code of Conduct | E3P (europa.eu)

[93] jrc136986_2024_best_practice_guidelines.pdf (europa.eu)

country, however six results returned with the search term “Ireland.”[94,95] They included Facebook Ireland (not specifying a centre in Ireland); Kyndrl (listing one data centre in Dublin, Ireland);[96] Keppel Data Centres also known as KDCR Ireland Ltd listing two in Ireland;[97] Intel listing one data centre; Microsoft Corporation listing ten data centres in Ireland; and Equinix EMEA listing four data centres in Ireland.[98]

94 CoC DC Partners | E3P (europa.eu)

95 CoC DC Partners | E3P (europa.eu)

96 Kyndryl United States

97 Connected & Secure Data Centres | Keppel Data Centres Ireland

98 Data Center Company & Enterprise Network Technologies | Equinix

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