

IRELAND'S DATA HOSTING INDUSTRY

"An Industry of Substance" 2020 Q1 Report



bitpower energy solutions



Ireland's Data Hosting Industry

2020 Q1 Update

May 2020







Foreword

More than ever before, data centres are part of the critical global infrastructure. They are a key piece of the jigsaw allowing us to not only live our lives amidst the COVID-19 lockdown, but providing the backend infrastructure for the most essential services we rely on.

We've come to depend on data centres to deliver the data we need in the same way we depend on the electric company to ensure the lights go on when we flip the switch. With the essential role of data centres highlighted in our day to day lives, we have decided to add some key metrics to our quarterly reports.

We have begun tracking data centre capacity growth alongside the carbon intensity of electricity and CO2 attributable to data centres. Using data from SEAI, IWEA, EPA and EirGrid, we have found that whilst the trend for data centre growth is upwards, their proportion of Ireland's total emissions will level-off at approximately 2.2% through 2025. The increase is expected to slow further as the transition to renewable electricity generation accelerates in order to meet the targets in the government's Climate Action Plan.

While these numbers are encouraging, ensuring data centre efficiency will still be critical as the greenest electricity is still electricity not consumed. As noted by the IEA*, advances in the efficiency of data centre infrastructure, as well as a shift to virtualised servers and cloud computing, will contribute to this goal by delivering higher work output with fewer servers.

There are a few other key factors contributing to this trend: First, electricity is expected to continue the transition to renewable generation. Ireland has the potential to generate far more wind power than needed and has the capacity to power 5% of Europe's electricity requirements based on its wind generation alone. This creates a virtually untapped resource of green energy within its borders and along its coastline. Because of this, Ireland is also on track to meet the decarbonisation of electricity target of 40% set out by the government by the end of 2020. The country will also require at least 3,500 MW of offshore wind generation capacity by 2030** in order to meet the 70% renewable electricity ambition Ireland has set out to achieve.

Second, any future growth of data centres will drive green energy development in order to meet power availability demands. Power availability defines the size of any data centre operation. Without a guarantee of power availability, the data centre business model would not work.

^{*} https://www.iea.org/reports/tracking-buildings/data-centres-and-data-transmission-networks#abstract ** https://www.rte.ie/news/business/2020/0519/1139379-offshore-wind-planning/



Foreword

Seventy-seven percent of the data centre market in Ireland relates to a category called Hyperscalers - Amazon, Google, Microsoft and Facebook. Collectively, these companies are the largest purchasers of renewable energy on the planet, and in the case of Microsoft, have pledged to be carbon neutral by 2025 and carbon negative by 2030. These companies are also innovating in how they can maximise power availability. Google, for example, recently announced a carbon-intelligent computing platform that shifts the timing of compute tasks to when low-carbon power sources, like wind and solar, are most plentiful·.

Despite the global pandemic, we do not expect to see a slowdown in the data centre sector. Given the long-term nature of data centre construction projects, we anticipate a short term shift of 10-15% - approximately €200 million - from 2020 to the next year or two with an additional €6.7 billion in investments by 2025.

While traditional factories have remained closed, data centres continue to operate and play a significant role in keeping the economy moving. Here in Ireland, they are a part of the largest export industry, ICT, responsible for €86 billion in exported services per year.

Given their role on the digital frontline, it comes as no surprise to see a positive outlook for the data centre industry.

We thank our team members and partners for all they are doing to give back to their communities and support the most vulnerable.

When we get through these current challenges, we'll not only be stronger, but there is one beautiful world waiting for us all.

Garry Connolly President & Founder - Host in Ireland



https://blog.google/inside-google/infrastructure/data-centers-work-harder-sun-shines-wind-blows/
https://www.cso.ie/en/releasesandpublications/er/its/internationaltradeinservices2018/

2020 Quarter One Update

Investment & COVID-19

In previous updates, we predicted an annual investment of €1.3 billion per annum for each of the five years from 2019 to 2023. The effect of COVID-19 on development activities has now been explored. There are a number of interesting aspects.

Firstly, design and planning activities continue unaffected as design teams can easily work from home.

Secondly, there was a two-month stoppage of construction activities from March to May 2020 and an anticipated delay as the construction phase opens back up again. This equates to a loss of 25% in construction time. From our discussions with contractors, we find that about 60% of investment applies to equipment purchase, which for the most part has continued. Large items of equipment may, for example, await the reopening of construction for installation on site. The impact of COVID-19 on data centre construction investment is expected to be 10 - 15%. This assumes Ireland's five-phase re-opening plan is effective.

We have revised our 2020 data centre construction investment estimate to \pounds 1.13 billion (from \pounds 1.33 billion). In construction terms, \pounds 200 million spend is delayed due to the pandemic. For the purposes of our dashboard, we have not yet re-allocated this spending – awaiting a clearer picture to emerge. We still predict an investment of \pounds 6.7 billion in data centres in Ireland between 2020 and 2025, to add to the \pounds 6.2 billion invested to date.

Carbon Impact of Data Centres

For this quarter, we have prepared an indepth analysis of the impact of data centres on Ireland's greenhouse gas emissions, historically and going forward to 2025. We project that due to the decarbonisation of the electricity grid, data centre CO2 will level off at about 2.2% of Ireland's total emissions.

Scale and Growth

As of Q1 2020, there are sixty data centres of various sizes operating in Ireland. There are twelve data centres in construction and twenty-six data centres in the pipeline with approved planning permission. Of those in operation, fifteen are colocation data centres averaging 6.5 MW in size. Twenty-six are hyperscaleowned averaging 21 MW and four are wholesale colocation facilities of 11 MW average size. There are fifteen smaller data centres averaging 1.6 MW. Seventy-seven percent of capacity is operated by the hyperscales – Amazon, Microsoft, Facebook and Google.

To illustrate the range of data centre scales, we have updated the dashboard to show the comparative sizes of all operational and planned data centres in Ireland. We estimate there is about 540 MW of IT capacity across these sixty facilities. Allowing for power and cooling overhead, the total incoming power capacity is 708 MW.

In Q1 2020, we revisited our database to fine-tune the numbers based on the latest information. Our model is always improving and we now include a number of existing small data centres that we had previously omitted. As always, we hope our dashboard and insights are useful.

Stay safe.





Data Centre Related Emissions to Steady Despite Growth

In Q4 2019 we reported that the energy-related emissions attributable to data centres (assuming no PPAs) was 1.7% of Ireland's total emissions (CO2 equivalent). This was a provisional figure based on 2018 electricity grid figures (375 gCO2/kWh). The latest 2019 SEAI data referred to above (331 gCO2/kWh), and finalisation of our data centre numbers allows us to revise that estimate to 1.58% of total emissions for 2019.

We have now combined our data centre model and its assumptions with SEAI, IWEA (Baringa), EPA and EirGrid data to arrive at a trend of CO2 attributable to data centres in Ireland. The model shows that while data centres continue to grow, the CO2 impact is beginning to level off at around 2.22% of total emissions. The levelling off of CO2 impact is mostly due to the fact that electricity is projected to continue its transition to renewable generation.



Figure 1 - Emissions related to data centres in Ireland as a % of total emissions.

In summary, the trend for data centre growth is upwards, while their proportion of Ireland's total emissions is levelling-off.

Figure 2 - Overall trend in data centre growth and related carbon emissions.

In our analysis, we take the past and future projected data centre capacity, apply a utilisation factor, and then apply the projected carbon intensity of the electricity grid going forward for each year until 2025. We account for on-site generation. We then look at the

total carbon for Ireland for each year and calculate the percentage for data centres. We follow the IWEA/Baringa assertion that Ireland can achieve 70% renewable electricity by 2030. We use a linear trajectory for this. We apply that assertion also to Ireland's total carbon projections to ensure a fair comparison.

Our model predicts that by the end of 2025, there will be 1,700 MW of data centre capacity operational in Ireland. This compares to the 658 MW operational in Q4 2019, as shown in Figure 3 below. At Q1 2020 we are reporting 708 MW and expect this to increase to 820 MW by the end of 2020.

Some future data centres are planning for on-site generation using natural gas. These are accounted for in the model as illustrated in Figure 4. It is likely that these will also include an electricity grid connection for primary power, using the on-site generation as support to the grid. This support will help the grid to absorb more renewable generation.

Figure 4 - Projected end-of-year data centre capacity 2012-2025 showing on-site generation.

For actual power use, we make some assumptions to estimate the demand. These assumptions err on the side of over-estimating the demand:

- 1. We apply end-of-year totals for completed data centres as if they were operational throughout the year. We also assume that data centres are fully fitted-out once operational.
- 2. Utilisation is assumed at 50% of total design power. This equates to 65% of IT Capacity see Figure 5. The demand profile is assumed to be flat once operational.

Figure 5 - 50% Utilisation.

Carbon and Electricity

The carbon intensity of electricity on the Irish Grid is reported annually by SEAI. Thanks to renewable energy (mostly wind) the CO2 per unit of electricity has almost halved over the past 15 years. The latest data from SEAI indicates a figure of 331 gCO2/kWh (see Figure 6).

Figure 6 - Carbon intensity of the Electricity Grid (2019 data from provisional energy balance 2019*).

In 2018, the Irish Wind Energy Association (IWEA) commissioned Baringa to assess the potential to achieve 70% renewable electricity by 2030. The 70 by 30 report** shows that the grid would reach 150 gCO2/kWh by 2025 and 100 gCO2/kWh by 2030. We combine SEAI historical data with the 70 by 30 projection for 2025 (assumed linear to 2025) to give the carbon intensity of electricity - shown in Figure 7 below.

Figure 7 - Projected greening of the Irish electricity grid to 2025.

* SEAI Revised 2019 CO2 numbers: https://www.seai.ie/data-and-insights/seai-statistics/key-publications/national-energy-balance/ ** IWEA Baringa 70 by 30 report: http://www.iwea.com/images/files/final-baringa-70by30-report-web.pdf

Carbon and On-Site Generation

Self-generation of electricity on-site is possible using natural gas. The process involves large engines and operates in a similar way to a conventional power plant. In terms of carbon, natural gas contains 204.7 gCO2/kWh. Conversion efficiency to electricity is about 40%. Assuming no re-use of waste-heat from the engines, electricity generated in this manner produces 512 gCO2/kWh. We use this figure for on-site generation in our model.

A small number of facilities began implementing temporary on-site generation in 2018. Some may phase this out as grid reinforcements are completed. Other developments plan for large-scale on-site generation, but increasingly these are also looking for complementary grid connections.

Whilst self-generated electricity is more carbon intensive than grid electricity, there are some benefits to the grid such as:

- Availability for backup in the event of times of no wind
- Local grid congestion reduction
- System inertia benefits

These factors mean that the grid operator will be more confident in offering sites with onsite generation capabilities the grid capacity they might need. These are termed "firm" connections. This fits better with the always-on nature of data centres.

Ireland's Total Greenhouse Gas Emissions

Ireland's CO2 equivalent emissions total approximately 60.5 million tonnes annually. The effect of electricity achieving 70% renewables by 2030 is shown in Figure 8. This was calculated by assuming a linear trajectory for renewables, and also by allowing for an increase in electricity demand to 35TWh by 2025 (as per EirGrid's Low scenario). In our model, data centres will be measured as a percentage of this decreasing number for total emissions.

Figure 8 - Ireland's total GHG emissions 1990 to 2030. Combined SEAI/EPA data.

2025

Host in Ireland is an award-winning strategic global initiative created to increase awareness of the benefits of hosting digital assets in Ireland as well as Irish companies that are designing, building, and operating data centres globally.

There are many benefits to hosting in Ireland: access to affordable power; redundant network and bandwidth capacity; along with a variety of data centre providers that offer an array of services sustained by the the "6 Ps": Policy, People, Pedigree, Pipes, Power, and Proximity.

Ireland is not only the optimum location to host data, but as a global centre of excellence, it is also exporting data centre related products and services all over the globe.

Host In Ireland Partners

Although many of Host in Ireland's partners are competitors, they have come together as a collective through Host in Ireland. This collective work together to promote the capabilities of Ireland as a centre of data excellence.

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