Baringa

Green Data:

A vision for sustainable data centres in Ireland

in association with

bitpower
energy solutions

commissioned by

Cloud Infrastructure Ireland
Ibec

July 2022

Version History

Version	Date	Description	Prepared by	Approved by
1.0	12 July 2022	Final Issue	Chris Kavanagh	Mark Turner

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This Report was Commissioned by Cloud Infrastructure Ireland

Formed in July 2021, Cloud Infrastructure Ireland (CII) is a trade association within Ibec focused on the infrastructure policy issues that affect cloud providers.

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Executive Summary

In this study, Baringa and BitPower examine the role of data centres in modern society, the value Ireland's cloud infrastructure sector creates in social, economic and sustainability terms, and the steps that should be taken by the sector, Government, and other stakeholders to ensure a sustainable future for the industry in Ireland.

Key findings

- **Data centres are essential for modern society**, powering the digital services we use, enhancing cyber security and enabling the digital transformation of all sectors. They were officially recognised as essential services during the COVID-19 pandemic.
- **Data centres were key to enabling people to feel connected, socialise and work from home**, including communicating with colleagues and friends over video calls and to access remotely delivered public services during the pandemic. They continue to enable remote working and more efficient, accessible and personalised public services.
- **Data centres are critical enablers of decarbonisation:**
  - They significantly reduce the emissions from computing - they typically use 80% less energy than traditional on-premises servers to do the same amount of work[1].
  - They reduce the need for travel and physical goods, lowering emissions from transport and manufacturing.
  - They support digital technology being deployed across the economy to deliver emission reductions and efficiency gains - a study in Germany[2] estimated that rapid digitalisation could deliver half of Germany's target emissions reductions to 2030.
  - Hyperscale[3] cloud companies, which are the leaders in the data centre industry, are also the leading buyers of renewable energy in Europe and the world.
- Data centres attract **over €1bn of direct investment into Ireland annually**. They are a key part of Ireland's **computer services industry**, which generated **€134bn of exports in 2020, representing 33% of all Irish exports**.
- **Data centres can help accelerate the energy transition in Ireland by:**
  - directly supporting new renewables projects
  - financing improvements in energy security and networks
  - offering grid support services to facilitate renewables integration
  - supporting innovative solutions to achieving a zero-carbon power system in Ireland, and
  - providing zero-carbon heat to neighbouring buildings.

[1] 451 Research 2021

[2] Bitkom March 2021

[3] "Hyperscale" refers to cloud infrastructure and companies (dubbed "hyperscalers") that are of massive scale, effectively limitless from the individual user perspective: the leading hyperscale cloud providers are Amazon, Google and Microsoft. Data centres operated by hyperscalers may be termed "hyperscale data centres".

- **But this will require engagement between Government, the data centre industry and other stakeholders** to deliver changes in practice, policy, and regulations.

The value of Ireland's data centres

We use cloud data centres every day without realising it: when we send messages, when we search and shop online and when we join a video call, we depend on data centres. We access better and cheaper products and services thanks to the **advantages cloud services bring to businesses**, and we benefit from **better and more efficient public services**. Recognising its benefits, **the Irish Government has pursued digitalisation as a policy goal**, most recently in "Harnessing Digital – The Digital Ireland Framework" (Ireland's new national digital strategy). Irish businesses are ahead of the EU average in adoption of cloud services.

Digitalisation is best achieved through the cloud, which centralises IT resources in data centres, **leading to massive efficiencies**. The cloud is much more powerful than the individual devices used to access it, so even a low-powered mobile phone can be used to access powerful services that rely on hyperscale computing. **Reliability, scalability, and security are all better through cloud data centres.**

Businesses, public services and researchers using the cloud also benefit from:

- **Reductions in costs** and potentially **80% reductions in the carbon footprint of their IT use.**
- **Collaborative working** enabling global teams to work as one.
- **Access to powerful tools** such as big data, AI and high-performance computing

Cloud services are delivered by data centres. The data centre industry is also a major contributor to Ireland's economy, attracting **an estimated €10bn of investment** over the past 10 years, and **averaging over 25% growth per year**. There are over 90,000 jobs in computing, almost universally relying on data centre services. Jobs in the computer services sector have grown faster than jobs in other sectors over the past decade (Figure 1). In the wider economy, Ireland now boasts over one million jobs in digitally-intensive industries.

Ireland's tech industry has taken off as data centre capacity has grown, and 15% of the gross value added (GVA) in the Irish economy now comes from Information & Communications. This is a particularly export-focused sector, with **computer services now accounting for 33% of total Irish exports**. The growth in these exports closely follows the increase in investments in data centres (Figure 2). The data centre industry has also contributed to impressive growth in construction services exports as Irish companies have become world leaders in developing data centres.

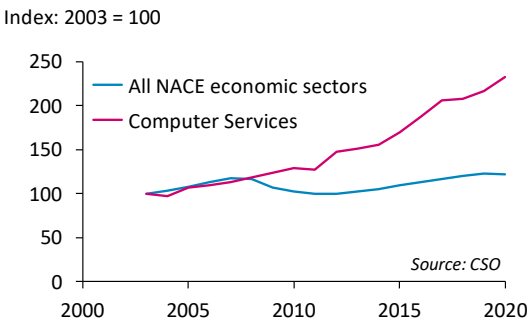

Figure 1: Evolution of jobs numbers in computer services versus all jobs in Ireland (2003-2020, index)

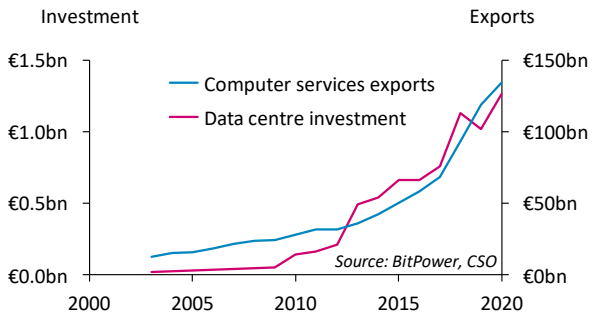

Figure 2: Investment in data centres (left axis) & computer services exports (right axis) 2003-2020 (€bn, nominal)

Looking ahead, Ireland has massive potential renewable energy resources which exceed Irish demand by over 300%. As these are developed, the electricity they produce can either be **exported "raw" to overseas markets** via interconnectors, or it can be **"refined" domestically, including in data centres**, and exported as computer services. **This latter option creates much more value in the Irish economy.**

Cloud services support wider sustainability

Data centres and digitalisation help drive emissions reductions across the economy in multiple ways.

Digitalisation can deliver significant emissions reductions by replacing physical goods and services with virtual ones. For example:

- The shift to **working, meeting and studying online** during Covid-19 restrictions was linked to a reduction in transport emissions in Ireland of almost 2m tonnes CO_2e[4], more than offsetting the 0.6m tonnes CO_2e increase in residential emissions.
- **Online shopping** can reduce emissions by up to 59%[5] compared with in person shopping.

Many decarbonisation solutions depend on data centre capabilities, including platforms to **manage energy use and software to make agriculture more efficient** – in fact **data and analytics are being deployed across almost every sector of the economy to support energy efficiency gains and increase productivity.** A cross-sector study in Germany found that potentially half of Germany's planned reductions in emissions by 2030 could be delivered by rapid digitalisation.

Cloud data centres can be 80% more energy efficient than traditional onsite servers, reducing the carbon footprint of computing workloads (Figure 3). Procurement of renewable energy to power them could reduce this further, and tech companies are leading on this in Europe and globally.

[4] Environmental Protection Agency October 2021

[5] Oliver Wyman 2021

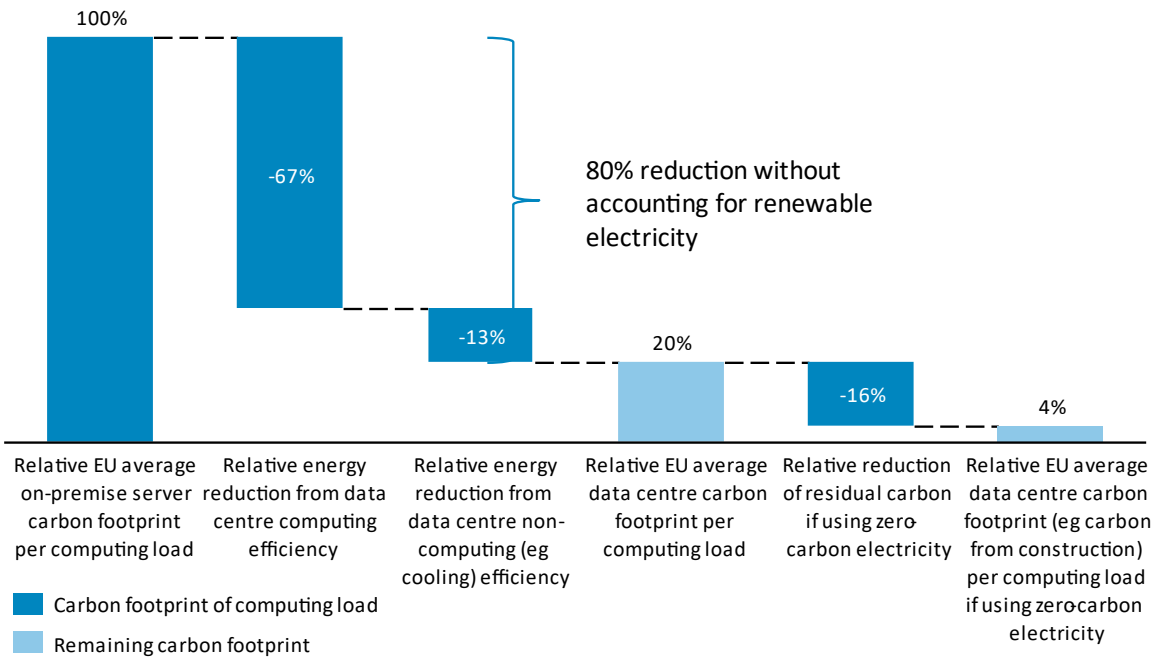

Figure 3: Calculated reduction in carbon footprint of computing loads shifted to cloud data centres from on-premise servers (%)[6]

The future of data centres in Ireland

Ireland's strong existing data centre and computing sector, together with its large potential renewable energy resources, people, climate and connectivity, puts it in prime position to capture expected future growth in the data centre industry.

Future data centres can lead the way on decarbonisation. Below, we set out the key ways they could do this, building on today's best-in-class examples.

Supporting new, unsubsidised renewables on the Irish grid, continuing to lead the way on sustainable corporate power procurement.

Decarbonising electricity use, by aiming to match electricity demand to carbon-free supply and investing in or enabling technologies such as batteries and green hydrogen to decarbonise peak generation.

Providing grid stabilisation services, that will replace services from retiring thermal generation and help integrate a higher proportion of renewable generation.

Providing low carbon heat for other applications, saving emissions that would otherwise have come from sources such as gas boilers.

[6] 451 Research 2021. Remaining relative data centre carbon footprint would include embodied emissions - some other emissions (such as occasional use of backup generators) not accounted for.

We conclude the report with a **set of principles** (Table 1) that we believe the data centre industry should work with the Government and other stakeholders to achieve.

Each principle tackles a different challenge and can be achieved by implementing different solutions. **We further recommend a set of concrete actions that should support these solutions.** Although these recommendations focus on data centres, many are also applicable to other large energy users, and **we would encourage** stakeholders to take **a sector-neutral, principles-based approach** as far as possible, to **maximise the scale of the impacts and to ensure consistency** across different parts of the economy.

Table 1: Principles & recommendations to enable sustainable digital infrastructure in Ireland

Principles	Challenges	Solutions
Decarbonise data centre electricity use	Power sector emissions must decline as electricity demand grows	**More granular carbon reporting**
		Carbon-efficient computing
		Cutting edge energy efficiency
		Low-carbon energy procurement
Enable secure and sustainable growth in electricity supply	Security of supply must be maintained and network capacity upgraded as the economy electrifies	**Collaboration on generation capacity**
		Enabling provision of electricity grid services
		Tackling network constraints
		Unlocking private wire renewables
Contribute to sustainability in other sectors	All sectors must become more sustainable	**Zero-carbon construction**
		Sustainable water use
		Sustainable sourcing and waste minimisation
		Making use of waste heat
All the solutions will require collaboration, and so we recommend: ***Dialogue and engagement***		
It is crucial that central Government, industry (power, data centres and other large energy users) and regulators work more closely together to achieve a sustainable future for data centres in Ireland.		

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We extend a thanks to Bitpower for their analytical support and for sharing their expertise regarding the data centre industry in Ireland.

Bitpower is a specialist data centre consultancy with a specific focus on power and sustainability. Bitpower brings local knowledge and experience to help clients achieve their objectives. They work with data centre operators, developers, and investors. Bitpower provides industry-leading analysis of the data hosting market in Ireland and tracks the scale and growth of the data industry for industry and government bodies.

Bitpower's experience spans over two decades in the industrial and regulatory ecosystem in Ireland, and they believe in fact-based analysis and strive to communicate complex issues in the simplest of forms. They actively participate in the growing debate about energy use and digitalisation.

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