Ireland's Data Hosting Industry

2018 Q2 Update

"Irish Data Centres, an Industry of Substance"

Host In Ireland

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July 2018

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Foreword

It has been an eventful three months for the data centre industry in Ireland with the main focus of attention landing squarely at Apple's decision not to progress with its €850m data centre investment in Athenry.

There was much cause for concern that the impact of the decision would greatly temper Ireland Inc's ability to attract continued investment in data centres but our 2018 Quarter 2 report shows momentum continues to grow.

From April to June of this year over €1 billion of new data centre investments were announced from CyrusOne, Crag Digital, Equinix and others. This brings the total investment expected from the construction of data centres up until 2021 in Ireland to €9.3 billion. There were also a combined total of 1,400 new jobs announced from Amazon and Google over the next three years linked to their data operations in Ireland.

The additional investment announcements come on the heels of a report by Grant Thornton on behalf of the IDA published in May examining the economic benefits of data centre investment in Ireland. The report found that data centres in Ireland employed 5,700 people in full time roles between construction and operational roles and generated €1.6 billion direct and €2.6 billion in indirect economic benefits to Ireland since 2010 including the engagement of 1,000 suppliers, 90% of which benefit Irish companies.

This quarter also seen the Government's statement on 'The Role Of Data Centres In Ireland's Enterprise Strategy'. We welcome the Government's recognition of the importance and strategic significance of the data centre industry in Ireland and its recognition of the challenges facing the industry in areas such as renewable energy, infrastructure and planning.

Ireland's contribution to the global data centre industry continues to grow also with demand increasing for Irish companies, skills and expertise to lead projects across the US, Europe and Asia cementing our position as a global industry player.

We are also seeing potential for the use of data centres to augment any future district heating systems here in Ireland. While the heat off the data centres is low grade it is consistent with how centres can add value to already established and functioning district heating systems which have been seen across the US and Europe and could make a tangible impact here in Ireland too.
This report is a Host in Ireland report with technical input and qualification from Bitpower to examine the opportunities and risks associated with the digital asset hosting industry in Ireland.

By providing the most timely and accurate update on data centre activity in the Irish market, we believe that this baseline will act as a useful reference for policymakers. This will be beneficial to Ireland as we look to continue our leadership in the creation, retention and exporting of digital products for the long term.

Garry Connolly
President & Founder – Host In Ireland

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Updated Data, Analysis and Dashboard Q2 2018

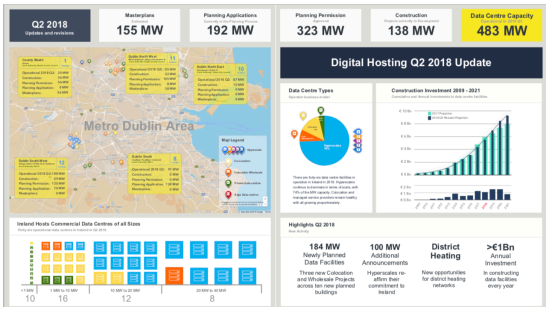
This Q2 2018 supplement augments our 2017 report with Host in Ireland and the Sustainable Energy Authority of Ireland - "Ireland's Data Hosting Industry 2017". We continue to provide quarterly updates on the scale, growth, and sustainability of Ireland's data hosting industry. We welcome any inputs, corrections, or contributions.

Our objective is to continue to maintain a watch on the growth of the commercial data hosting industry in Ireland. We will report in an aggregated manner, and all our data comes from publically available sources.

There is now estimated to be 483 MW of data centre capacity in operation in Ireland. Construction continues on a further 138 MW in 2018. Planning is proving less of a barrier, with 323 MW of facilities holding full planning permission. Planning applications are in progress for 192 MW. Apple's decision to abandon plans in Athenry does not seem to have affected the growth of the Industry.

The data hosting industry continues to invest over €1 billion per annum in developing facilities in Ireland. The growth trend of incumbent operators continues, and more new digital hosting companies have entered the Irish market in 2018. In Q2, over €1Billion of new projects were announced.

In this edition, we have updated our map of data centre facilities. Our dashboard summarises the key numbers in terms of power and investment, and our analysis provides context for policymakers.



This quarter, we also provide a brief commentary on research considerations for **district heating systems** and outline some recommendations for an Irish legislative policy on **Corporate PPAs** for renewable energy.

David McAuley
Founder & CEO – Bitpower

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Data Market Developments in Q2 2018

The first half of 2018 saw a continuation of development and growth in the Dublin Metropolitan Area. In Q2, new planning applications included 144MW of additional data centre facilities across ten new data halls. Confirmation of expansion plans by Hyperscales also demonstrate this growth trend. New plans in Q2 indicate an **additional €1billion** of investment over the coming years.

There are forty-six data centre facilities in operation in Ireland in Q2 2018.

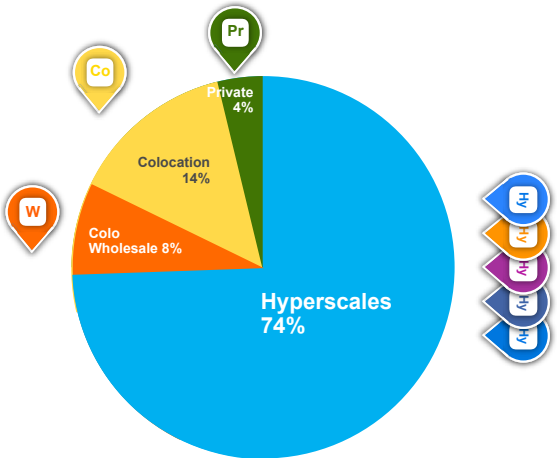


Figure 1 - Relative scale of digital hosting types in Ireland in 2018.

Hyperscale Data Centres

Microsoft, Amazon, Google, and Facebook all have operational facilities in the greater Dublin area. Expansion plans continue, with Facebook announcing it will grow in Clonee, and Google planning for expansion in Grange Castle. Amazon continue to develop in Dublin.

Colocation Wholesale

CyrusOne and Crag Digital are in the planning process. Orion has full planning permission for three data halls in Ballycoolin powered on-site using natural gas. The K2 Datacentres facility in Ballycoolin is expected to commence operation in Q3.

Colocation Data Centres

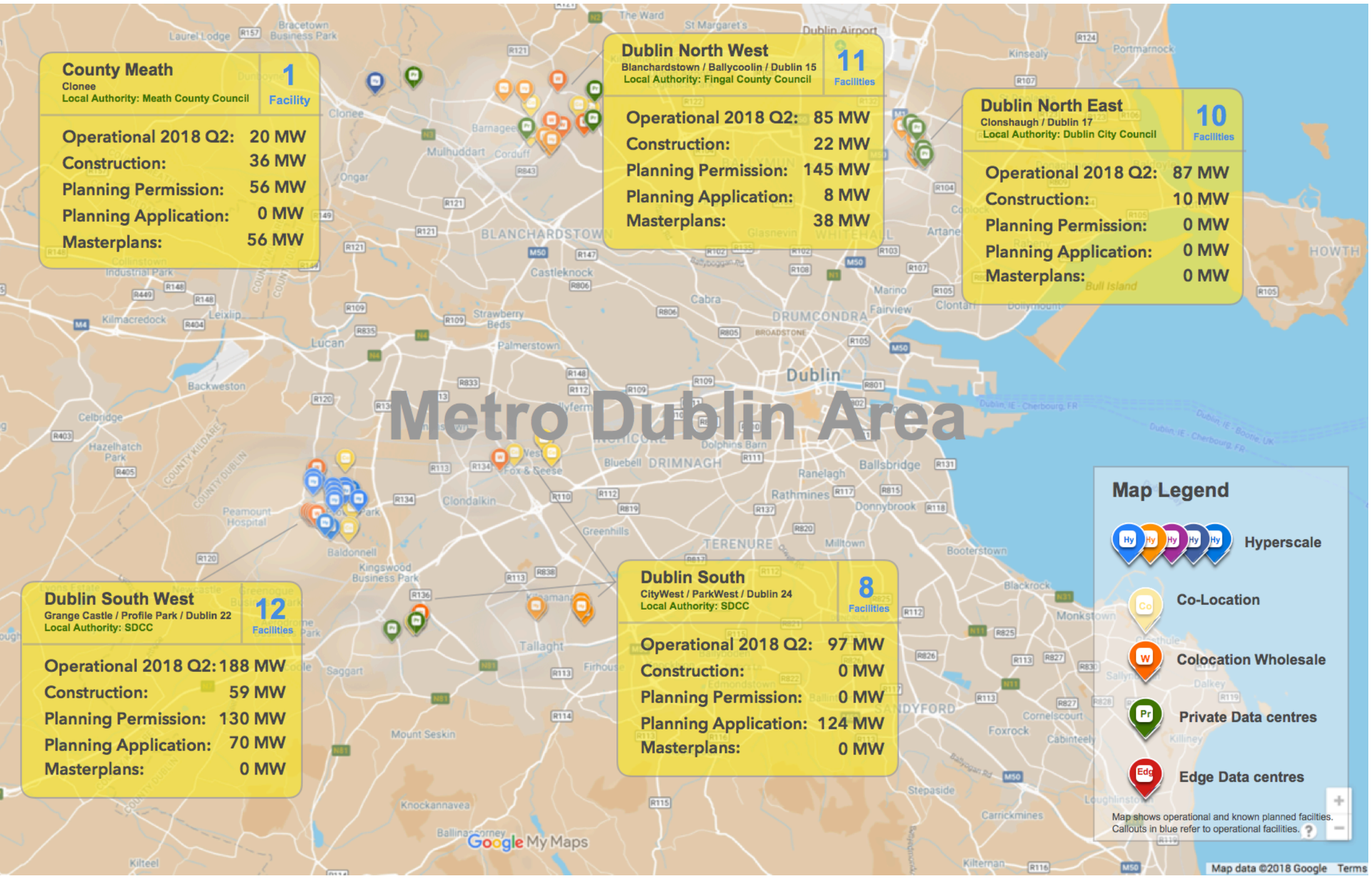
In 2018, Digital Realty commenced construction of their new facility at Profile Park. Equinix received planning permission for a new facility in Blanchardstown. Keppel DC continue to upgrade their Parkwest site, and InterXion are up and running at their Grange Castle facility.

Private Data Centres

We are unaware of any significant developments since 2017, though a number of tech jobs announcements in Q2 2018 indicate this sector remains healthy.

Edge Data Centres

We have not identified any new Edge data centres in Ireland in this update, and we have not estimated their growth in our model, but we do expect them to begin appearing very soon.



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Scale of Ireland's Data Industry in Q2 2018

Masterplans	Planning Applications	Planning Permission	Construction	Data Centre Capacity
Estimated	Currently in the Planning Process	Approved	Projects currently in Development	Operatonal in 2018 Q2
344 MW	184 MW	305 MW	138 MW	483 MW

There are forty-six operational data facilities of various types operating in Ireland in 2018.

The average size of buildings has increased over the years, moving from 5-10 MW in the 2000's up to 15-20 MW+ today. The diagram below shows the approximate size of operational facilities in Ireland in 2018.

Eight new buildings are in construction totalling 138 MW, and a further twelve have approved planning permission for 305 MW. New planning applications were submitted for ten new data halls.

Note - To calculate the power capacity, we have aggregated data from several sources. We first calculated the total maximum power capacity across all facilities identified using a methodology described in Appendix II of the 2017 report. Power capacity relates to the infrastructure required to deliver power through the national grid.

483 MW
up 3MW
Total connected data centre power capacity in Q2, 2018

138 MW
up 28MW
data centres in construction in 2018

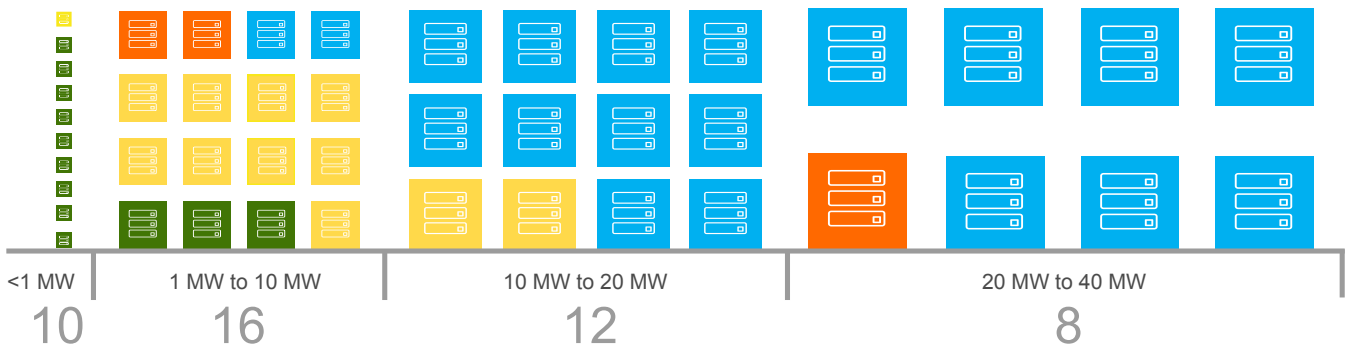
305 MW
up 15MW
with full planning permission

184 MW
up 144MW
in the planning process

344 MW
Masterplans

Ireland Hosts Commercial Data Centres of all Sizes

Forty-six operational data centres in Ireland in Q2 2018



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Investment in Data Centres

Our estimates of construction investment in data centres have been updated to account for industry developments since our 2017 report. In 2017, €1.2 Billion was invested in constructing data facilities. We expect investment of approximately €1.1 Billion in 2018, €1.5 Billion in 2019, and €1.4 Billion in 2020, as shown below. The total cumulative investment to date is approximately €5 Billion. By 2021, **€9.3 Billion** will have been invested. See Figure 2 below.

New developments and growth by existing operators are helping to drive investment in the data industry. The demand for data keeps growing and Ireland's digital ecosystem is keeping pace with demand.

Our model selects an investment year for a given project, but in reality, expenditure during the construction of a data facility may span several years. The diversity of projects at various stages tends to smooth out our projection.

These estimates represent the investment in land, buildings and energy infrastructure only. The computer servers, storage, and racks contained in data centres are a separate investment. We use estimates of between €3M and €7.5M per MW of data centre capacity depending on the type of facility.

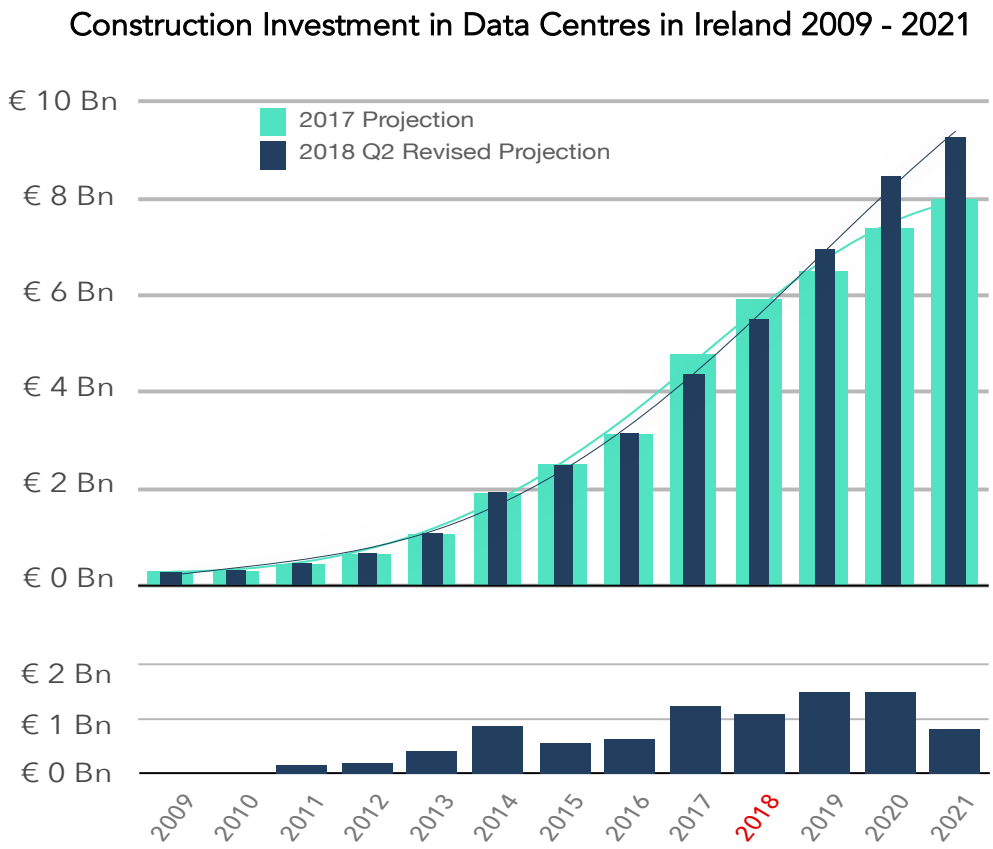
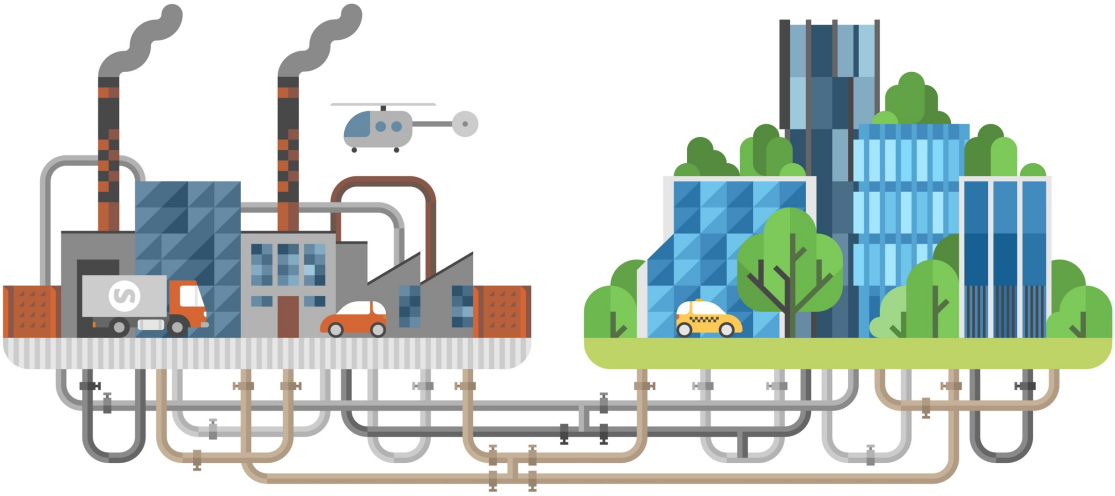


Figure 2 – Construction Investment in Data Centres 2009 – 2021 – Cumulative and Annual.

District Heating Considerations for Data Centres

There has been a notable trend in data centre planning conditions to request developers to capture waste heat for distribution to local heat users. The EU Energy Efficiency Directive requires that the technical and economic feasibility of district heating be considered for power plants above 50MW thermal input.

While district heating systems may appear economically feasible, there are some points that should be considered by researchers examining the potential for data centres to provide waste heat in Ireland. We have listed some of these below.



Research questions for District Heating Systems:

We need some exploration of these questions:

- District heating systems need multiple heat sources and multiple heat demands in order to ensure non-dependency on any single entity. Who should plan, build, and operate these networks?
- Who might manage the interface between the data centre and the heat user? What is the business model? What is the optimum design – e.g. Air to water heat pump feeding a 60°C water network loop?
- There is a need to quantify the theoretical heat availability profile from a data centre. The power utilisation, ramp-up profiles, and cooling methods should be considered.
- The capture of waste heat may have an efficiency cost for a data centre. We need a formula to account for this. Refer to international examples.
- Account for differences in data centre design, including on-site generation.
- Account for reduction in heat demand of users brought on by improved technology at building level (e.g. better insulation, heat pumps)

We have made our dataset available to researchers in aggregated format to facilitate the exploration of these questions.

The forthcoming **EU Renewable Energy Directive** will facilitate the market for district heating by:

1. Counting re-used waste heat as a renewable energy source, thereby increasing its value.
2. Regulating for the guarantee of origin of heat from renewable sources.
3. Providing consumer confidence in the regulation of a district heating market.

Renewable Energy Procurement & PPAs

In our 2017 report on Ireland's data hosting industry, we identified the measures being taken by digital corporations to monitor and report their carbon footprints (see sections 11 and 12 of our 2017 report). We also looked at how renewable energy is procured in Ireland.

In Q2 2018, we participated in a workshop facilitated by the Irish Wind Energy Association (IWEA) exploring the challenges and opportunities in Corporate Power Purchase Agreements (PPAs).

There were some interesting developments highlighted at this session. These are paraphrased below:

1. Energy demand growth of digital corporates is showing a combined annual growth rate (CAGR) of approximately ten percent.

2. The EU Commission's new Renewable Energy Directive will make it the responsibility of member state governments to facilitate the establishment of a robust PPA market.

3. In the EMEA region corporate PPAs are becoming more popular. Of the top corporate PPA deals in 2017 – digital companies made up three of the top four deals. Google (Avangrid renewables) – 196MW, Amazon (Lincoln Clean Energy) – 253 MW, Microsoft (General Electric) – 37MW. These deals were all for wind power.

4. RE100 – It is relevant for Ireland that about 60% of the companies signed up to RE100 commitments have operations in Ireland. We need to ensure we can meet the corporate demand for renewable energy.

Credit: Marie Donnelly, Former Director Renewables, Research & Innovation and Energy Efficiency at DG Energy of the European Commission.

The Department of Communications, Climate Action, and Environment (DCCAE) is exploring ways to facilitate the PPA market. Some high-level principles being discussed include:

1. Establishment of standard contracts for PPAs to simplify the legal complexities and reduce transaction costs.

2. Additionality – Ireland's electricity consumers support renewable energy through the PSO levy. PPAs for corporates should tie in to new projects that are outside the current support mechanisms.

3. Innovation – particular interest in renewable projects that would include wider benefits such as, for example energy storage or community involvement.

Our recommendations for Ireland's PPA policy:

1. Clarify for end users the sources of energy credited by the Guarantees of Origin system. The current system does not provide sufficient transparency and prevents much needed investment in Ireland's renewable energy industry.

2. Provide clarity on potential renewable energy feed-in tariffs (REFIT) for new wind and Solar PV developments. This will facilitate investment certainty for developers of renewable energy projects.

3. Underwrite or guarantee long term procurement from renewable energy projects, thereby reducing financial risk.

These actions would help to ensure that Irish renewable energy projects can attract support from corporates interested in powering their Irish operations from 100% renewable energy.

Q2 2018
Updates and revisions

Masterplans
Estimated
155 MW

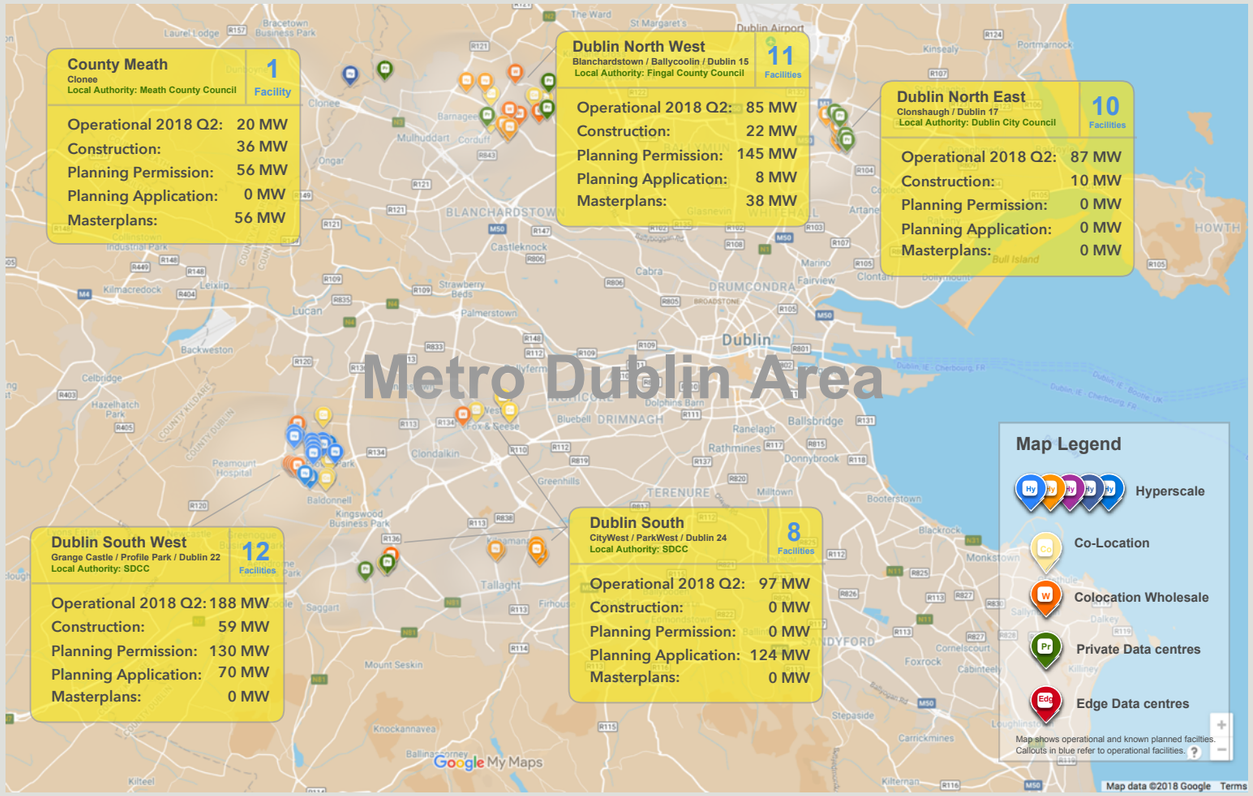
Planning Applications
Currently in the Planning Process
192 MW

Planning Permission
Approved
323 MW

Construction
Projects currently in Development
138 MW

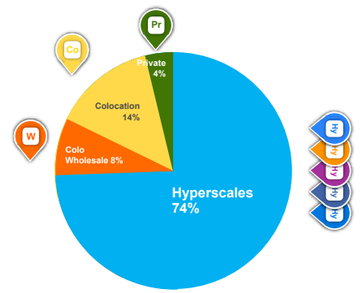
Data Centre Capacity
Operatonal in 2018 Q1
483 MW

Digital Hosting Q2 2018 Update



Data Centre Types

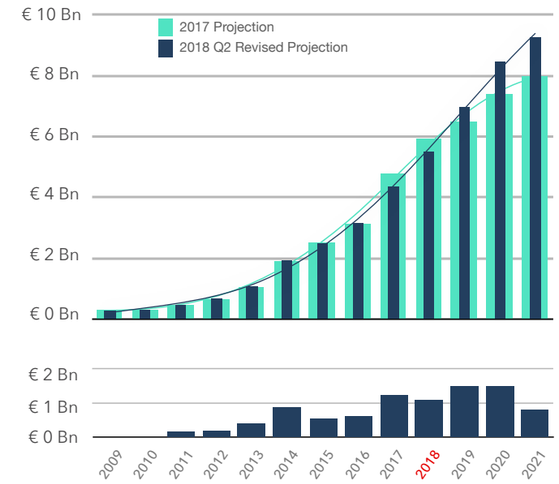
Operator business model



There are forty-six data centre facilities in operation in Ireland in 2018. Hyperscales continue to dominate in terms of scale, with 74% of the MW capacity. Colocation and managed service providers remain healthy with all growing proportionately.

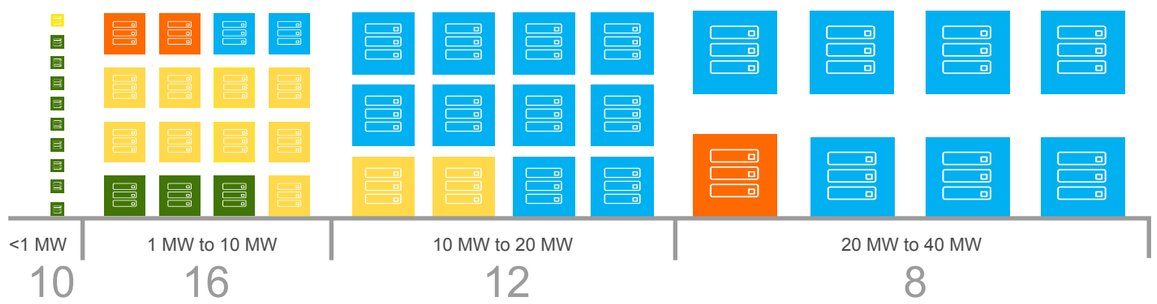
Construction Investment 2009 - 2021

Cumulative and Annual investments in data centre facilities



Ireland Hosts Commercial Data Centres of all Sizes

Forty-six operational data centres in Ireland in Q2 2018



Highlights Q2 2018

New Activity

184 MW
Newly Planned Data Facilities
Three new Colocation and Wholesale Projects across ten new planned buildings

100 MW
Additional Announcements
Hyperscales re-affirm their commitment to Ireland

District Heating
New opportunities for district heating networks

>€1Bn
Annual Investment
In constructing data facilities every year

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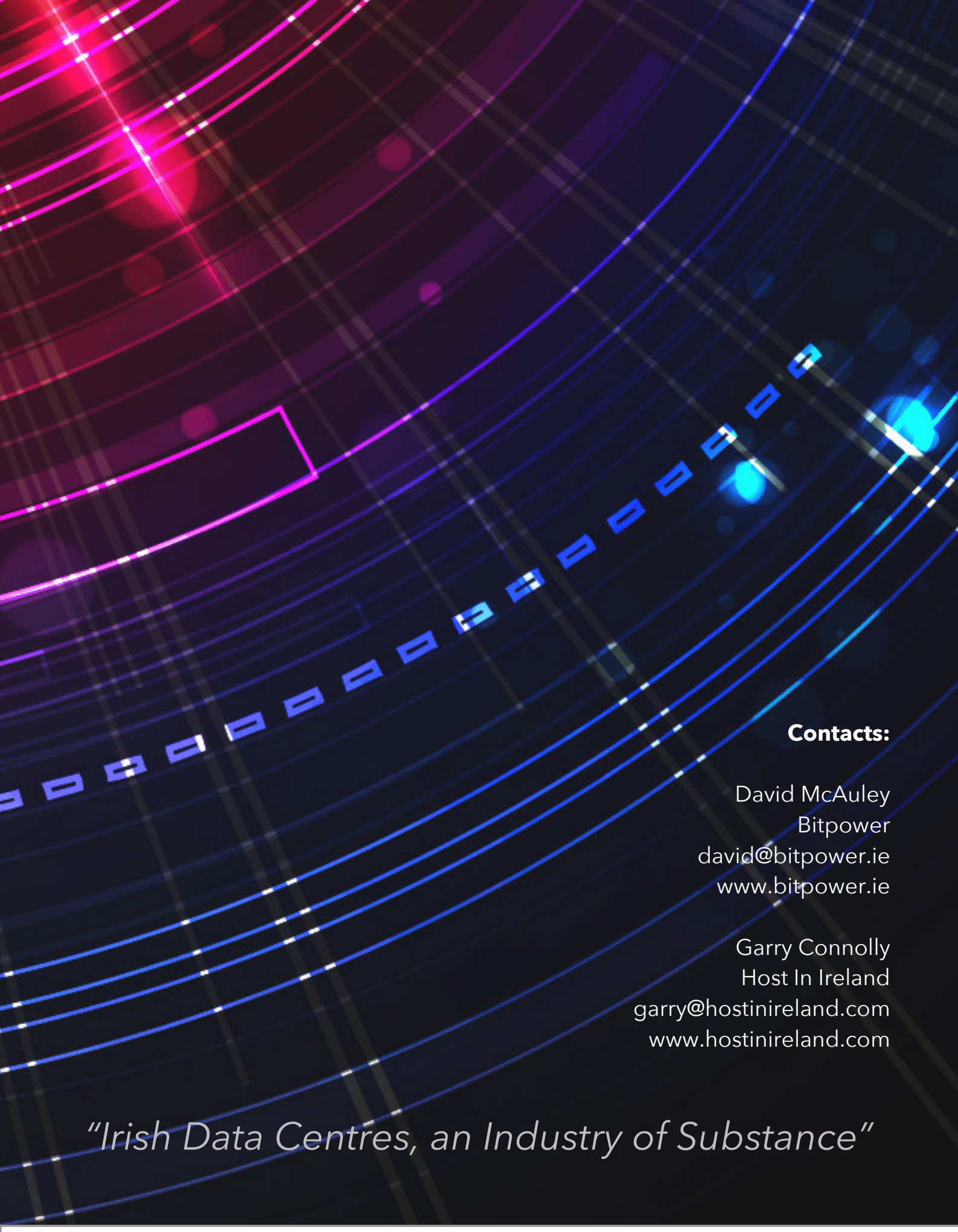

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