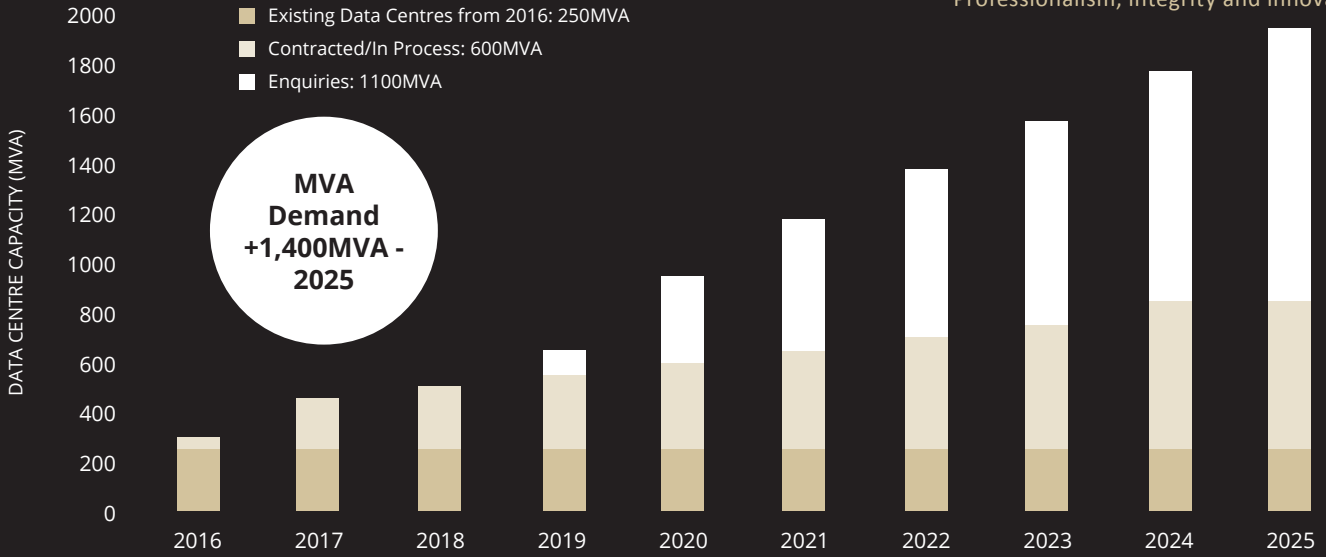
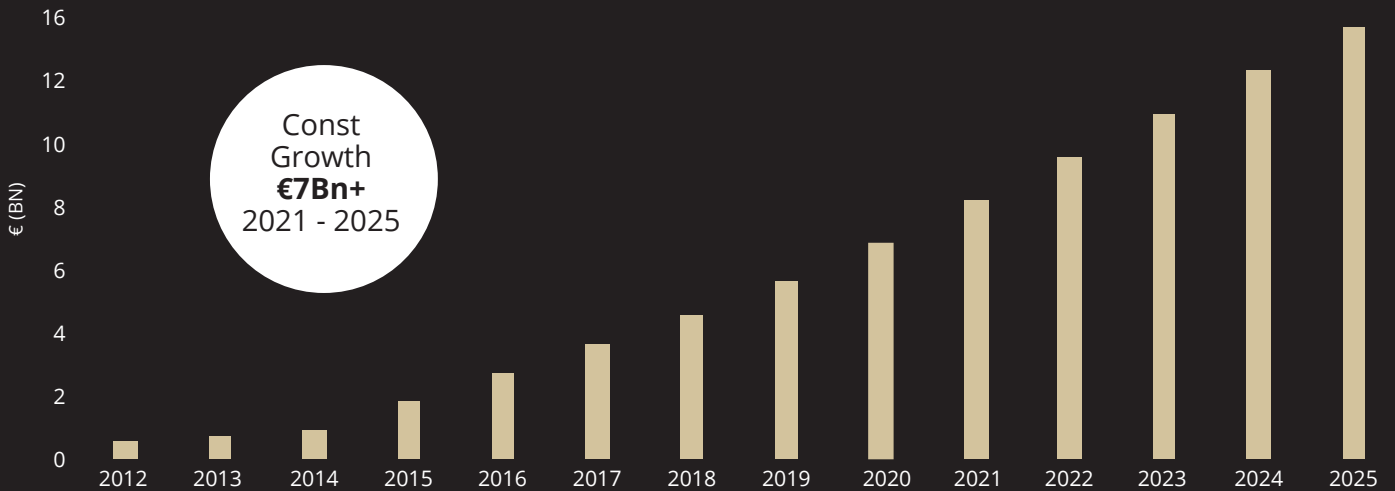


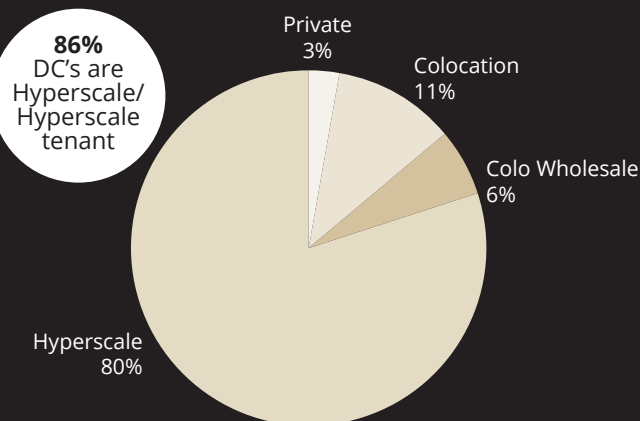
IRISH OVERVIEW



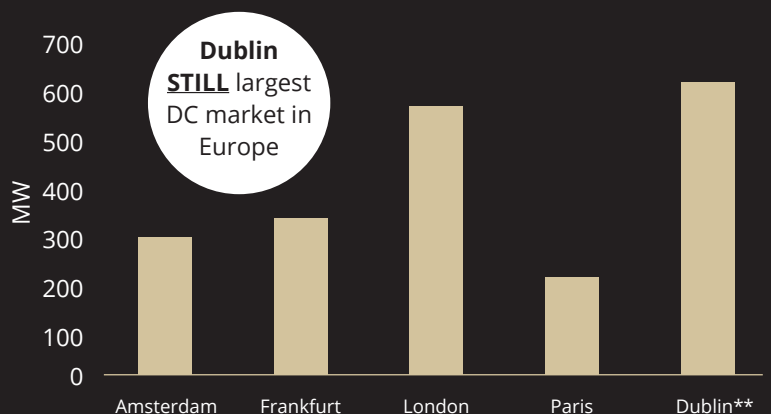
CONSTRUCTION INVESTMENT IN DATA CENTRES 2009 - 2025 (IRELAND)



DATA CENTRE TYPES IN IRELAND



MARKET SIZE (MW)



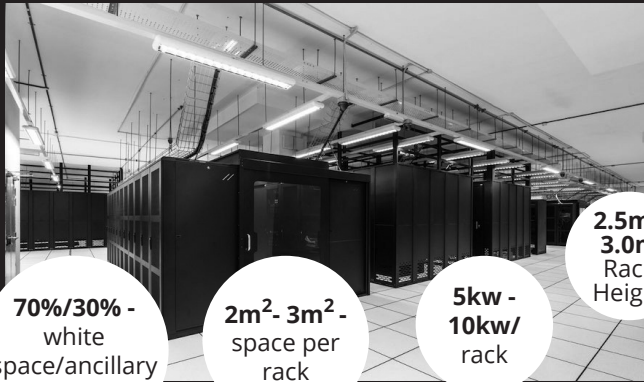
DATA HOSTING TYPES IN IRELAND

- Hyperscale** **Examples: Amazon, Apple, Facebook, Google, Microsoft.** Large scale companies that manage hosting for their clients. They build and operate their own data facilities to their own specification.
- Colocation Wholesale / Build to Suit** **Examples: K2, EdgeConnex, Echelon, Cyrus One.** Private investors fund, build and lease to the Hyperscales. The Hyperscale leases the "white space". This is relatively new to Ireland but is growing significantly due to demand.

- Colocation** **Examples: Digital Realty, Keppel, Equinix, InterXion.** Managed facilities for partial use by third parties. IT managers in various companies can lease "white space" which have high security, power and cooling.
- Private** **Examples: BT, Eir, OPW.** Purpose built by private companies involved in financial transaction, telecom and IT type industries.
- Edge** **Examples: Not yet in Ireland.** Edge DC's will range from 500kW to 2 MW. They will be located closer to where the end user is to help improve speed and latency.

DC DESIGN BENCHMARKS

Professionalism, integrity and innovation



2.5m - 3.0m Rack Height

70%/30% - white space/ancillary space

2m²- 3m²- space per rack

5kw - 10kw/ rack

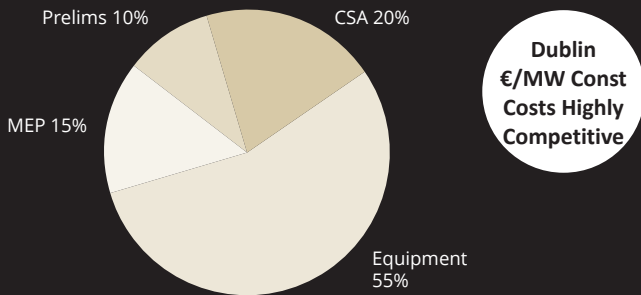
CONSTRUCTION COSTS

COST RANGE
€0,000

Data Centre (white space spec) - €MW	
Data Centre	€7.5m - €9.5m
Substations	
Substation - 110kV	€14m - €18m
Substation -38kV	€4m - €5m
Infrastructure - Suburban	
HV Cable (1Nr) - aluminium (2km - 10km length)	*€140/m - €195/m
Trenching for HV Cable (2km - 10km length)	€430/m - €650/m

* Can also be copper pending trench depth. Rate fluctuates due to commodities market

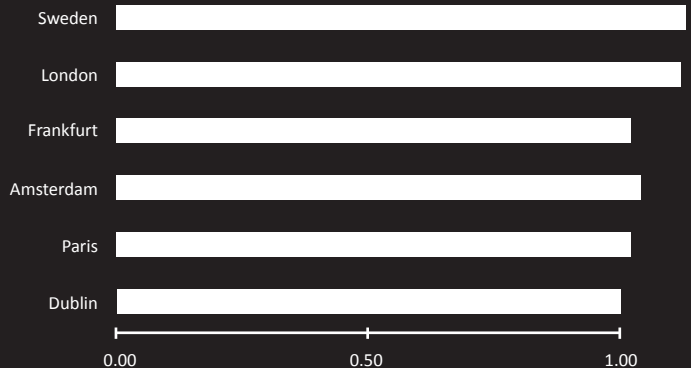
Elemental Split €/MW



JARGON BUSTER

Term	Explanation
PUE	Power Usage Effectiveness: measure of DC efficiency calculated by dividing the total data centre energy consumption by the energy consumption of the IT computing equipment.
LV, MV, HV, EHV	Low Voltage - up to 1000V Medium Voltage - 1000V to 35kV High Voltage - 35kV to 230 kV Extra High Voltage - above 230 kV.
MW	Mega Watt: a measure of power equal to one million watts. Often used to describe the size of data centres in terms of power capacity.
MVA	Used for the apparent power in an electrical circuit, equal to the product of root-mean-square (RMS) voltage and RMS current. It is a measure of power consumption.
N+1	Need plus one: a redundancy concept where capacity is configured to include used capacity plus one additional device to enable continued operations with the failure of one system in the configuration.
2N	A redundancy model that ensures that every component has a backup such that the data centre has no single point of failure.
Cold Aisle	An aisle where rack fronts face into the aisle. Chilled airflow is directed into this aisle so that it can then enter the fronts of the racks in a highly efficient manner.
Hot Aisle	An aisle where rack backs face into the aisle. Heated exhaust air from the equipment in the racks enters this aisle and is then directed to return vents.
HAC	Hot Aisle Containment: system that directs heated air from the outlet side of racks to air conditioning equipment return ducts in a highly efficient manner.

DATA CENTRE COST INDEX (Dublin base = 1.0)



IRISH CONTRACTOR DELIVERY OF DC'S IN LAST 5-6 YEARS

GENERAL CONTRATORS	Ireland	International
	MW	MW
BAM	138MW	107MW
Mercury*	36MW	663MW
John Paul	91MW	20MW
Bennett Construction	48MW	-
PJ Hegarty	n/a	n/a
Collen Construction	300MW	75MW
Walls Construction	12MW	
Sisk	80MW	22MW
Winthrop*	73MW	224MW
Designer	10MW	44MW
Jones Engineering*	62MW	62MW
Structuretone	52MW	544MW

*Ambiguity in responses between CSA only and M&E Subcontractor only role. Result: some overlap in MW's delivered. **Traditional M&E contractors have taken role as General Contractor on some projects in the Data Centre sector.

USEFUL CONTACTS

Company	Website
IDA	www.idaireland.com
Enterprise Ireland	www.enterprise-ireland.com
bitpower energy solutions	www.bitpower.ie
Host In Ireland	www.hostinireland.com
Eirgrid	www.eirgridgroup.com
Gas Networks Ireland	www.gasnetworks.ie
Planning & Construction Costs	www.mitchellmcdermott.com/knowledge-centre

The figures & data used for this card are based on a 10MW-20MW Data Centre with "white space" only. Tenant servers and racks are excluded. Professional advice should be sought for specific projects. Costs are for construction only and exclude VAT | Tender Inflation from January 2020 | Site Acquisition | Planning and Statutory Fees | Development Contributions | Capital Contributions for Services connections | Bonds | Professional Fees | Sales and Letting Costs | Marketing | Legals | Valuers | Accountancy Costs | Finance Costs | Owner Insurances | Adjoining Neighbour Costs | Abnormal Ground Conditions



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