

# techUK Data Centres Programme

## Briefing Note:

### Power provisioning, energy consumption and sector growth

March 2017

#### Introduction

Power provisioning and energy consumption are frequently confused, but in the data centre sector they mean very different things. Power provisioning relates to the total capacity available to data centres. Energy consumption is what they actually use. Power demand is instantaneous and measured in MW, GW etc. (though data centres tend to use MVA to describe usable capacity). Energy consumption is cumulative and measured over time, in MWh, GWh etc.<sup>1</sup>

#### What is power provisioning?

Power provisioning is the maximum supply the operator has contracted from the energy provider. In other words, the amount that the operator has the right to use at any one time. Power is provisioned on the basis of the maximum amount that a data centre site could need when fully occupied and when systems, including cooling, are all working at full capacity, plus a safety margin. We estimate very roughly that between 1,500 and 1,700MW of power is available for UK operators in this way, based on a combination of measured data and extrapolation<sup>2</sup>.

#### How much energy does the sector actually use?

The UK's commercial (colocation) data centre sector<sup>3</sup> used 2.15 TWh of energy in 2014<sup>4</sup>. We estimate that enterprise (in-house) operators like government, banks and retailers that don't outsource to commercial providers use nearly the same again. The part of the sector that is harder to quantify in terms of energy use is tucked away in small data centres and server rooms within office buildings and is known as "distributed IT". Opinions vary regarding energy demand and estimates range from 2-5TWh. Adding this all together, the total figure is probably somewhere between 6TWh and 9TWh. With total UK electricity use at around 300TWh per year, this suggests that the sector uses between 2% and 3% of our domestic electricity supply. This should not be confused with total energy, of which it consumes below 1%.

#### How does power provisioning compare to actual demand?

Power provisioning is approximately three times actual power draw, and dependent on the maturity of the site and type of operator. For commercial (colocation) operators with mature sites that are fully occupied, power draw can be up to 60% of provisioned capacity. Newer sites, with lower occupancy, will draw less whilst they gradually fill up, so the average is probably between 30% and 40%. The picture also varies among enterprise operators: risk averse businesses like banks have tended towards "over provision" but this is offset by other enterprise users.

Within the distributed IT market (multiple smaller data centres and server rooms within office buildings) there may be no additional provisioning above the actual requirement because the energy bill is just part of the corporate office costs. This is a generalisation and the picture will vary, but sector average for actual power demand is probably between 1/3 and 1/2 of total provisioned capacity.

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<sup>1</sup> A KWh is what it says on the tin: 1 KW of energy delivered for one hour, or 1/2KW delivered for 2 hours, and so on.

<sup>2</sup> Measured data: Power provisioning for the London commercial data centre market is around 450MW, of which 333MW represents existing commercial activity (or space that is spoken for), 71MW is fitted out with racks ready for action but not yet occupied and 44MW ready for action but not yet fitted out (Source CBRE European Data Centre MarketView Q4 2016).

Extrapolation: It is widely accepted that London represents about 75% of the UK commercial market which suggests that power provisioning for the whole commercial UK market is around 600MW. This commercial element of the data centre sector is assumed to represent about 1/3 of the total UK estate, which suggests that total power provisioning for the UK sector is likely to be between 1500 and 1700 MW.

<sup>3</sup> Operators that provide data centre services to third parties, as opposed to organisations that operate data centres to support their own IT functions.

<sup>4</sup> Audited data provided for the Climate Change Agreement report for target period 1. 2016 data will be available in mid-2017

### **Are operators concerned about security of supply?**

Although supply margins are smaller than they used to be, from an operator perspective the UK's power supply is amongst the most reliable in the world. Existing data centre operators have power supply contracts in place and are not overly concerned about security of current supply. Moreover, if generating capacity is squeezed, the impact on operators is likely to be limited to restricted periods of peak demand. Operators have business continuity measures in place and are well prepared to handle short term and even medium term power outages without any impact on function.

### **Is the sector growing and how will that impact energy demand?**

The data centre sector is one of the UK's industrial success stories and is probably the fastest growing industry in the developed world. Colocation provider Equinix, for instance, has just reported its 56<sup>th</sup> quarter of continuous growth. This rapid expansion is driven by two factors:

- Firstly, the increasing digitisation of business and government processes and social activity: (policy initiatives like the digital agenda, IoT, superfast broadband, smart grid, etc. , video and image based social networking and the increased demand for moving larger data packets around). This will drive net growth: a large growth in data and an incremental growth in energy demand<sup>5</sup>.
- Secondly, moves to outsource existing distributed IT to the cloud will drive growth in the commercial sector by displacing in-house activity. Net energy use will decrease however, because the act of consolidating distributed IT into purpose-built facilities improves efficiency by around two thirds. The energy also becomes measurable and transparent.

### **Will lack of generating capacity hinder future growth?**

Some of this growth will be accommodated by existing capacity: the power provisioned by operators envisages their own expansion up to full occupancy. While a number of older sites are full, the majority still have room for expansion within their existing contractual power thresholds.

However, for new data centre developments or major expansion (not covered by existing contractual arrangements)<sup>6</sup> growth could be limited if grid supply is constrained. This could be problematic for operators wishing to expand a site beyond its current power provisioning and for inward investors seeking sites in the UK. This issue is also likely to affect some locations more than others.

### **Other developments**

Some investors are exploring innovations in the field of alternative power sources for data centre developments and are moving away from reliance on grid supply and towards onsite biomass or other renewable generation. Longer term battery storage options are also being explored as relevant technologies are maturing. It is likely to be some time before deployment of these approaches is widespread within the sector.

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<sup>5</sup> The growth in energy demand is much more muted than the growth in digital data, because of factors like Moore's Law, where the energy required to process a given amount of data halves every 18 months, and other factors like improved energy stewardship, higher server utilisation and other energy management technologies.

<sup>6</sup> It is common practice for a data centre operator, when building a new site, to make engineering provision for electricity supply well in excess of the contractual power provisioning arrangements. This allows for future expansion without the need for costly re-engineering. However, to expand to the functional capability of the site, new supply contracts would have to be negotiated and if supply were limited in future, sites might be unable to grow to their original planned capacity.