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REPORT EXCERPT

Global Case Studies in Highly Efficient Datacenters 2014

For datacenters, efficiency and operational excellence are achievable in any location, despite regional differences in datacenter markets across the world. This report looks beyond theoretical solutions and supplier marketing and concentrates on real-life projects and results. The datacenter projects profiled in this report showcase trends in design, deployment approaches, tools and services at the forefront of facility efficiency. Many of these case studies serve as models for other operators to follow, and all were winners of the Uptime Institute Brill Award for Efficient IT at the Institute's annual Symposium in May 2014.

KEY FINDINGS

- **Efficiency for all.** Most of the highly efficient datacenters we analyzed are run by very large organizations, but many of the technologies and strategies employed are within the reach of all datacenter operators, including airflow remediation and forming multidisciplinary teams for collaboration and shared management.
- **Free cooling.** Many highly efficient datacenters are lowering their capital and operational costs by downsizing mechanical cooling equipment and relying heavily on free cooling.
- **Prefab modular.** The use of prefabricated modular (PFM) datacenters is very often, though not always, more efficient in terms of energy and capital, and may have the advantage of more easily supporting multitier and mixed-density facilities.
- **Green clouds.** Renewable and low-carbon energy strategies (on and off site) will become increasingly common for new cloud and other public-facing datacenters. Some are deploying onsite energy production, while for others the availability of low-carbon energy sources is likely to be a factor when siting new facilities.

ABOUT 451 RESEARCH

451 Research is a preeminent information technology research and advisory company. With a core focus on technology innovation and market disruption, we provide essential insight for leaders of the digital economy. More than 100 analysts and consultants deliver that insight via syndicated research, advisory services and live events to over 1,000 client organizations in North America, Europe and around the world. Founded in 2000 and headquartered in New York, 451 Research is a division of The 451 Group.

New York
20 West 37th Street, 6th Floor
New York, NY 10018
Phone: 212.505.3030
Fax: 212.505.2630

London
Paxton House (5th floor), 30 Artillery Lane
London, E1 7LS, UK
Phone: +44 (0) 207 426 0219
Fax: +44 (0) 207 426 4698

San Francisco
140 Geary Street, 9th Floor
San Francisco, CA 94108
Phone: 415.989.1555
Fax: 415.989.1558

Boston
125 Broad Street, 4th Floor
Boston, MA 02109
Phone: 617.275.8818
Fax: 617.261.0688

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SECTION 1
Executive Summary

1.1 INTRODUCTION

The case studies in this report focus on datacenter efficiency and availability achieved through technology and design elements, as well as operations and management. Most (but not all) also achieve a high degree of reliability (2N) through the use of technologies such dual power supplies, dual fiber paths, redundant uninterruptible power supply (UPS) systems and backup generators, as well as reserve fuel and water supplies that will last multiple days. These datacenters are noteworthy for their high levels of efficiency, often achieved through the novel deployment or use of power and cooling technologies, innovative facility designs and by taking a holistic operations management approach that can span datacenter facilities and IT teams, as well as third-party contractors and suppliers.

All of the case studies exhibit one or many of these characteristics. For presentation purposes, we have broken them down by geographic region: North America, Europe, Asia and Latin America. High-level observations about the local datacenter market for each region include datacenter market size and the rate of adoption of efficiency designs, technologies and approaches.

The datacenters in this report were Brill Award winners at the Uptime Institute's annual Symposium event in May 2014.

1.2 KEY FINDINGS

- **Efficiency for all.** Most of the highly efficient datacenters we analyzed are run by very large organizations, but many of the technologies and strategies employed are within the reach of all datacenter operators, including airflow remediation and forming multidisciplinary teams for collaboration and shared management.
- **Efficient and available.** High efficiency can be achieved through datacenter technology and design elements, and operations and management – without compromising on availability.

- **Multiple tactics.** Efficiency approaches include cooling designs, reduced compute power consumption, and the incorporation of modularity and sustainability elements in datacenter design.
- **Location, location, location.** Several of our case studies also feature location-dependent innovations, reflecting a greater recognition of the role that a datacenter's environment plays in its operational efficiency.
- **Free cooling.** Many highly efficient datacenters are lowering their capital and operational costs by downsizing mechanical cooling equipment and relying heavily on free cooling.
- **Prefab modular.** The use of prefabricated modular (PFM) datacenters is very often, though not always, more efficient in terms of energy and capital, and may have the advantage of more easily supporting multitier and mixed-density facilities.
- **IT efficiency.** If managed properly, virtualization is proving to be an effective tool for driving up IT utilization, including on-premises private-cloud environments. However, the use of IT power management and control software to curb power waste remains low.
- **Green clouds.** Renewable and low-carbon energy strategies (on and off site) will become increasingly common for new cloud and other public-facing datacenters. Some are deploying onsite energy production, while for others the availability of low-carbon energy sources is likely to be a factor when siting new facilities.

SECTION 3
Case Studies

3.2 EUROPE

3.2.1 DIGITAL REALTY, CUNDALL, EXCOOL AND NICHOLAS WEBB ARCHITECTS

Wholesale datacenter provider DLR wanted to build a green datacenter in Ireland with a low PUE. It spent two years researching its options for an indirect outside air-cooling system before choosing a product from Excool. By deploying Excool's system, which uses adiabatic and evaporative cooling technologies, DLR's new 4MW facility at Profile Park in Dublin uses no mechanical refrigeration for the cooling process – it is chiller free.

There are no compressors for the data halls and equipment rooms. The facility was designed to operate within the ASHRAE 2011 A1 allowable temperature envelope (15-32 degrees Celsius or 59-89.6 degrees Fahrenheit), and a small direct-exchange (DX) coil is used to de-humidify a very small amount of fresh air used to pressurize the datacenter room.

The Profile Park campus comprises four power base buildings, each containing two 1,920kW turn-key flex (TKF) modules. Each TKF module uses prefabricated electrical switchgear and UPS skids, containerized generators and a fully offsite built cooling plant to support the data halls. The autonomous data halls were designed to support as many as 494 racks per hall, with an IT load of approximately 3.88kW per rack. DLR's entire 10-acre campus will ultimately support up to 15.4MW of total IT load capacity.

In the current 4MW facility, eight Excool units serve each TKF module, conditioning and delivering cool air via a raised floor void at 75 degrees Fahrenheit (24 degrees Celsius). Exhaust air is contained in a hot aisle and returned to the Excool unit via a ceiling plenum.

By eliminating mechanical cooling from the datacenter design, DLR was able to downsize its generators and transformers, achieving significant capex savings (more than 40% savings for the generator and almost 25% for the transformer). Proportional decreases in diesel fuel storage capacity and electrical distribution equipment yielded additional capex savings. DLR estimates opex savings of almost US$875,000 (€643,000) annually, compared with a legacy datacenter (based on a €0.10 per kWh power cost). The datacenter, which achieved an 'Excellent' Building Research Establishment Environmental Assessment Methodology (BREEAM) score, has a theoretical PUE of 1.15.