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TELUS Quebec Intelligent Internet Data Center, Canada

Case Study 105

Aspects of Sustainability

This project highlights the following:

Green Aspects

Energy

Carbon

Materials

Water

Local Impacts

Social Aspects

Human Resources

Corporate Community Involvement

Business Ethics

Health and Safety

The TELUS Quebec Intelligent Internet Data Center (IIDC), constructed in Canada, uses Skanska-developed solutions to realize substantial guaranteed energy and financial savings. The data center is pursuing LEED (Leadership in Energy and Environmental Design) Gold level.



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“The agile design approach with Skanska has provided TELUS with the required flexibility in a constantly changing IT world – we can optimize capital deployment and minimize total cost of ownership while ensuring required reliability, security, and scalability.”

Lloyd Switzer, SVP Network Transformation, TELUS

build process for a new prototype IIDC in Quebec for TELUS. The US\$ 65 million Quebec facility was completed in August 2012, and Skanska will complete a second TELUS IIDC in British Columbia in June 2013. The data centers include a central utilities building, an office and administration building and server modules that are connected by a central access spine. The data hall containing the server modules was fully prefabricated, and was shipped to the site in 64 pieces and assembled onsite in four weeks.

Skanska’s Mission Critical Center of Excellence and its technology partner Inertech have developed innovative eComb™ modular infrastructure solutions, which enable a “just-in-time” modular deployment to increase server capacity. Inertech is Skanska’s technology partner that also developed and its technology partner Inertech, who highly efficient eOPTI-TRAX™ cooling technology. The eComb modular solution allows future capacity to be delivered over the multi-year Quebec agreement, from a 2.7 MW capacity in phase 1

Project Introduction

TELUS is a Canadian telecommunications company that is in the process of upgrading its national technical infrastructure. TELUS has opted for Skanska’s state-of-the-art next-generation solutions to upgrade its data centers, which provide more efficient and sustainable operations, whilst being able to accommodate increases in capacity over time to optimize space and cost.

Skanska Canadian Construction Services Inc. led the integrated, collaborative design and

Skanska Color Palette™

Energy



Carbon



Materials



Water



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to a 25+ MW capacity and a total facility area of 11,613 m² by phase 7 through a series of modular expansions. Skanska managed the entire design and build process, which allows it to underwrite and guarantee the performance of the IIDCs for the client. The Quebec site will be able to reduce its overall costs by 40 percent by lowering up-front investment through the modular deployment approach and by enhancing energy efficiency.

The new TELUS IIDCs are pursuing LEED Gold certification with the Canadian Green Building Council (CaGBC). LEED is a voluntary certification process intended to encourage and guide the construction of more sustainable and energy efficient buildings. The highly efficient nature of the IIDC aligns with TELUS' sustainability commitments, including its 10-year climate change strategy and its objective to eliminate over half a billion kWh in energy waste

Contributing Toward Sustainable Development

The TELUS Quebec IIDC uses around 80 percent less power for cooling and over 80 percent less water than a conventional data center to realize significant financial savings over its lifespan. Highly efficient eOPTI-TRAX cooling and eComb modular technologies developed by Inertech were incorporated into the project, along with Skanska's intelligent energy management tools and software. Furthermore, Skanska guaranteed the performance of the IIDC as part of a long-term agreement with TELUS. Skanska's modular solution also allows the "just-in-time" deployment of server

capacity, which promotes flexibility and reduces costs. Skanska worked closely with the client and project partners from the outset to adapt its efficient technological solutions to TELUS' requirements. During construction, a significant proportion of construction waste was diverted from landfill, high standards of health and safety were achieved, and regional workers and construction materials were used that promoted local economic benefit.

Green Aspects

Energy

Energy efficiency

The Skanska/Inertech eOPTI-TRAX cooling platform and eComb modular solution ensure that the TELUS IIDCs use around 80 percent less power for cooling than conventional data centers. The Quebec site has an industry leading system-wide annualized Power Usage Effectiveness (PUE) of 1.15, compared with a conventional newly constructed data center of around 1.6. The PUE is the ratio of total amount of power used by a data center to the power delivered to the computing equipment, whereby an ideal PUE is 1.0.

Skanska's eComb or eHive aisle containment systems have self-contained IT and mechanical systems within the modules that track and optimize internal environmental conditions, which ensures they are significantly more efficient than conventional facility-wide data center mechanical systems. The ultra-efficient eOPTI-TRAX cooling involves liquid refrigerant coil-cooled technology, which uses significantly less energy than conventional energy intensive

raised-floor fan-assisted cooling. eOPTI-TRAX cooling only requires 0.3 W to cool a 300 W server, compared with 90 W required by a conventional server cooling system. eOPTI-TRAX technology also extends a data center's "free cooling" zone. Conventional data centers can only utilize free cooling when outdoor temperatures are less than 7 °C, whereas eOPTI-TRAX can use free cooling when temperatures are under 29 °C. eOPTI-TRAX data centers can therefore be located in warmer climates and still benefit from long periods of free cooling. In the case of the Quebec IIDC, the IIDC can use free cooling almost every day of the year. In fact, TELUS estimates that the facility will only require 40 hours of mechanical cooling per year.

In addition, highly efficient LED (Light Emitting Diode) lighting and T8 florescent fixtures were used throughout the facility to promote energy efficiency.

Intelligent energy management

The Quebec IIDC was equipped with an advanced Data Center Intelligence Platform (DCIP), which was developed by Skanska and its partners. The DCIP combines conventional building management tools with sophisticated data tracking and analysis capabilities into a single user-friendly dashboard.

Energy Performance Guarantee (EPG)

Skanska guaranteed the performance of the Quebec IIDC and backed that guarantee with a commitment to pay the difference for any electrical cost in excess of the guaranteed level directly to

TELUS. The entire performance risk has therefore been transferred entirely to Skanska. The long-term agreement is known as an improvement guarantee, whereby Skanska must also ensure the facility becomes increasingly efficient throughout its lifespan.

Carbon

Reduced operational carbon emissions

The Quebec IIDC emits around 30 percent less carbon during operation than a conventional data center. The 2.7 MW facility (phase 1) will emit around 255 tCO₂e, compared with a conventional data center with a 1.6 PUE that would emit approximately 1,170 tCO₂e (figures based on Quebec's 95 percent hydro power and 5 percent natural gas energy mix).

Materials

Waste management during construction

71 percent of construction waste was diverted from landfill in total. The remote nature of the



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site complicated waste management efforts. For example, waste drywall had to be transported around 6 hours to Montreal to be recycled.

Water

Water efficiency

The Quebec IIDC uses around 80 percent less water in total than a conventional data center. Skanska's eOPTI-TRAX technology is responsible for the majority of the facility's water savings. The solution involves the use of a closed circuit cooling tower system, which can reduce water use compared with a conventional open loop chiller. Conventional systems cool the air through constant evaporation and therefore consume large amounts of water. In contrast, Skanska's closed loop system reuses the refrigerant as it repeatedly changes from a gas to a liquid. The only water loss from the eOPTI-TRAX system occurs when the outdoor temperature exceeds 29 °C.

Social Aspects

Project partner cooperation

Skanska worked closely together with project partners and the client from the design phase to develop the necessary solutions capable of guaranteeing significant energy and water savings. TELUS scheduled a three-day programming charrette early in the design process, which involved an intensive collaborative session with 25 participants to identify the most efficient and cost-effective solutions to meet the project's requirements. Skanska led the programming and design process, to develop an integrated and collaborative design model and to verify that all project components met the client's objectives. TELUS Electrical and Mechanical engineers were integral in this design process, including decisions regarding the selection various project components, such as technology and vendors.

Occupational health and safety

There were no lost time accidents during construction. 96,852 hours were worked in total on the project.

Healthy indoor environments

Skanska's eOPTI-TRAX solution significantly improves the indoor environment in the server rooms of the data center by avoiding the creation of "hot aisles" that are typical to conventional data centers. eOPTI-TRAX ensures that the "hot aisle" is no warmer than adjacent spaces as the hot air from the servers is instantaneously neutralized as it passes over the cooling coils. The solution therefore



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creates a more pleasant environment for data center employees who are not exposed to extreme temperature swings as in conventional data centers.

Functional and flexible data center

The Quebec IIDC has been independently assessed to meet Tier 3 data center requirements, which incorporates dual-powered IT equipment and provides over 99.999 percent uptime. The facility also supports high rack densities of up to 60 kW/rack, while ensuring rack access.

The Quebec facility is a flexible and dynamic data center that is designed to allow the addition of Just-In-Time data center capacity to meet the client's projected future growth requirements. The installation of an additional self-contained eComb module to the facility's central access spine takes around 16 weeks, which allows the client to quickly respond to changing business needs and anticipated customer demands, and provides maximum flexibility within TELUS' future load

growth profile. Skanska's eComb modular data center solution is consequently much more flexible than conventional solutions, which typically require large initial investments to establish the infrastructure to accommodate future capacity from the outset. Furthermore, the addition of modules does not disrupt ongoing operations, and individual eComb modules can be upgraded over time in order to adapt to and incorporate the benefits of evolving technology during the facility's lifetime. Skanska modular data center solutions are tailored to the client's evolving IT strategy, and are fully customizable to the industry, location and unique specifications.

Economic Aspects

Regional construction workforce and materials

Approximately 300 trades people worked on the project in total. Over 90 percent of the workers were from the local area. Locally extracted, manufactured and sourced materials included the sand, gravel, concrete masonry units, steel, paving, asphalt, exterior metal wall panel system, doors and windows used on the project.

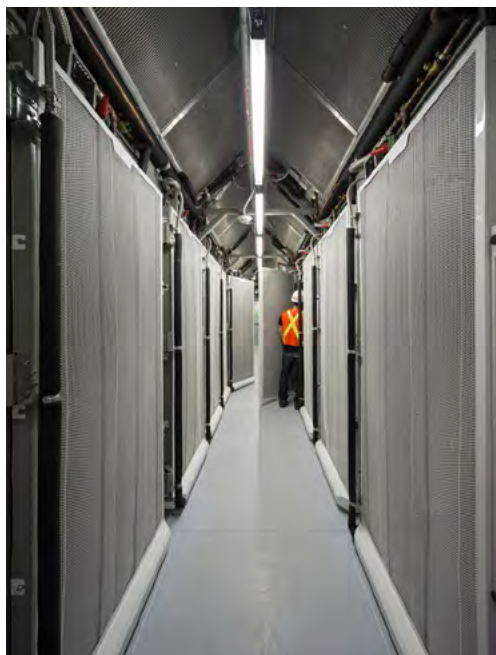
Efficiency financial savings

Skanska and TELUS developed a detailed capital and cash flow analysis for the lifespan of the Quebec project, which was based on a phased build-out plan designed to provide maximum flexibility, in order to respond to the inevitable changes in TELUS' future load growth profile.

A key objective was to optimize capital deployment whilst minimizing Total Cost of Ownership (TCO). The final solution delivered a US\$ 60 million saving on day one compared with a conventional data center, as the Quebec facility is designed to meet TELUS' current capacity demand and capacity can be gradually increased over time to ensure that future demands are met. These up-front capital savings resulted from the modular nature of Skanska's solution, which avoids the need to construct a full capacity data center from the outset. The modular solution allows infrastructure costs to be minimized during each phase of expansion, whilst increasing the facility's overall reliability and efficiency.

Learning From Good Practice

Skanska was able to underwrite and guarantee the entire facility's performance for the client by overseeing the entire design, build and improvement contracts over a 20-year period. This holistic and long-sighted approach allows Skanska to capitalize on its expertise and make significant financial and environmental savings throughout the facility's lifespan.



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