



# The Telecommunications Network

Hydro-Québec's other large grid



## THE TELECOMMUNICATIONS NETWORK



WITH ITS EXTENSIVE EXPERTISE AND STATE-OF-THE-ART FACILITIES, THE TEAM IN CHARGE OF HYDRO-QUÉBEC'S TELECOMMUNICATIONS NETWORK SETS THE STANDARD IN THE ELECTRICITY SECTOR.

## HYDRO-QUÉBEC AT A GLANCE

HYDRO-QUÉBEC GENERATES, TRANSMITS AND DISTRIBUTES ELECTRICITY. ITS SOLE SHAREHOLDER IS THE QUÉBEC GOVERNMENT. THE COMPANY'S GENERATING FACILITIES HAVE AN INSTALLED CAPACITY OF OVER 36,900 MW.

### **A WORLD LEADER IN HYDROPOWER**

Hydro-Québec generates more than 98% of its electricity using water. Spread out over a vast area, its generating facilities comprise over 60 hydroelectric generating stations as well as numerous large reservoirs with a total storage capacity exceeding 175 TWh.

### **MAJOR SUPPORT FOR RENEWABLE ENERGIES**

Hydro-Québec supports the development of renewable energy sources like wind and biomass through purchases from independent power producers.

### **AN INTEGRATED VALUE CHAIN**

Hydro-Québec operates the most extensive power transmission system in North America. In addition to its primary mission, which is to ensure a reliable supply of power to Quebecers, it sells electricity on the Canadian and U.S. wholesale markets.

Three separate divisions are responsible for generating, transmitting and distributing electricity. A fourth division, Hydro-Québec Innovation, équipement et services partagés, designs and carries out the company's infrastructure projects.

Hydro-Québec also devotes considerable resources to technological innovation initiatives in energy-related sectors, including telecommunications.

## LARGE-SCALE OPERATIONS

HYDRO-QUÉBEC'S TELECOMMUNICATIONS NETWORK SUPPORTS ONE OF THE MOST COMPLEX POWER GRIDS IN THE WORLD. IT'S ALSO ONE OF THE LARGEST TELECOMMUNICATIONS NETWORKS IN THE NORTH AMERICAN POWER INDUSTRY.



### **CRITICAL INFRASTRUCTURE**

For many years, Hydro-Québec has relied on its own telecommunications network to manage, monitor and operate its facilities. Given the importance of communications in ensuring the safety of Québec's electricity supply and the reliability of its interchanges with neighboring systems, the company's telecommunications network has to be much more robust than public networks. Moreover, most of its generating stations are located in remote regions, on hard-to-access sites not served by telecommunications companies.

### **STRATEGIC PARTNERS**

The Direction principale – Télécommunications helps ensure the optimal operation of the power system, continuity of service and the long-term operability of equipment. It plays a key role in implementing leading-edge solutions to maintain or improve facility performance as well as the efficiency of the company and its roughly 20,000 employees.

### **AN INNOVATIVE TEAM**

The Direction principale – Télécommunications possesses a broad range of skills in its areas of responsibility. It is one of the major teams under the Vice President – Information and Communication Technology.



## SUPPORTING THE POWER GRID

THE DIRECTION PRINCIPALE – TÉLÉCOMMUNICATIONS PROVIDES A BROAD ARRAY OF SERVICES IN A FAST-MOVING, CONSTANTLY CHANGING FIELD. ITS PRIMARY MISSION: TO DEPLOY INTEGRATED SOLUTIONS FOR HANDLING ALL COMMUNICATIONS RELATED TO THE OPERATION AND REAL-TIME MONITORING OF THE POWER GRID.

### SUPERIOR PERFORMANCE

Using a wide variety of advanced means of communication to ensure the stability of the power system, Hydro-Québec's telecommunications infrastructure is a model of reliability. Among other things, signals can travel along several different circuits to reach a given destination, and multiple versions of the same signal are sent in accordance with pre-established redundancy, looping, and frequency and technological diversity criteria.

- Latency of less than 10 milliseconds for some strategic circuits
- Continuity index: interruption duration measured and closely monitored

THE TELECOMMUNICATIONS NETWORK AT A GLANCE – MORE THAN:

800 TELECOMMUNICATIONS SITES

200 MICROWAVE LINKS

200 MOBILE RADIOCOMMUNICATION SITES

4,000 MOBILE RADIOCOMMUNICATION USERS

300 SPECIALIZED TELEPHONE CONSOLES FOR CONTROL CENTRES, TELECONTROL CENTRES, OPERATION CENTRES, THE ENERGY TRADING FLOOR AND CUSTOMER RELATIONS CENTRES



500 ROUTERS

3,000 SWITCHES





**STRATEGIC TRANSMISSIONS**

- Transmission of signals required to maintain power grid stability:
  - special protection systems: automatic, instantaneous tripping of system protections in the event of an anomaly
  - telecontrol: remote management of the power grid
- Voice and data transmission via mobile radiocommunications for jobsites and work crews

**SYSTEM COMPLIANCE**

- Telecommunications facilities designed and operated in compliance with Hydro-Québec TransÉnergie requirements and the standards set by several regulatory authorities:
- North American Electric Reliability Corporation (NERC)
  - Federal Energy Regulatory Commission (FERC)
  - Northeast Power Coordinating Council (NPCC)

GEOGRAPHICALLY SPEAKING, IT REPRESENTS MORE THAN:

7,500 KM OF HIGH-CAPACITY MICROWAVE LINKS

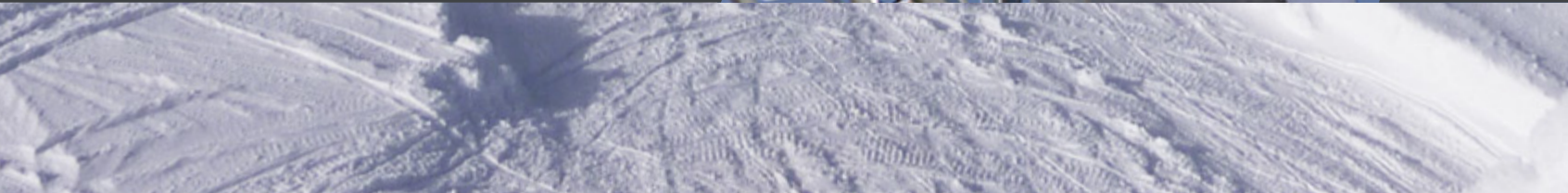
14,000 KM OF FIBRE-OPTIC CABLES (INCLUDING 40% JOINT BUILD WITH TELECOMMUNICATIONS PARTNERS AND ANOTHER 40% OPTICAL GROUND WIRES (OPGW) ON HIGH-VOLTAGE POWER LINES)

850,000 KM<sup>2</sup> OF COVERAGE (NEARLY HALF THE AREA OF QUÉBEC)



### **STRINGENT REQUIREMENTS**

The complexity of Hydro-Québec's telecommunications network can be attributed to the very stringent robustness requirements applying to the power grid. Its extensive reach and the harsh climate are also contributing factors.





## THE TELECOMMUNICATIONS NETWORK



### SUPPORTING CORPORATE ACTIVITIES

IN ADDITION TO HANDLING ALL THE DATA RELATED TO POWER GRID OPERATIONS, THE TELECOMMUNICATIONS NETWORK MEETS THE COMMUNICATION NEEDS OF HYDRO-QUÉBEC'S DIVISIONS AND CORPORATE UNITS BY IMPLEMENTING COST-EFFECTIVE SOLUTIONS THAT FACILITATE BUSINESS PROCESSES AND THE WORK OF EMPLOYEES.

#### A FULL RANGE OF SERVICES

The various teams working under the Vice President – Information and Communication Technologies provides a host of technologies and services that are essential to Hydro-Québec's administrative functions and commercial activities:

- Telephone services for administrative staff and customer relations centres

- Operation of landline and wireless corporate networks (intranet and Internet) and access management
- Audioconferencing and videoconferencing
- Data transmission for the advanced metering infrastructure (AMI)
- Management of mobile communication devices (cellular phones, smartphones, tablets and satellite telephones)



#### CYBERSECURITY

Cybersecurity, and computer security in general, are issues of paramount importance for Hydro-Québec. In addition to its IT equipment and corporate data, Hydro-Québec's critical infrastructure—the power system itself—has to be protected from threats of all kinds (attacks, intruders, etc.). To that end, information and communication technology experts oversee the application of various standards, guidelines and procedures covering every facet of security, particularly equipment monitoring, access control and vulnerability management.



## THE TELECOMMUNICATIONS NETWORK



## A HUB OF EXPERTISE

DEVELOPING AND MANAGING THE TELECOMMUNICATIONS NETWORK REQUIRE  
ADVANCED EXPERTISE ON FOUR FRONTS: DESIGN, IMPLEMENTATION,  
OPERATIONS AND MAINTENANCE.

### HIGHLY QUALIFIED PERSONNEL

The Direction principale – Télécommunications, which has a workforce of some 600 people, is well acquainted with Hydro-Québec's needs and operations. It is thus ideally positioned to support ongoing development of the power system as well as the company's practices and procedures. Its mission also includes a continuous improvement component, which takes several different forms: technology watch, deployment optimization, benchmarking, etc.

### THE FOUR FACETS OF THE TELECOMMUNICATIONS MANDATE

Given the scope and technological diversity of the telecommunications network, along with the importance of being able to take prompt, independent action to ensure its smooth operation, the four facets of the company's telecommunications role pose numerous challenges.

#### DESIGN

Architecture, planning and design of innovative, secure and robust solutions to ensure the power grid's ongoing development and long-term viability.

#### IMPLEMENTATION

Project management, contract administration and telecommunications infrastructure deployment in accordance with design criteria.

#### OPERATIONS

Telecommunications network control and provision of wide-ranging expertise to ensure service availability, reliability and continuity.

#### MAINTENANCE

Troubleshooting, preventive maintenance and rollout of equipment.

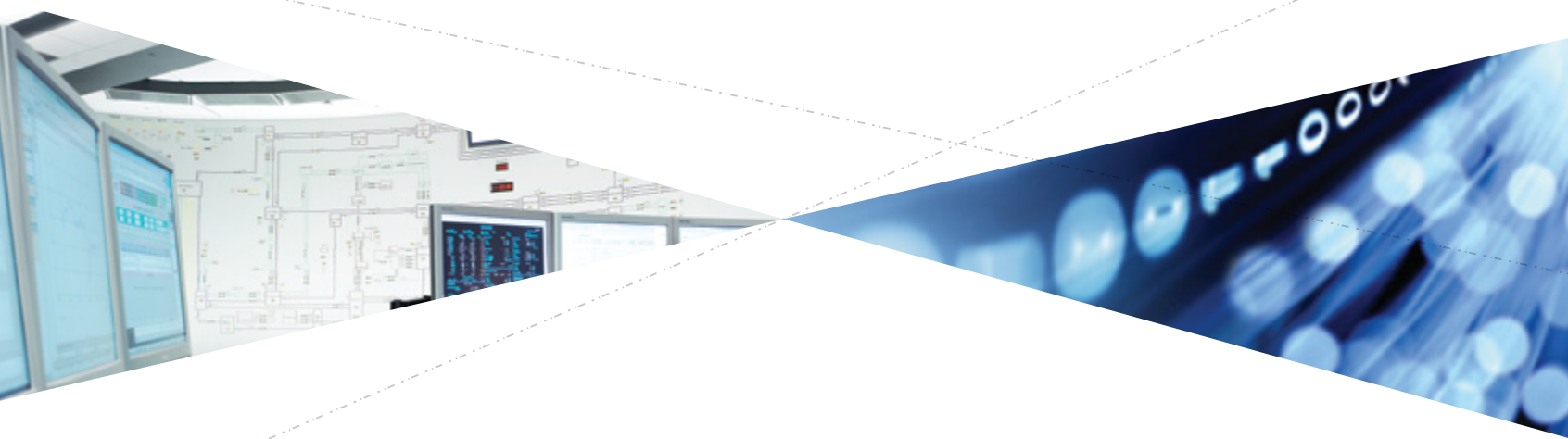
## STATE-OF-THE-ART FACILITIES

THE TELECOMMUNICATIONS NETWORK HANDLES COMPLEX TELEFUNCTIONS, REQUIRING THE TRANSFER OF MASSIVE VOLUMES OF DATA AND COMMANDS OVER VARIOUS MEDIA (MICROWAVE LINKS, OPTICAL FIBRES, ETC.). IN LIGHT OF EXPANDING NEEDS, ALL OF THE COMPANY'S SITES ARE CURRENTLY MIGRATING TO AN IP/MPLS ARCHITECTURE, MAKING IT POSSIBLE TO INTEGRATE SERVICES AND OPTIMIZE EXCHANGES.

### THE NETWORK OPERATIONS CENTRE

To ensure 24-hour surveillance of network facilities, the network operations centre (NOC) relies on a remote monitoring system capable of processing thousands of alarm signals from telecommunications equipment across Québec. It plays a key role in managing the power grid, thereby contributing directly to the security of Québec's energy supply. In the event of an anomaly or outage, the NOC team can respond quickly from a distance or, in the case of complex technical problems, call on experts with advanced skills to develop solutions and test them in the laboratory.





## THE TELECOMMUNICATIONS NETWORK



### A FORCE FOR INNOVATION

THE DIRECTION PRINCIPALE – TÉLÉCOMMUNICATIONS MUST CONSTANTLY UPGRADE ITS FACILITIES TO ENSURE THAT HYDRO-QUÉBEC CAN BENEFIT FROM EVER MORE EFFECTIVE TECHNOLOGIES. IT MUST ALSO SUPPORT THE ONGOING CHANGES IN THE POWER GRID.

HERE IS A BRIEF GLIMPSE OF THE MAIN NETWORK UPGRADE PROJECTS UNDER WAY AT HYDRO-QUÉBEC:

#### **MOVE TO DIGITAL MICROWAVE LINKS**

Completion of the digitization of all microwave links.

#### **MODERNIZATION OF FIBRE-OPTIC LINKS**

Deployment of latest-generation optical equipment to carry exponentially increasing volumes of data and incorporate digital protection systems for the transmission grid.

#### **OPTIMIZATION OF DATA CENTRES**

Commissioning of a new strategic corporate data centre (Tier 3) outside of Montréal.

#### **ESTABLISHMENT OF AN IP/MPLS TELECOMMUNICATIONS NETWORK**

Secure, universal platform designed to aggregate all power system and administrative services. This provincial network will help optimize telecommunications management and reduce the number of technology solutions.

#### **EVOLUTION OF GRID AUTOMATION**

Development of a target architecture for the telecommunications transport infrastructure in view of the evolution of grid automation.

**Hydro-Québec**

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