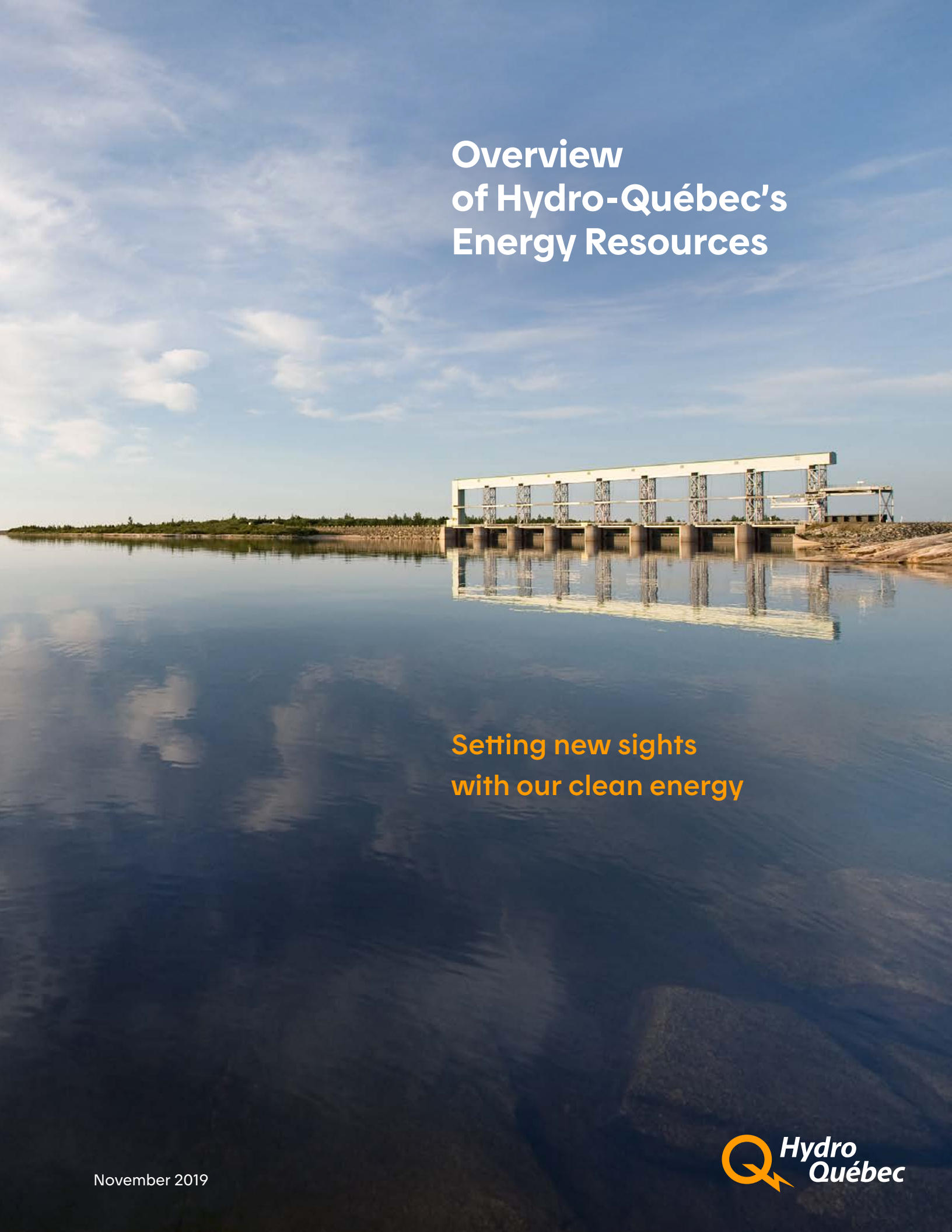
Overview of Hydro-Québec's Energy Resources



Setting new sights with our clean energy

November 2019

Hydro Québec

Highlights

Hydro-Québec Distribution's Electricity Supply Plan 2020–2029 sets out the anticipated electricity needs of Québec customers for the next 10 years and the means by which they will be met. The division submits an electricity supply plan to the Régie de l'énergie [Québec energy board] every three years and updates it the two subsequent years.

Québec's electricity demand will continue to grow over the 2020–2029 period, driven by the vigor of the economy and the development of new markets such as the data center sector. As a result, unused heritage pool electricity, often referred to as a surplus, will gradually decrease.

According to present forecasts, Hydro-Québec Distribution's current and planned electricity supplies will be sufficient to meet energy needs until 2026 and capacity needs until 2025. No new supplies will therefore be required in the short term. On a horizon of three to five years, however, calls for tenders could be launched if demand increases as expected.

Hydro-Québec Distribution plans to implement an energy transition in all of its off-grid systems (those not connected to the main grid) by integrating clean, renewable energy sources into these systems. The division plans to launch its energy-transition initiatives in all of these systems by the end of 2020.

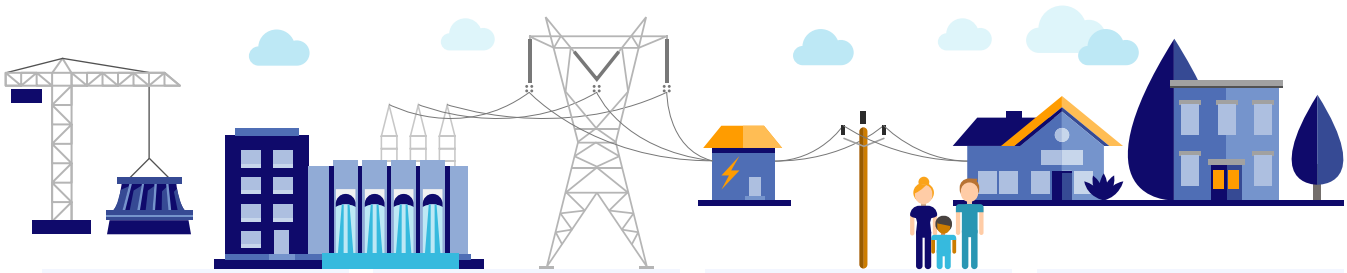
Overall, the generating capacity of Hydro-Québec's generating stations and the company's other sources of supply exceeds its requirements by more than 40 TWh of available energy each year. Since this situation is expected to continue for a number of years, Hydro-Québec will have enough energy to power Québec's economic development while boosting its contribution to the decarbonization of neighboring markets by signing new long-term export contracts.

Cover page
Reservoir and spillway of
the Robert-Bourassa development.

Hydro-Québec: One Company, Four Divisions

In 1997, the North American wholesale electricity market opened to competition. Hydro-Québec created the TransÉnergie division (which later became "Hydro-Québec TransÉnergie") given this context. The division's mission is to provide non-discriminatory access to Québec's transmission system so that all stakeholders can benefit from reliable, high-quality power transmission. The restructuring was necessary so that regulatory authorities could allow Hydro-Québec to buy and sell electricity on neighboring markets.

In 2000, Hydro-Québec confirmed the functional separation of its generation, transmission and distribution activities by creating two other divisions: Hydro-Québec Production, which is now part of Exploitation et Hydro-Québec Production, and Hydro-Québec Distribution. A fourth division, Hydro-Québec Équipement (which became Hydro-Québec Innovation, équipement et services partagés), was added in 2002.



Hydro-Québec Innovation, équipement et services partagés

Designs, builds and refurbishes generating and transmission facilities, mainly for Hydro-Québec Production and Hydro-Québec TransÉnergie.

Hydro-Québec Production

Generates electricity to meet most of the needs of the Québec market and to sell on export markets. Almost 100% of the electricity it generates uses the force of water.

Hydro-Québec TransÉnergie

Operates a high-voltage power transmission system so that large amounts of electricity output by our generating stations can be transmitted to Québec's distribution systems and export markets.

Hydro-Québec Distribution

Supplies electricity to the Québec market and delivers reliable power and quality service to all Quebecers.

Overview of Hydro-Québec's Available Energy*

Hydro-Québec requires substantial means to meet its commitments to its Québec customers and sell electricity on export markets to benefit the entire population. To achieve this, Hydro-Québec operates a vast fleet of generating stations having an installed capacity of 37,310 megawatts (MW). In 2021, 245 MW of capacity will be added when Romaine-4 generating station is commissioned. Hydro-Québec has other sources of supply as well, with a total capacity of 10,314 MW under contracts with other power producers.

In the last several years, the capacity of its generating stations and other sources of supply has surpassed needs by more than 40 TWh per year. This surplus is the "available energy." Given the expected increases in precipitation, the company will continue to have substantial amounts of available energy to supply Québec's economic development and to boost its contribution to the decarbonization of neighboring markets.

* Source: Hydro-Québec, *Sustainability Report 2018*

Hydro-Québec's "surplus" energy

Hydro-Québec's surplus, or "available energy," is the electricity it is able to generate over and above the volume Hydro-Québec Production requires in order to supply heritage pool electricity and fulfill its contractual commitments with Hydro-Québec Distribution and neighboring markets. With a few rare exceptions, this surplus can be stored in our 28 large reservoirs, which can accumulate up to 176 TWh (almost 1.5 times the annual consumption of the six New England states), or exported to neighboring markets. Hydro-Québec is in an enviable position as the "battery" of northeastern North America. Over the coming years, we expect to sell 9.45 TWh of this energy to Massachusetts under contracts with distributors from this state. We expect to negotiate other long-term export contracts. We will also be in a position to meet Québec's needs if economic growth continues.

Electricity that Hydro-Québec Distribution does not use is often referred to as "surplus" as well. More specifically, this is the heritage pool electricity the division has access to but does not require to meet the needs of Quebecers, primarily during the summer months. However, we anticipate that all of this surplus will be needed in the coming years to meet Québec's growing demand, arising specifically from the strength of the economy and the development of new markets such as data centers.

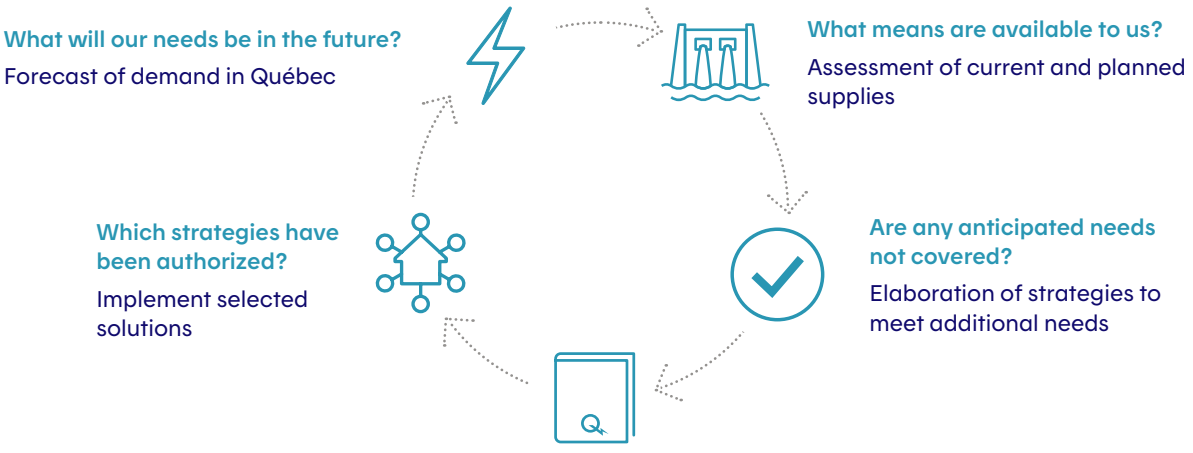
Meeting the Needs of Québec

Hydro-Québec Distribution is responsible for providing an adequate and reliable supply of electricity—an essential service—to the Québec market. To achieve this, it must:

- forecast the electricity needs of its Québec customers,
- determine whether its current and planned supplies are sufficient, and
- develop strategies to add to its supplies as needed, while complying with the requirements of regulatory bodies in the energy sector.

The results of this exercise are presented every three years in an electricity supply plan that covers the following 10 years. This document is deposited with the Régie de l'énergie and updated the next two years.

Hydro-Québec Distribution's supply process



Do our strategies comply with regulatory requirements?

Presentation to regional regulatory bodies

- North American Electric Reliability Corporation (NERC)
- Northeast Power Coordinating Council (NPCC)

Approval by the Régie de l'énergie

- Filing
- Public hearings
- Decision

Forecast of Electricity Demand in Québec

The first step in the supply process involves forecasting electricity consumption in Québec during the period in question.

GROWTH DURING THE 2019–2029 PERIOD

+12.5 TWh*

NATURAL GROWTH

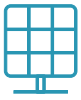
+7.8 TWh

MARKET DEVELOPMENT

+3.7 TWh

EMERGING TECHNOLOGIES

Photovoltaic solar



–1.3 TWh

Electric vehicles

+2.3 TWh

* 1 TWh = consumption of 54,000 households

This forecast must take into consideration multiple factors that will increase or decrease demand for electricity:

- natural growth related to economic and demographic development (for example, level of economic activity, new residential construction and the needs of large industrial companies)
- development of markets such as data centers, cryptocurrency and greenhouse farming
- emerging technologies adopted by customers, such as electric vehicles, home automation, photovoltaic solar panels and energy storage systems
- the decarbonization and electrification of the economy and energy-efficiency measures
- the impact of climate change on temperature and on heating needs

11%

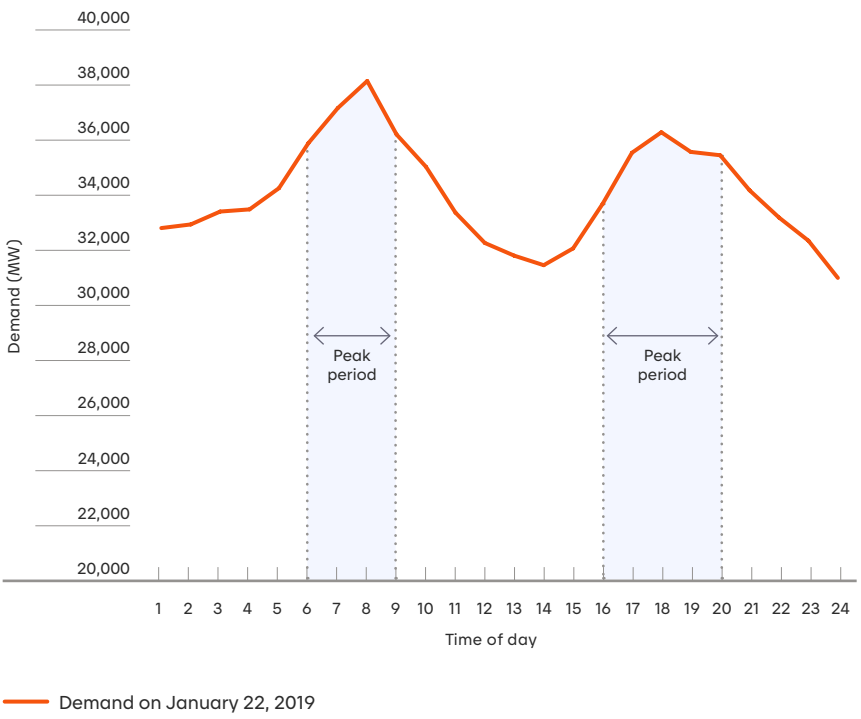
Percentage of electric and plug-in hybrid vehicles anticipated in Québec's fleet by 2029 (635,000 vehicles)

−5.6 TWh

Impact of energy-efficiency measures applied by business and residential customers from 2019 to 2029 (equivalent to the consumption of about 300,000 households)

We must also consider that more than 80% of Québec households use electric heating. Therefore, during winter cold spells, there is a very high demand for electricity during daily peak periods, which occur in the morning and in the evening. This is a determining factor in demand forecasts.

Peak periods



Hydro-Québec Distribution's Supply

Hydro-Québec Distribution relies on a long-term supply portfolio consisting of heritage pool electricity (essentially hydroelectricity) and contracts with Hydro-Québec Production and independent producers of renewable energy. It also uses various energy-efficiency initiatives to reduce its customers' consumption.

Hydro-Québec Distribution's sources of supply

	MAXIMUM CONTRIBUTION	
	PEAK CAPACITY (MW)	ANNUAL OUTPUT (TWH)
Heritage pool electricity	37,442	165.0
Contracts with Hydro-Québec Production	1,100	5.4
Wind	1,489	11.4
Biomass and biogas	346	2.5
Small, privately owned hydroelectric generating stations	144	0.6

Complementarity of hydroelectricity and intermittent or variable sources of energy

Wind power and photovoltaic solar power are intermittent and variable sources of energy. In other words, the wind and the sun are not always available to meet the demand for electricity, and their intensity fluctuates. Conversely, demand is not always there when wind power or photovoltaic generation is at its peak.

To integrate these generating options into the grid, they must be combined with a stable and readily dispatchable energy source. Hydroelectricity currently plays this role in Québec, a solution that is both efficient and ecological.

Hydro-Québec Production: our main supplier of clean energy

Hydro-Québec Production has a fleet of 63 generating stations, 62 of which are hydroelectric, making it one of the world's largest hydropower producers. Almost 100% of the electricity is generated using the force of water, a renewable energy source with very low greenhouse gas (GHG) emissions and no toxic waste. This clean energy is generated for the population of Québec and for export markets.

Heritage pool electricity supplied by Hydro-Québec Production

In 2000, the Québec government passed the *Act to amend the Act respecting the Régie de l'énergie*, which provides for the establishment of heritage pool electricity, intended to guarantee affordable electricity rates to Québec customers. Heritage pool electricity, which consists of a maximum annual reference volume of 165 TWh and which Hydro-Québec Production is required to supply to Hydro-Québec Distribution, is roughly equal to the amount of electricity generated by "heritage" facilities, that is, those in the La Grande complex and generating stations on the Rivière Manicouagan, the Rivière des Outaouais (Ottawa River) and the Fleuve Saint-Laurent (Saint-Lawrence River). It is the main source of supply for Hydro-Québec Distribution and meets approximately 90% of Québec's needs. The initial price for heritage pool electricity was 2.79¢ per kilowatthour (kWh). It has been indexed annually with inflation since 2014. On April 1, 2019, the rate was set at 2.96¢/kWh.

Long-term supply contracts

To meet the needs of the Québec market that cannot be met by the heritage pool, Hydro-Québec Distribution has concluded supply contracts with various electricity suppliers through calls for tenders and purchase programs. To date, it has signed 78 contracts with independent power producers and Hydro-Québec Production.

Energy efficiency

A reduction in electricity consumption by our customers directly impacts our supply needs, especially during peak periods. Hydro-Québec will therefore continue to focus on raising awareness of best practices in energy efficiency and on financial support and helping customers manage their energy use in the coming years.

Beginning in December 2019, we will be offering dynamic pricing in the form of a rate or credit. Residential and business customers who take advantage of dynamic pricing will save when they reduce their electricity consumption at our request during peak periods in the winter months.

Residential customers

- The Customer Space offers various tools so customers can better understand how their habits impact their electricity bill, evaluate the consumption of certain appliances and receive a personalized diagnostic.
- The Energy Wise site offers tips to help our customers choose the most energy-efficient products and apply measures to reduce their electricity consumption and thus lower their electricity bill.

Business customers

- Various programs offer energy efficiency measures adapted to the needs of Québec businesses and provide financial support.
- The Demand Response program for business customers offers financial support to eligible customers who reduce their demand during peak periods.
- The interruptible electricity rate option is designed for industrial customers. Customers who agree to curtail their operations during peak periods will receive a credit.
- We also offer support services to help businesses interested in developing energy-efficient strategies.

Strategies for Balancing Supply and Demand

Hydro-Québec Distribution must ensure it has an adequate supply to meet its customers' need, or demand, at all times. It must also maintain a margin to deal with unforeseen circumstances, such as extreme weather events or higher-than-expected economic growth. Customer demand will vary over the next 10 years and require tailored supply strategies.

+4,000 MW

Additional capacity needs during extreme winter temperatures

+5 TWh

Potential shortfall in the next five years if the need for electricity is higher than expected

In its Electricity Supply Plan, Hydro-Québec Distribution sets out the balance between the projected supply and demand for two measures of electricity: power, or capacity, and energy.

What is power?

Power, or capacity, is the amount of energy required or generated at a specific point in time. It is calculated in watts (W or MW in this document).

Example: The power demand of Hydro-Québec Distribution's customers at the peak of winter 2018-2019 reached 38,159 MW at 8 a.m. on January 22, 2019.

What is energy?

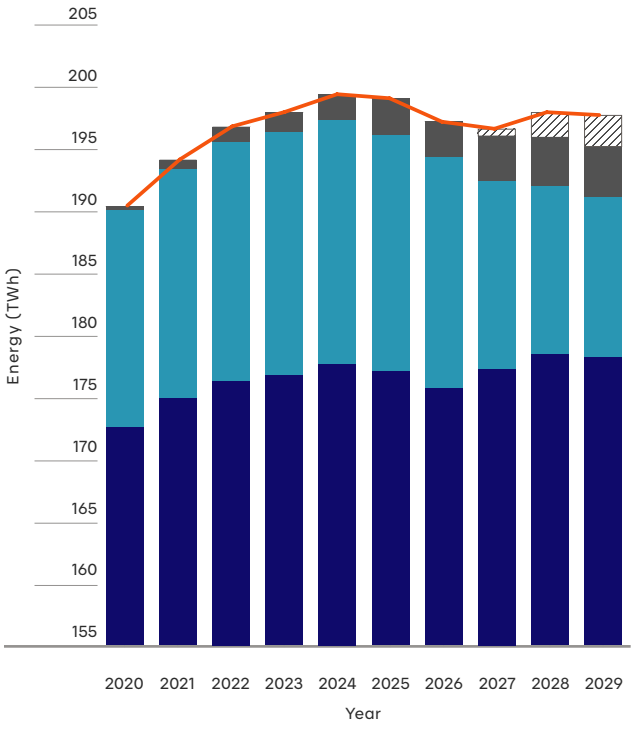
Energy is power multiplied by time, measured in watthours (Wh, MWh or TWh in this document). For example, using 1 W over 3 hours corresponds to 3 Wh.

Example: For the day the highest demand was recorded during winter 2018-2019, energy consumption reached 816,800 MWh.

Energy balance

The energy balance demonstrates the status of electricity supply contracts. It indicates that the total electricity supply currently contracted by Hydro-Québec Distribution is sufficient to meet the needs of Québec customers until 2026.

Over the next three to five years, however, calls for tenders could be issued if demand increases as expected. Hydro-Québec Production, which has surplus energy, and wind farm owners, whose contracts will expire during this period, could submit proposals.

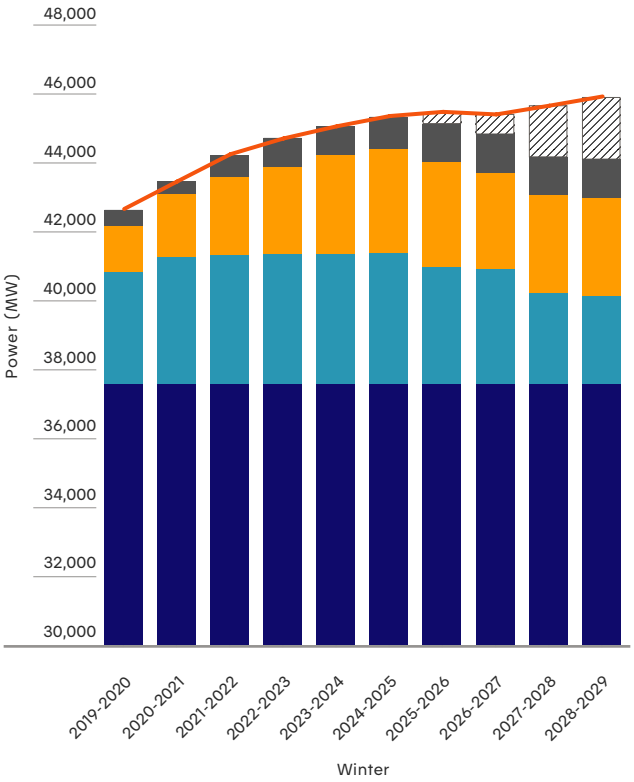


Heritage pool electricity*
Electricity purchase contracts and management methods
Purchases on short-term markets
Requirements
Additional supplies required

** Including transmission and distribution losses.*

Capacity balance

The capacity balance indicates the supply status for the annual winter peak forecast, that is, when electricity consumption is likely to be at its highest. The graph shows that Hydro-Québec Distribution can ensure a capacity balance until winter 2024-2025 by managing power demand and making power purchases on short-term markets.



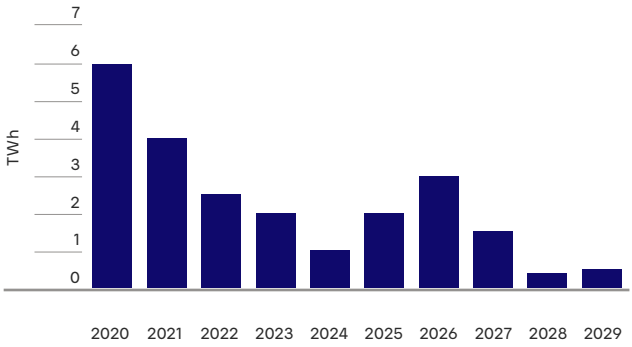
Heritage pool electricity
Contracts and management methods
Demand response measures
Purchases on short-term markets
Requirements
Additional supplies required

Strategy 1
Optimize available supply.

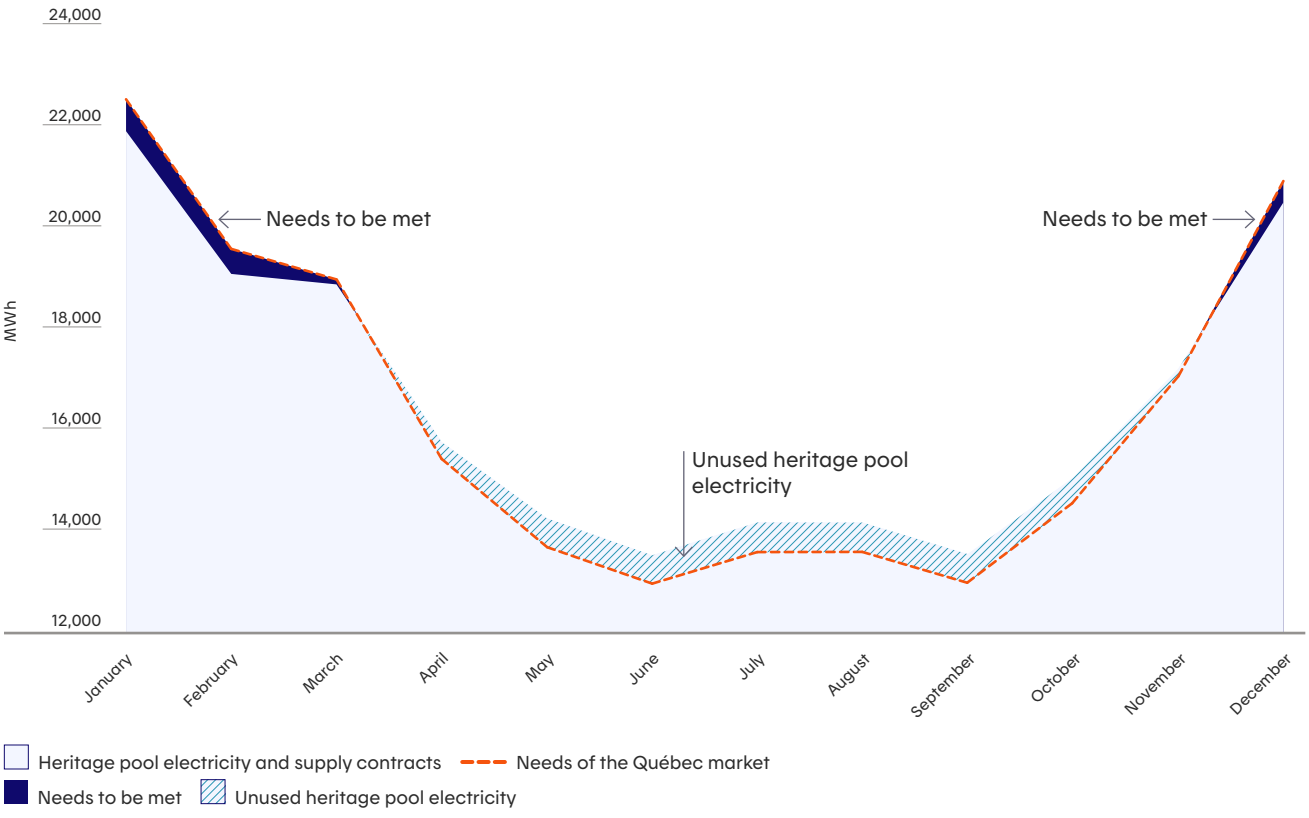
Some supplies can be adapted according to needs. This is the case for heritage pool electricity, which provides great flexibility to Hydro-Québec Distribution. Heritage pool electricity is divided into 8,760 different hourly values; the smallest amounts are delivered in the summer, when the province's needs are lowest, and the highest are delivered in the winter. Heritage pool electricity helps to balance supply and demand in this way.

During the course of a year, because of the seasonal variations in supply and demand, there are periods when some of the heritage pool electricity is not used (often referred to as Hydro-Québec Distribution's "surplus") and other periods, especially during the winter months, where additional purchases are required. In such cases, Hydro-Québec Distribution buys electricity on short-term markets.

Unused heritage pool electricity



Seasonal characteristics of supply and demand



Strategy 2
Offer new energy-efficiency measures.

To compensate for the expected increase in power demand, Hydro-Québec Distribution intends to prioritize the development of energy-efficiency measures, and in particular demand response measures for all customer categories.

To do this, it will rely on Hilo, a new range of products and services available beginning in 2020. Load shaving during peak periods will be achieved through technological tools that allow customers to easily manage energy use related to certain loads, in particular heating. Hydro-Québec Distribution estimates that a reduction in power demand of 600 MW could be reached by 2028 as a result.

In addition, the division plans to modify the Demand Response program for businesses and the interruptible electricity rate option offered to industrial customers to maximize the impact of these measures on the capacity balance.

Energy is getting smarter with Hilo

Hydro-Québec is moving toward new markets and focusing on its expertise in power system management and its leadership in renewable energy and technological innovation.

Hilo by Hydro-Québec

Hydro-Québec's brand-new subsidiary, Hilo, will begin offering smart home products and services. It will then expand to provide energy services for businesses as well as in the areas of electric mobility, smart storage and solar self-generation.

The Hilo model is a winner on all fronts:

- for the environment – reduction of GHG emissions and electricity needs
- for customers – money and energy savings
- for Hydro-Québec – diversification and increase in sales
- for the Québec economy – development of new markets and contribution to collective wealth

Strategy 3
Plan for new supply in the long term.

According to the 2020–2029 Plan, Hydro-Québec Distribution's current and planned electricity supplies will be sufficient to meet energy needs until 2026, and capacity needs until 2025. This outlook takes into account several new energy-efficiency measures, and specifically demand response management for all customer categories. No new supplies will therefore be required in the short term. On a horizon of three to five years, however, calls for tenders could be launched if demand increases as expected.

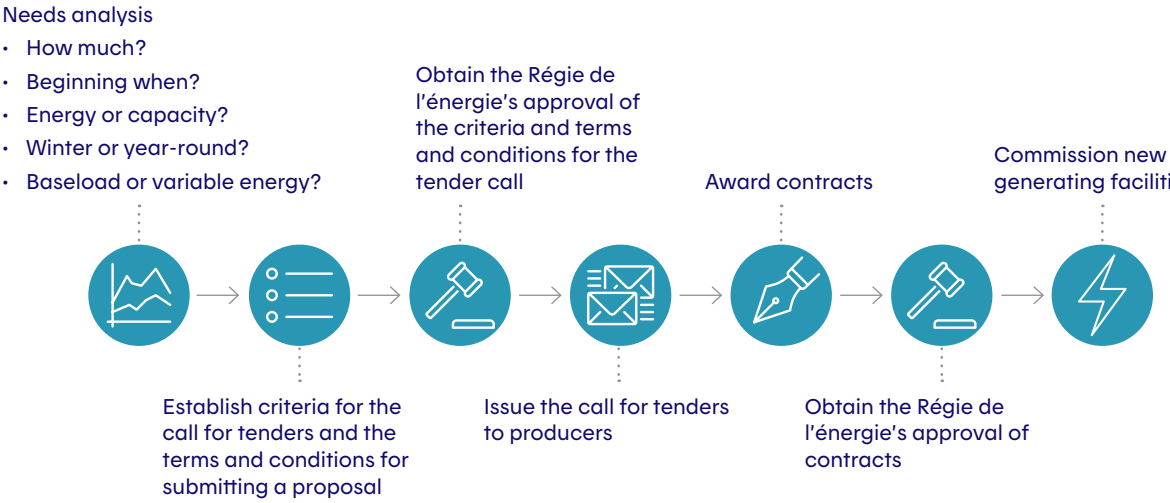
Acquiring new supplies through a tendering process

To enter into supply contracts, Hydro-Québec Distribution must launch a tendering process as set out in the *Act respecting the Régie de l'énergie*. Calls for tenders must be issued at least four years before the commissioning of the facilities concerned. Hydro-Québec Production as well as independent power producers can submit bids, on condition that they meet the criteria approved by the Régie de l'énergie. These criteria are based on three main principles:

- ensure reliable electricity service
- favor renewable energy sources
- obtain the best possible price

Hydro-Québec Production would be able to participate in upcoming calls for tenders by offering its available energy. Wind farm owners whose contracts will expire in upcoming years could also submit new projects.

The *Act respecting the Régie de l'énergie* requires that Hydro-Québec Distribution deal with all participants in a fair and impartial manner.



Supplying Off-Grid Systems

Hydro-Québec Distribution delivers renewable electricity to more than 99% of customers connected to its main grid. However, a minority of customers are not connected to the main grid because they live in a remote region. These customers are served by 22 off-grid systems, which must produce their own power, often using diesel generating sets. Hydro-Québec has, however, undertaken to connect two of these regions to the main grid.

To meet the needs of off-grid systems, Hydro-Québec prioritizes energy-efficiency measures and the transition to renewable energy.

Decisions concerning transition projects are based on four guiding principles:

- positive environmental impact
- reliable electricity service
- favorable reception by communities
- lower operating costs

By the end of 2020, the division hopes to launch transition initiatives in all off-grid systems.

Maintaining service reliability

Integrating renewable energy into an off-grid system involves more than adding storage batteries to ensure service reliability. A second generation source is also required and must be available at all times. For this reason, diesel-powered supply must be maintained. As a result, we will be replacing certain diesel generating sets and adding new ones during the period covered by the Supply Plan.

Energy transition on off-grid systems

QUAQTAQ

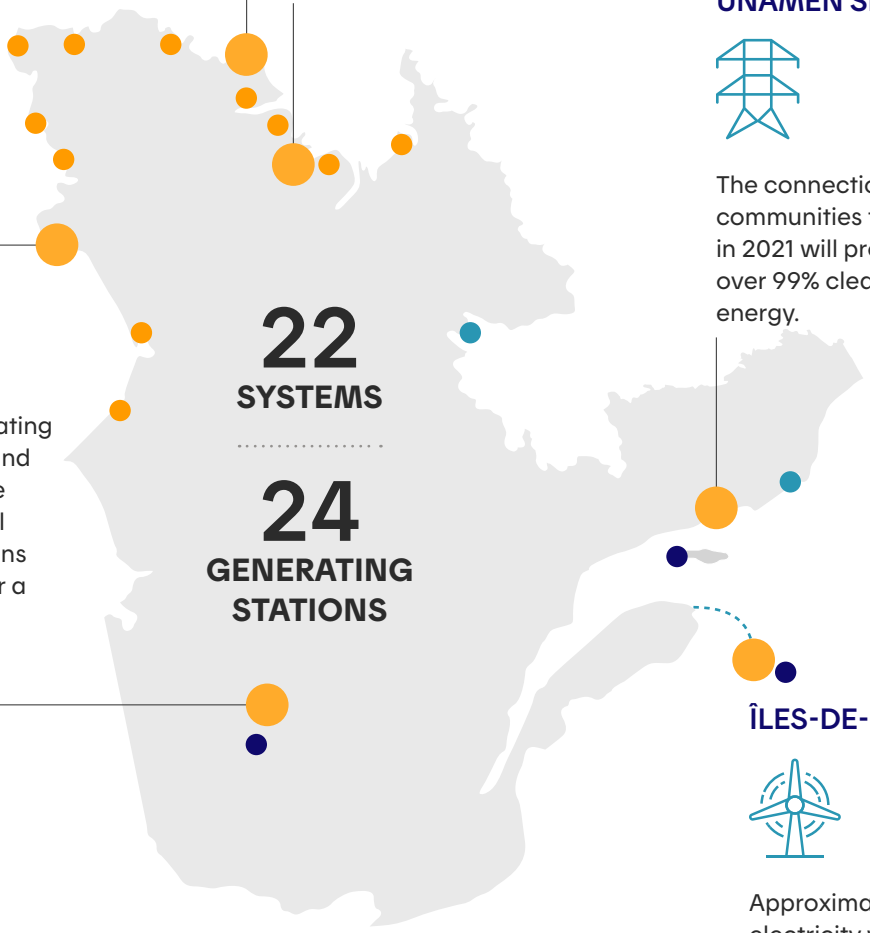
We have already installed solar panels and batteries to store energy.

TASIUJAQ

A hybrid generating station integrating renewable energy will be commissioned in 2022.

VILLAGE OF LA ROMAINE AND THE COMMUNITY OF UNAMEN SHIPU

The connection of these communities to the main grid in 2021 will provide them with over 99% clean, renewable energy.



INUKJUAK

A run-of-river generating station will be built and commissioned at the end of 2022. This will reduce GHG emissions by 700,000 tons over a 40-year period.

OBEDJIWAN

Discussions are underway with the community concerning the integration of a biomass generating station.

ÎLES-DE-LA- MADELEINE

Approximately 13% of electricity will soon be generated by a wind farm. In addition, the Îles will be connected to the main grid in 2025 via 225 km of underwater cables. This will reduce GHG emissions arising from electricity generation by 94%.

- Two off-grid systems (Schefferville and Lac-Robertson) are already supplied by hydroelectric generating stations.
- To prepare our other facilities for the integration of renewable energy, we are modernizing automatic controls in diesel generating stations and plan to add energy storage systems in six off-grid systems.
- Transition initiatives for the other off-grid systems are expected to be launched in the coming years.

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