



INTEGRATED RESOURCE PLAN



MEETING B.C.'S FUTURE
ELECTRICITY NEEDS

NOVEMBER 2013

BC hydro 

FOR GENERATIONS

ABOUT BC HYDRO

BC HYDRO IS ONE OF CANADA'S LARGEST ELECTRIC UTILITIES, SERVING ABOUT 95 PER CENT OF B.C.'S POPULATION.

BC Hydro is a Crown corporation owned by the Province of British Columbia. BC Hydro's mandate is to generate, conserve, purchase, and sell electricity to meet the needs of its customers. BC Hydro serves 95 per cent of B.C.'s population, delivering electricity safely and reliably to approximately 1.9 million customers.

As the largest electric utility in British Columbia, BC Hydro operates an integrated system with 31 hydroelectric facilities and three thermal generating plants, totalling approximately 12,000 MW of installed generating capacity. The hydroelectric facilities provide over 95 per cent of the total electricity generated and are located in the Peace, Columbia, and Coastal regions of B.C. BC Hydro's own

generation is complemented by additional electricity purchased from independent power producers in the province to meet customers' annual needs.

BC Hydro delivers electricity to its customers through a network of over 75,000 km of transmission and distribution lines, approximately 300 substations, 900,000 utility poles, and 325,000 individual transformers. The system is connected to other transmission systems in British Columbia, Alberta, and Washington State, which improves the overall reliability of the system and provides opportunities for trade.

The legislation that enables BC Hydro to carry out its mandate is the *Hydro and Power Authority Act*. Under the *Utilities Commission Act*, the British Columbia Utilities Commission (BCUC) regulates public utilities, including BC Hydro.



ABOUT THE INTEGRATED RESOURCE PLAN

BC HYDRO'S RESOURCE PLANNING PROCESS IS GUIDED BY PROVINCIAL ENERGY POLICY.

The *Clean Energy Act* requires BC Hydro to submit its Integrated Resource Plan (IRP) to the Minister of Energy and Mines by August 3, 2013, and at least every five years thereafter. The Act also requires BC Hydro to be electricity self-sufficient by 2016* and to describe how it is responding to objectives in the Act, including:

- Generating at least 93 per cent of all electricity from clean or renewable sources in B.C.**
- Ensuring rates remain among the most competitive of those charged by public utilities in North America.
- Meeting at least 66 per cent of the expected increase in demand through conservation and efficiency by 2020.
- Using clean or renewable resources to help achieve provincial GHG reduction targets.
- Encouraging economic development and the creation and retention of jobs.
- Fostering the development of First Nations and rural communities through the use and development of clean or renewable resources.

The IRP was submitted to the Minister on August 2, 2013, and includes BC Hydro's recommended actions to cost-effectively meet the forecast electricity needs of the province over the next 20 years, including the development of the liquefied natural gas (LNG) industry.

In developing the IRP, BC Hydro first consulted with the public, stakeholders, and First Nations in 2011 and 2012. This consultation included multiple stakeholder meetings, open houses, workshops and feedback forms. A Technical Advisory Committee of outside experts and interested parties was also engaged to provide in-depth technical input into development of the IRP. After submission of the IRP in August, Government directed BC Hydro to undertake final consultation of the IRP from September 3, 2013 to October 18, 2013.

In response to the additional feedback and to a request from the Minister of Energy and Mines, BC Hydro is adding a new action to ensure it aligns with and supports the province's long term vision for clean energy in B.C. This recommended action is to support a healthy and diverse clean energy sector and to promote clean energy opportunities for First Nations communities.

If BC Hydro's IRP is approved by the Province, the BCUC must consider and be guided by the approved IRP when considering future BC Hydro applications for approval of the expenditures and projects required to implement the IRP.

* In February 2012, the BC Government amended the definition of self-sufficiency so that BC Hydro must be electricity self-sufficient during average water conditions. The previous definition required self-sufficiency during historically low inflows, or critical water conditions.

** Pursuant to British Columbia's Energy Objectives Regulation of July 2012, this excludes electricity to serve demand from facilities that liquefy natural gas for export by ship.



SERVING GENERATIONS

BC HYDRO'S HERITAGE SYSTEM AND THE CLEAN ENERGY SECTOR CONTINUE TO SUPPORT BRITISH COLUMBIA'S STRONG-AND-GROWING ECONOMY.

Clean, abundant, and affordable electricity has been the backbone of British Columbia's economic prosperity and quality of life for generations.

From the time BC Hydro was created more than 50 years ago, it undertook some of the most ambitious hydroelectric construction projects in the world. Generations of residential, commercial and industrial customers in B.C. have benefited from these historical investments in hydroelectric facilities.

It is because of these heritage assets that British Columbians now enjoy some of the lowest electricity rates in North America, helping to provide one of the highest standards of living in the world and attracting more and more people and investment to B.C.

In addition, since the late 1980s, BC Hydro has been purchasing power from clean energy producers to complement the energy it generates from its own system. Independent Power Producers now contribute about 20 per cent of BC Hydro's total supply requirements.

Today, our population is growing, our economy is expanding, and new technologies and industries are advancing every day. That's why BC Hydro is planning now to meet the future electricity needs of our customers.

In two decades, British Columbia's population is forecast to grow to nearly 5.7 million people. This means we will have to support the energy needs of 1.1 million more British Columbians and the economic activity they will generate.

BC Hydro's Integrated Resource Plan provides a long-term look at how BC Hydro can cost-effectively meet our customers' needs – by continuing to promote conservation and energy efficiency, by developing or acquiring renewable energy resources for the future, and by planning for the emerging LNG industry.

This balanced approach forms the basis of our commitment to future generations of British Columbians – just as vital decisions made long ago led to the reliable and affordable electricity we enjoy today.



UPGRADING THE SYSTEM

B.C.'S POPULATION AND ECONOMY CONTINUE TO EXPAND, BRINGING NEW BUSINESSES, RESIDENCES AND INDUSTRIAL ACTIVITIES.

British Columbia's hydroelectric system is vast and reliable, but it will not be enough to meet the electricity needs of future generations. New sources of electricity are required to meet our growing demand for clean, reliable power.

Since the 1980s, when BC Hydro's last new major hydroelectric facility was built, the province's population has grown by more than a million people. Along with this population increase, B.C.'s economy has continued to expand, bringing new businesses, residences and industrial activities.

Without action, B.C.'s demand for electricity in 20 years is forecast to be 23,000 gigawatt hours per year (GWh/yr) greater than it is today – an increase of 40 per cent over what British Columbians currently use (57,000 GWh/yr). While using less electricity and using it wisely through conservation and energy efficiency is the first and best choice to meet this challenge, it will not be enough.

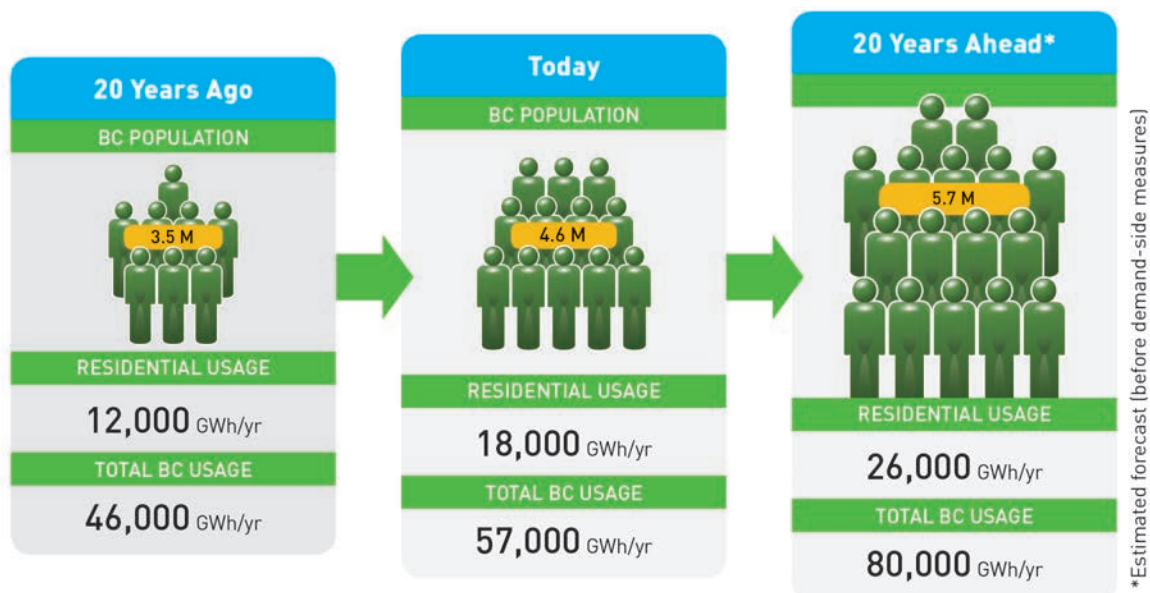
Based on BC Hydro's load forecast and most recent assessment of existing and committed supply-side resources, there is a need for energy resources in



four years (F2018) and a need for capacity resources in two years (F2016), before demand-side measures are taken into account.

The IRP focuses on the actions BC Hydro must take to ensure our customers continue to receive cost-effective, reliable, clean electricity for decades to come.

BC Hydro's recommended actions are described in detail in the Integrated Resource Plan. This summary document includes a list of the IRP's recommended actions on pages 12-13.



MEETING DEMAND

NEW INDUSTRIAL OPPORTUNITIES, LIKE LNG, ARE EMERGING WITH A PROMISE OF JOBS AND A DEMAND FOR RELIABLE ELECTRICITY.

New consumer products, expanding commercial enterprises and changing industrial practices have steadily evolved over the last 50 years. And while lifestyles may have changed, the graph below shows the steady increase in electricity demand from generation to generation. That trend is forecast to continue.

At the residential level, our households have multiple electronic devices and our family members carry a growing range of communication tools. Commercially, electric vehicles have moved from the design stage to designated parking spots, and our schools and businesses are “wired” like never before. In addition, new industrial opportunities are also emerging with a promise of jobs and economic development – and with them a greater demand for reliable electricity.

BC Hydro forecasts customers’ demand for electricity will grow by 40 per cent over the next 20 years – before accounting for savings from conservation and efficiency

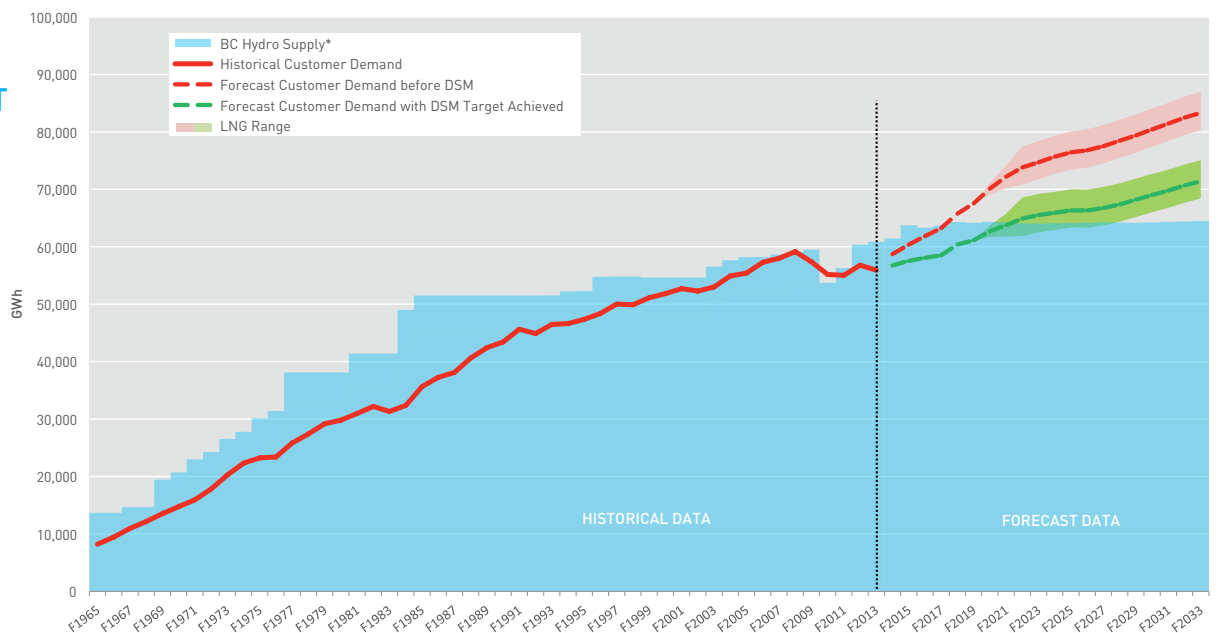
measures. And beyond this growth in demand which is driven by population increase and broad economic expansion, liquefied natural gas will increase electricity demand further.

Forecasting B.C.’s future electricity needs is not without challenges. Many variables and uncertainties are at play, including the impacts of customer behaviours, technological shifts (such as electric vehicles), global energy markets, economic trends and climate change.

Under the *Hydro Power and Authority Act*, BC Hydro has an obligation to serve its existing residential, commercial and industrial customers and any future customers in its service area.

While existing generation resources and already planned conservation efforts will address demand growth in the short term, the IRP shows that a supply-demand gap emerges within the next 10 years.

HISTORICAL AND FORECAST FUTURE DEMAND AND BC HYDRO SUPPLY



* The drop in BC Hydro supply in F2010 is a result of removing Burrard Thermal Generating Station from the planning stack pursuant to the October, 2009 Direction 2 to the BC Utilities Commission.

SUPPORTING LNG

BC HYDRO HAS ADEQUATE SUPPLY TO MEET THE INITIAL 3,000 GWH OF LNG LOAD AND WILL PREPARE TO MEET FURTHER REQUIREMENTS AS THEY EMERGE.

Just as previous generations invested wisely in the heritage system that currently serves British Columbians with affordable and reliable electricity, new choices must be made now to support the province's unique opportunities for economic growth and prosperity.

One of the most important economic opportunities for the province is the development of B.C.'s LNG industry.

Today, there are approximately a dozen publicly announced LNG projects proposed for Kitimat, Prince Rupert and other areas of the province, including the north coast, Howe Sound and Vancouver Island.

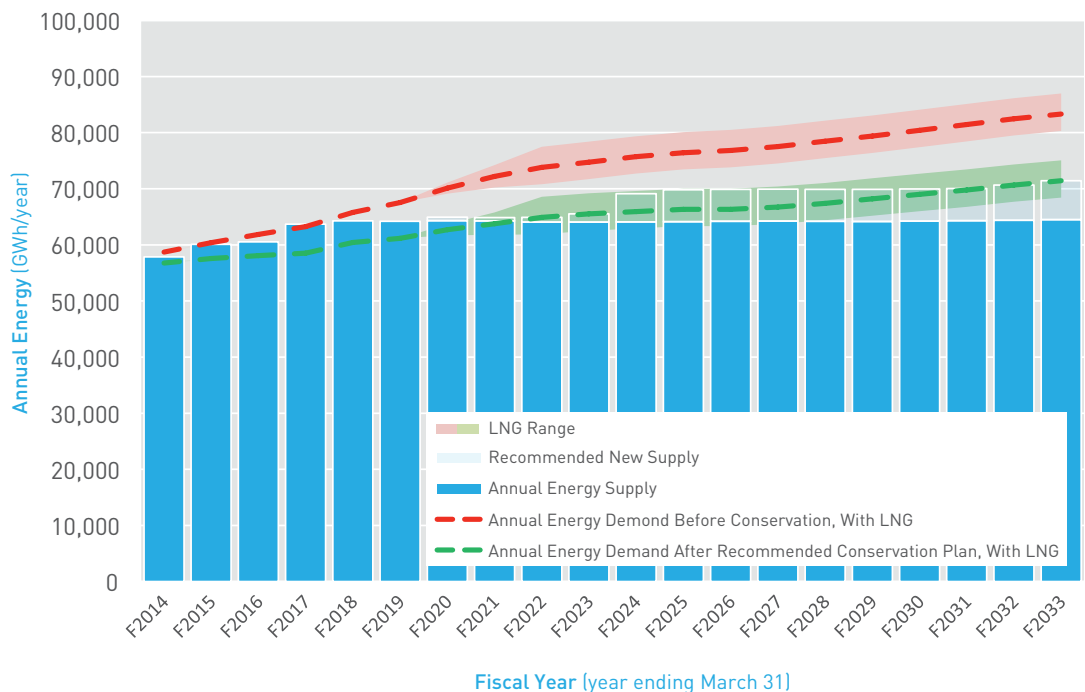
After undertaking the recommended actions in this IRP, BC Hydro will have sufficient supply to meet the initial 3,000 gigawatt hours of LNG load and will prepare to meet further LNG requirements as they emerge.

BC Hydro understands that while most LNG producers will use direct-drive natural gas turbines to run the cooling process to convert natural gas to liquid form, many are expected to take electricity for ancillary requirements, such as lighting, control systems and office requirements. Others may choose electricity for all their energy needs. As the LNG industry develops, BC Hydro will continue to support the needs of this sector.

The IRP recommends actions to support the development of the LNG industry, including reinforcing an existing 500 kilovolt transmission line from Prince George to Terrace; working with industry to explore natural gas supply options on the north coast to enhance transmission reliability and to help meet the expected load; and being prepared to acquire clean energy supply in the future if LNG needs exceed existing, contracted supply.

ENERGY SUPPLY-DEMAND OUTLOOK

Energy is the amount of electricity that can be produced or used over a period of time measured in gigawatt-hours (one GWh = one million kilowatt hours).



CONSERVING FIRST

POWER SMART ENCOURAGES RESIDENTS, BUSINESSES AND COMMUNITIES ACROSS B.C. TO TAKE A LEADERSHIP ROLE IN CONSERVATION.

Conservation is the first and best choice to meet future demand growth. Not only are such measures cost-effective and have low environmental impact, they also help reduce customers' electricity bills.

Through our Power Smart program, BC Hydro is a recognized leader in conservation, providing a range of programs and incentives to help our customers conserve, be more efficient, use power wisely, and ultimately use less. British Columbians are now saving the equivalent amount of electricity to meet the annual needs of approximately 425,000 homes.

Placing a high priority on conservation and efficiency is consistent with government policy as well as public, First Nations and stakeholder input collected from IRP consultation to date.

BC Hydro believes that building and maintaining a conservation culture and achieving associated savings

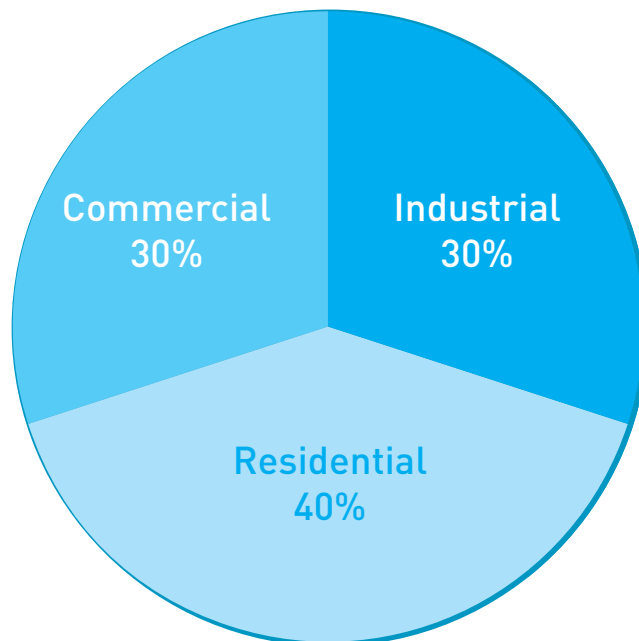


requires sustained effort. For this reason, the IRP recommends maintaining BC Hydro's demand-side management measures at the same level going forward as has been undertaken in recent years, and preparing to increase these measures as load increases.

LOOKING AHEAD TO F2021

BC Hydro is relying on all three customer classes to undertake demand-side management activities and meet our 7800 GWh target in F2021.

This graph illustrates the expected contribution by customer class.



POWERING TOMORROW

LIKE BC HYDRO'S OTHER HERITAGE ASSETS, SITE C WOULD PROVIDE RELIABLE AND COST-EFFECTIVE ELECTRICITY FOR GENERATIONS.

Electricity systems are inherently complex, capital intensive and require significant lead time to construct.

As B.C.'s population and economy continue to grow, so will our demand for electricity. And while BC Hydro continues to upgrade the capacity, safety and reliability of our aging facilities, even these important investments will not be sufficient to meet future demand.

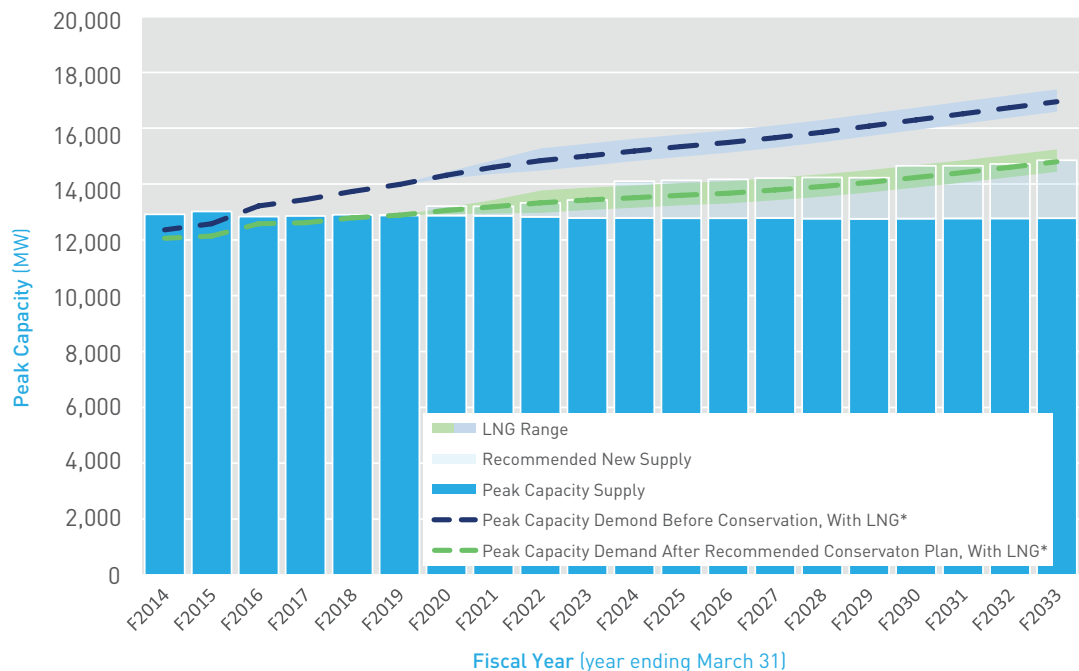
To meet that demand, the IRP recommends building Site C, a proposed third dam and generating station on the Peace River, which would provide cost-effective, reliable and renewable electricity for generations.

Analysis of alternative portfolios in the IRP shows that Site C provides the best combination of financial, technical, environmental and economic development attributes and is the most cost-effective way to meet the long-term need for energy and dependable capacity.



PEAK CAPACITY SUPPLY-DEMAND OUTLOOK

Peak capacity refers to the maximum amount of electricity that BC Hydro can supply to meet peak customer demand in the province at any point in time. Typically, demand peaks at dinner time on the coldest day of the year.



* Including planning reserve requirements

MANAGING RESOURCES

BC HYDRO IS FOCUSED ON MANAGING COSTS TO KEEP ELECTRICITY RATES AMONG THE LOWEST IN NORTH AMERICA.

BC Hydro is fortunate to have several clean energy resource options to help meet the electricity needs of our customers, including biomass facilities, run-of-river hydro and wind projects.

Independent power producers (IPP) have been bringing value to BC Hydro's system since the late 1980s, and they will continue to have an important role in providing clean, renewable electricity for decades to come.

The IRP recommends advancing a set of actions that will support a healthy, diverse clean energy sector and promote clean energy opportunities for First Nations.

BC Hydro commits to reviewing the IRP in two years to ensure there is adequate lead time to respond to any changing market conditions that could drive the need for additional energy acquisitions. As of August 2, 2013, BC Hydro has 127 Electricity Purchase Agreements (EPAs)

with IPPs, of which 81 are in operation providing about 20 per cent of BC Hydro customers' electricity needs. These EPAs provide clean, renewable power for the long term.

As BC Hydro plans to meet the future needs of customers for decades to come, it also needs to stay focused on keeping electricity rates competitive with those charged by other public utilities in North America.

The IRP recommends managing the costs associated with BC Hydro's current energy portfolio of EPAs and selecting the most cost-effective plan to meet customers' needs within the context of the *Clean Energy Act*. As part of this cost-management effort, the IRP recommends reviewing IPP projects not yet in commercial operation and renewing cost-effective EPAs that provide benefits such as enhanced system reliability and economic activity.



PLANNING FOR THE UNEXPECTED

BC HYDRO WILL CONTINUE TO EXPLORE AND ADVANCE CAPACITY RESOURCE OPTIONS FOR CONTINGENCY PURPOSES.

BC Hydro's long-term planning also takes account of future uncertainties. As part of good utility practice, BC Hydro must have contingency plans in place in case electricity demand grows faster than forecast, or if planned resources don't become available when expected. If more large projects than expected come on line (e.g., LNG facilities or mines), or efficiency and conservation measures do not achieve their intended results, the need for new supply may be advanced.

Ensuring BC Hydro can meet future peak capacity requirements is a specific objective because capacity resources must be available the instant they are needed. New, clean capacity resources are more limited than clean energy resources that could be secured on relatively short notice through a procurement process.




To ensure that contingency plans are in place, the IRP recommends continuing to explore and advance capacity resource options, including:

- Advancing the Revelstoke Generating Station Unit 6 Resource Smart project to preserve its earliest in-service date of F2021 with the potential to add up to 500 megawatts of peak capacity.
- Advancing GM Shrum Generating Station upgrades with the potential to gradually add up to 220 megawatts of peak capacity starting in F2021.
- Working with industry to explore natural gas supply options to reduce their potential in-service lead time and to develop an understanding of where and how to site such resources, should they be needed.



IRP RECOMMENDED ACTIONS

This section summarizes the recommended actions of the IRP. These actions do not, by themselves, commit BC Hydro to any specific projects identified over the planning period. Specific projects, such as DSM and the construction of generation facilities and transmission lines, may have additional consultation and approval requirements. Readers are referred to the IRP (bchydro.com/irp) for a complete review of the recommended actions.

		RECOMMENDED ACTIONS
 <p>CONSERVING FIRST</p>	1. Moderate current spending and maintain long-term target	Target expenditures of \$445 million on conservation and efficiency measures during the fiscal years 2014 to 2016. Prepare to increase spending to achieve 7,800 gigawatt-hours per year in energy savings, and 1,400 MW in capacity savings, by F2021.
	2. Pursue DSM capacity conservation	Implement a voluntary industrial load curtailment program from F2015 to F2018 to determine how much capacity savings can be acquired and relied upon over the long term.
	3. Explore more codes and standards	Explore additional opportunities to leverage more codes and standards to achieve conservation savings at a lower cost and to gain knowledge and confidence about their potential to address future or unexpected load growth.
 <p>MANAGING RESOURCES</p>	4. Optimize existing portfolio of IPP resources	Optimize the current portfolio of IPP resources according to the key principle of reducing near-term costs while maintaining cost-effective options for long-term need.
	5. Investigate customer incentive mechanisms	Investigate incentive-based pricing mechanisms over the short term that could encourage potential new customers and existing industrial and commercial customers looking to establish new operations or expand existing operations in BC Hydro's service area.
 <p>POWERING TOMORROW</p>	6. Continue to advance Site C	Build Site C to add 5,100 GWh/year of annual energy and 1,100 MW of dependable capacity to the system for the earliest in-service date of F2024 (for all six generating units) subject to: environmental certification; fulfilling the Crown's duty to consult, and where appropriate, accommodate Aboriginal groups; and Provincial Government approval to proceed with construction.
	7. Pursue bridging options for capacity	Fill the short-term gap in peak capacity with cost-effective market purchases first and power from the Columbia River Treaty second.
	8. Advance reinforcement along existing GMS-WSN-KLY 500 kV transmission line	Advance reinforcement of the existing GM Shrum-Williston-Kelly Lake 500 kV transmission lines to be available by F2024.
	9. Reinforce South Peace transmission	Review alternatives for reinforcing the South Peace Regional Transmission Network to meet expected load.
	10. Support clean energy sector	Advance a set of actions that will support a healthy, diverse clean energy sector and promote clean energy opportunities for First Nations.



SUPPORTING LNG

RECOMMENDED ACTIONS

<p>11. Explore natural gas-fired generation for the north coast</p>	<p>Working with industry, explore natural gas supply options on the north coast to enhance transmission reliability and to meet the expected load.</p>
<p>12. Explore clean energy supply options, if LNG demand exceeds available resources</p>	<p>Explore clean or renewable energy supply options and be prepared to advance a procurement process to acquire energy from clean power projects, as required to meet LNG needs that exceed existing and committed supply.</p>
<p>13. Advance reinforcement of the transmission line to Terrace</p>	<p>Advance reinforcement of the existing 500 kV transmission line from Prince George to Terrace, which includes development of three new series capacitor stations and improvements in the existing BC Hydro substations to be available by F2020.</p>
<p>14. Horn River Basin and northeast gas industry</p>	<p>Continue discussions with B.C.'s northeast gas industry and undertake studies to keep open electricity supply options, including transmission connection to the integrated system and local gas-fired generation.</p>



PLANNING FOR THE UNEXPECTED

RECOMMENDED ACTIONS

<p>15. Advance Revelstoke 6 Resource Smart project</p>	<p>Advance the Revelstoke Generation Station Unit 6 Resource Smart project to preserve its earliest in-service date of F2021 with the potential to add up to 500 megawatts of peak capacity.</p>
<p>16. Advance GM Shrum Resource Smart project</p>	<p>Advance Resource Smart upgrades to GM Shrum Generating Station Units 1–5 with the potential to gradually add up to 220 MW of peak capacity starting in F2021.</p>
<p>17. Investigate natural gas generation for capacity</p>	<p>Working with industry, explore natural gas supply options to reduce their potential lead time to in-service and to develop an understanding of where and how to site such resources, should they be needed.</p>
<p>18. Investigate Fort Nelson area supply options</p>	<p>Investigate procurement options to serve future Fort Nelson load.</p>

For more information about BC Hydro's
Integrated Resource Plan, please go to:
www.bchydro.com/irp

BC Hydro

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FOR GENERATIONS