Electricity powers our lives — it lights our streets, heats our homes and fuels our industries. According to BC Hydro’s forecast, B.C.’s electricity demand is expected to increase by about 50 per cent over the next 20 years — from economic expansion, population growth and the increased use of, or conversion to, electricity. The draft Integrated Resource Plan (IRP) details the actions BC Hydro recommends to meet growing demand so that customers will continue to receive affordable, clean and reliable electricity.

Given the long lead time necessary to build new generation facilities and transmission infrastructure, BC Hydro must plan well into the future. The IRP recommends actions for BC Hydro to undertake in the next 10 years to ensure that customers will continue to receive cost-effective, reliable, clean electricity over the long term.

As you will see in the draft plan, conservation continues to be the first and preferred way to close the gap between forecast need and supply — helping keep rates low and protecting the environment. However, future growth in electricity demand cannot be met through conservation alone. While growth in customers’ electricity demands can be cut by more than half through conservation, our province will need additional electricity. In the draft plan, we recommend buying and building a combination of the most cost-competitive and reliable clean generation resources to address our customers’ growing energy needs and to ensure sufficient capacity within the system to meet periods of peak demand. While ensuring electricity will be there in the future when it’s needed, we are also mindful of the need to advance actions in a prudent manner to avoid unnecessary risks and keep rates as low as possible.

While B.C. has a wealth of potential renewable energy resources, future capacity resources are more limited. Meeting future growth in peak capacity requirements is becoming more challenging as we tap into the last remaining capacity projects within our reservoirs on the Peace and Columbia River systems. Looking to the future, BC Hydro will need to examine other resources like pumped hydro storage facilities and natural-gas fired generation for meeting periods of peak demand.

In developing this draft IRP, we have considered input from First Nations, the public and stakeholders that was gathered through consultation in March and April 2011. Now, BC Hydro is seeking feedback on the draft plan, with consultation taking place this June and July. To participate, please go to www.bchydro.com/irp.
BC Hydro was created 50 years ago to harness B.C.’s renewable power on the Columbia and Peace River systems and to bring affordable electricity rates to communities across British Columbia. Today, BC Hydro is one of Canada’s largest electric utilities, serving 95 per cent of B.C.’s population — safely, reliably and at rates that are competitive with other jurisdictions in North America.

More than 93 per cent of BC Hydro’s current electricity supply comes from renewable sources that create little or no greenhouse gas emissions. BC Hydro operates 31 hydroelectric generation stations and three natural gas-fired generating stations. More than 70 independent power producers also connect to the grid, contributing approximately 20 per cent of the power required by customers. BC Hydro’s integrated transmission system also connects to Alberta and Washington state, enabling BC Hydro to import electricity when necessary or to trade for the benefit of B.C. ratepayers.

BC Hydro’s mandate is to provide British Columbians with reliable and affordable electricity. As a Crown-owned utility, it is governed by the Hydro and Power Authority Act and regulated by the B.C. Utilities Commission under the Utilities Commission Act.

The provincial Clean Energy Act requires BC Hydro to submit an Integrated Resource Plan to the Minister of Energy by December 2012 and at least every five years thereafter. The Act also requires BC Hydro to be self-sufficient* by 2016 and to describe how it will respond to objectives in the Act, including:

- Generate and deliver at least 93 per cent of all electricity in British Columbia through clean or renewable sources.
- Keep rates among the most competitive in North America.
- Meet at least 66 per cent of any increase in demand through conservation and efficiency by 2020.
- Use renewable power to help achieve provincial greenhouse gas reduction targets.
- Encourage economic development and the creation and retention of jobs.
- Explore and, subject to Cabinet approval, pursue the opportunity to develop and sell clean electricity into the interprovincial and international markets.
- Foster the development of First Nations and rural communities through the use and development of clean or renewable resources.

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

## Consultation Input

During March and April 2011, BC Hydro sought input from First Nations, stakeholders and the public as it developed the information and conducted the analysis necessary to prepare the draft Integrated Resource Plan. During consultation, more than 700 stakeholders and members of the public attended stakeholder meetings and open houses. Participants completed 400 feedback forms and made 51 written submissions. At the same time, BC Hydro held nine First Nations regional workshops, attended by 121 participants representing 78 First Nations, tribal councils and Aboriginal organizations. BC Hydro also sought input from the IRP Technical Advisory Committee on its analysis.

For more information on the IRP consultation program and for reports summarizing the input received to date, go to bchydro.com/irp.
KEY PLANNING QUESTIONS

In developing its draft Integrated Resource Plan, BC Hydro addressed three questions:

1. How much electricity will British Columbians need over the next 20 years?
   Demand must be understood in two ways: how much annual energy is required in total over the course of a whole year, and how much energy might be needed to meet demand peaks — to ensure that BC Hydro has sufficient peak capacity to keep the lights on, even on the coldest, darkest days.

2. What is the gap between existing supply and forecast demand?
   What is the expected future output of BC Hydro’s existing electricity generation, contracted energy supply and transmission assets, and to what degree might existing conservation and efficiency measures reduce future demand? After conservation is accounted for, what is the gap between existing supply and anticipated demand?

3. How can the gap be closed?
   What blend of additional conservation measures and additional generation and transmission resources will be needed to meet demand, reliably and cost-effectively?

BC Hydro’s Integrated Resource Plan does not, by itself, commit BC Hydro to any specific capital projects. Recommended action items will be subject to subsequent approval and consultation requirements.

20-YEAR LOAD FORECAST: ENERGY

The December 2011 long-term load forecast shows that demand for energy could grow by approximately 50 per cent over the next 20 years before accounting for the savings that can be achieved by current conservation and efficiency — or demand-side measures.

While growth in population and normal economic activity are relatively predictable drivers of electricity demand, growth in demand among large industrial customers is more challenging to forecast and is subject to the fluctuating global appetite for B.C.’s natural resources. In its December 2011 forecast, BC Hydro notes that growth in demand for electricity from the mining, oil and gas sectors will be particularly strong.

BC Hydro has included the development of two new liquefied natural gas facilities proposed for the north coast of the province in the load forecast.

To manage uncertainty, BC Hydro is including the expected load in its forecast, and is continuing to work with government and customers to manage scenarios that reflect potential additional demand. This ensures that BC Hydro will be able to respond positively, should demand increase more than expected, or should demand arrive more quickly, due to any individual large industrial projects.

Annual Energy Load Forecast

Source: BC Hydro Long-Term Load Forecast, December 2011
20-YEAR LOAD FORECAST: PEAK DEMAND

In addition to examining the total energy needed by its customers over the period of a year, BC Hydro must also ensure that it has sufficient peak capacity to reliably meet the instantaneous demands placed on the system.

BC Hydro’s load forecast indicates peak demand will grow by 50 per cent over the next 20 years, before accounting for the savings that can be achieved by current conservation and efficiency — or demand-side measures.

**Peak Demand Load Forecast**

![Graph showing peak demand load forecast from 2007 to 2017 with projected growth up to 2021.]

*Source: BC Hydro Long-Term Load Forecast, December 2011*

ELECTRIFICATION: SWITCHING FUELS TO ELECTRICITY

The Clean Energy Act includes, as an energy objective for B.C., “to encourage the switching from one kind of energy source or use to another that decreases greenhouse gas emissions in British Columbia.” Fuel switching to clean electricity could occur across the economy. The North Coast liquefied natural gas (LNG) industry and the Horn River Basin natural gas industry are examples of potential electrification — traditionally, industry burned fossil fuels to power their industrial processes. Beyond those examples, the transportation sector is the largest source of greenhouse gases (GHG) emissions in B.C., and replacing vehicles that use gasoline and diesel with electric vehicles could reduce greenhouse gases significantly.

Within the IRP, BC Hydro has examined the potential drivers of electrification, the potential impact of electrification on the electric system, and when electrification might occur. Analysis shows that future carbon prices (the regulated cost of emitting greenhouse gases) would have the strongest influence on the speed with which the transportation and industrial sectors will decide to switch fuels and electrify. In the next 10 years, the forecast demand for electric vehicles is predicted to be relatively small due to the availability of vehicles and their cost. In the long term, electric vehicle usage could climb to become a more significant component of overall electricity demand and a source of distributed energy storage.

BC Hydro will continue to monitor forecast carbon prices, and analyze future potential demands on its system to put it in a ready-state to respond and assist in enabling fuel-switching, should the marketplace demand it.
THE LOAD RESOURCE BALANCE

A key step in long-term integrated resource planning involves comparing the electricity load forecast (demand) to currently available resources (supply). When forecast demand for electricity exceeds resources, a gap emerges that BC Hydro must consider how to fill.

BC Hydro’s energy supply-demand outlook, or load resource balance, indicates that customers will need 4,900 gigawatt hours of additional energy by fiscal 2021 and an additional 12,500 by fiscal 2031, assuming the first two LNG plants proceed as planned. They will also need an additional 2,400 megawatts of capacity by fiscal 2031 to meet peak demands.

KEY FINDINGS FROM ANALYSIS

In preparing the draft Integrated Resource Plan, BC Hydro updated its long-term electricity forecast and its potential resource options database. Here are key findings that inform the recommended actions in this draft plan.

- BC Hydro customers will need considerable new energy and capacity over the next 20 years. Specifically, in the next 10 years, they will need an additional 4,900 gigawatt hours of firm energy and 1,100 megawatts of peak capacity to meet probable needs.

- BC Hydro’s load profile is changing. New mining and oil and gas development in northern B.C. is creating new load centres in the province, potentially driving the need for additional energy and capacity in areas of the province where they didn’t exist before.

- Our province has an enviable quantity of future sources of clean and renewable energy. While analysis shows that hydro, wind and biomass will continue to be the more affordable options in the next 10 years, other qualified clean or renewable resources will be eligible in BC Hydro’s procurement processes.

- Future clean capacity resources are more limited than energy resources. Meeting future growth in peak demand will become more challenging as we tap into the last remaining additional capacity projects at our reservoirs on the Peace and Columbia river systems. Looking to the future, new sources of capacity such as pumped storage and natural gas will need to be explored for meeting peak periods of demand. While run-of-river and wind offer much energy, they cannot be relied upon when the wind isn’t blowing or water flows are inadequate.
BC Hydro’s Integrated Resource Plan focuses on the recommended actions BC Hydro must take over the next 10 years to add new resources to ensure that British Columbians receive low-cost, reliable electricity over the long term.

BC Hydro’s overall strategy to meet growing demand for electricity is to conserve more first, then to build more and reinvest in our existing resources and buy more electricity from B.C.-based producers. In addition, as part of good utility practice, BC Hydro also recommends contingency plans to prepare for the event that demand is potentially greater than forecast. Following this approach, here are the recommended actions.

**CONSERVE MORE**

Conservation and efficiency, also referred to as demand-side measures, is BC Hydro’s cleanest and least expensive way to close the gap between future electricity demand and existing resources. Conservation measures can include:

- Programs that provide information, education and incentives (for example, the Fridge Buy-Back Program).
- Specifically-designed electricity rates such as the existing residential inclining block rate that sends price signals to conserve but remains revenue neutral for BC Hydro.
- Government codes and standards that set minimum energy performance levels for products or systems that use, control or affect the use of energy — for example, by eliminating the sale of low-efficiency light bulbs.

BC Hydro’s current demand-side management plan, established in 2008, targets a reduction in new load growth of 8,800 gigawatt hours per year by 2020. In analyzing how much conservation and efficiency to plan on going forward, BC Hydro compared its current approach, which emphasizes a complementary mix of programs, rates and government codes and standards, against a more aggressive approach that places increased reliance on more government-regulated codes and standards as well as other conservation measures. While such an approach has considerable upside, it would require further government action and consumer acceptance. Therefore, BC Hydro recommends increasing its current target and undertaking work to increase confidence and reduce risks associate with additional measures.

> **Recommended Action:** Increase the energy savings target to 9,800 gigawatt hours per year by 2020 (1,000 gigawatt hours more than the current plan) through conservation and efficiency programs, incentives and regulations.

> **Recommended Action:** Explore more codes, standards and conservation options for savings beyond the annual target of 9,800 gigawatt target.

Beyond measures aimed at reducing annual energy consumption, BC Hydro also recommends it undertake other measures to reduce peak demand, thereby reducing the capacity requirements placed on the system.

> **Recommended Action:** Pursue voluntary conservation programs that encourage industrial, commercial and residential customers to reduce electricity consumption during peak periods.
While conservation is our first and preferred strategy to meet customers’ future electricity requirements, made-in-B.C. power is still required to close the remaining gap between existing supply and future demand.

**Site C Clean Energy Project**

Site C is a proposed third dam and hydroelectric generating station on the Peace River in northeast B.C. With an earliest in-service date of fiscal 2021, Site C provides the most cost-effective clean energy under a range of potential load and market price scenarios. In addition to energy, Site C provides much-needed peak capacity, thereby facilitating the development and integration of intermittent renewable projects from sources such as wind and run-of-river hydro.

> **Recommended Action:** Build Site C to add 5,100 gigawatt hours of annual energy and 1,100 megawatts of dependable capacity to the system for the earliest in-service date, subject to environmental certification and fulfilling the Crown’s duty to consult and, where appropriate, accommodate Aboriginal groups.

**Resource Smart for Additional Capacity**

BC Hydro initiated the Resource Smart program in 1988 to identify and implement efficiency gains at existing BC Hydro facilities. The program provides additional annual energy and peak capacity by modifying, updating and retrofitting our existing generation facilities.

> **Recommended Action:** Begin work to allow the sixth generating unit at Revelstoke Generating Station to be built by 2018, adding another 500 megawatts of peak capacity to the BC Hydro system.

And beyond installing the sixth and last generating unit at Revelstoke Generating Station, BC Hydro recommends:

> **Recommended Action:** Continue to investigate and advance cost-effective Resource Smart projects to utilize the remaining untapped capacity within BC Hydro’s existing hydroelectric system.

**SITE C PUBLIC, STAKEHOLDER AND ABORIGINAL CONSULTATION**

Site C is currently in the environmental and regulatory review stage, which includes a co-operative federal and provincial environmental assessment process, including a joint review panel. The environmental assessment process for Site C will include multiple opportunities for timely and meaningful participation by the public, Aboriginal groups, governments and other interested stakeholders.

Separate from consultation opportunities led by the regulatory agencies as part of the environmental assessment, BC Hydro is leading several streams of public and stakeholder consultation. In addition, BC Hydro and Aboriginal groups are engaged in a thorough consultation process that will continue through all stages of the project.

The streams of BC Hydro-led consultation are:
- Regional and Local Government Liaison
- Property Owner Liaison
- Local Area Consultation
- Project Definition Consultation
- Aboriginal Groups

For more information about Site C, the work of the joint review panel and the opportunities for consultation and input, visit bchydro.com/sitec.
Combine Readily Available Resources to Meet the Short-Term Capacity Gap

BC Hydro’s load resource balance shows a short-term gap in peak capacity until Revelstoke Unit 6 can be brought online in fiscal 2019 and Site C in fiscal 2021. The only other capacity resources that could be available in this time frame would be new natural gas generation plants, so to fill this short-term gap, BC Hydro proposes to rely on cost-effective and readily available resources to meet customers’ growing requirements. The recommended action is:

> **Recommended Action:** Fill the short-term peak capacity gap from 2015 to 2020 with a combination of market purchases first, power from the Columbia River Treaty second, and extending the existing backup use of Burrard Thermal Generating Station, if required and as authorized by regulation.

Purchasing peak capacity on the market and using the Canadian Entitlement under the Columbia River Treaty involves calling upon electricity from the United States during periods when customers’ demand peaks. Because of transmission line constraints on its interties to the United States, BC Hydro expects it can count on no more than 500 megawatts of additional peak capacity from those sources.

The Canadian Entitlement is a result of the Columbia River Treaty between Canada and the United States in which the Canadian dams on the Columbia River are operated in a way that optimizes hydroelectric power generating potential in both countries. Within this treaty, Canada receives one-half of the extra power produced in the U.S. as a result of the Treaty projects — this is called the Canadian Entitlement. The Canadian Entitlement varies from year to year, but is generally in the range of 4,600 gigawatt hours per year and about 1,300 megawatts of capacity.

Burrard Thermal Generating Station is the only major generating facility located in the Lower Mainland, and is a valuable backup resource. The plant is available to meet demand in the Lower Mainland in the event that peak demand exceeds available resources or on an emergency basis. BC Hydro has, on average, called upon Burrard 12 days per year during the past three years to meet peak demand and to provide emergency backup for generation and transmission outages.

Transmission Requirements

B.C.’s bulk high-voltage transmission system is the backbone of electricity delivery to customers across the province. It carries high-voltage electricity long distances from where it is generated to the cities, towns and industrial centres where it is consumed.

To meet forecast load growth, BC Hydro has concluded that no high-voltage inter-regional transmission lines are required in the next 20 years. However, the existing 500 kilovolt (kV) line from Prince George to Terrace will need to be reinforced to meet new demand on the north coast. In addition, BC Hydro must:

- Complete committed transmission line projects such as the Interior-to Lower-Mainland (ILM) and Northwest Transmission Line (NTL) projects.
- Address region-specific transmission needs. For example, oil and gas expansion is driving rapid growth in the South Peace area.

> **Recommended Action:** Reinforce the existing 500-kilovolt line from Prince George to Terrace to meet new demand on the north coast.
After targeting more demand-side measures and advancing Site C, additional energy is still needed in the 2017 to 2022 time frame. Clean energy producers can bring new clean power projects online in five to six years and in smaller increments that better match B.C.’s growing electricity demand curve.

> **Recommended Action:** Develop energy procurement options to acquire up to 2,000 gigawatt hours from clean energy producers for projects that would come into service in the 2016 — 2018 time period.

While design work can proceed at a minimal cost, final decisions on the timing and the volume of energy will be made once there is more certainty regarding projected electricity load.

Based on BC Hydro’s assessment of potential generation resources in the province, it expects the majority of this power will come from wind, run-of-river hydro and biomass projects because these resources currently appear to be lower cost than other alternatives. However, power producers will have the opportunity to advance other forms of renewable power, such as geothermal, wave and tidal, in future procurement processes.
The recommended actions discussed so far address the forecast annual energy gap and peak capacity gap. From a cost perspective, the recommended actions (or portfolio of resources) are the most cost-effective ones available that can reliably close the gap and meet provincial energy objectives, thereby helping keep rates low over the long term. From an environmental and economic development perspective, the province’s clean energy, conservation, self-sufficiency and greenhouse gas reduction policies have guided BC Hydro’s direction in this plan, minimizing environmental impacts and supporting economic development.

As BC Hydro works toward fulfilling future electricity requirements, it will continue to monitor emerging new loads closely and be ready to adjust course as needed. In particular, forecast new demand from the liquefied natural gas industry requires close attention, as new LNG demand will arrive in substantial segments, versus growing slowly and incrementally over time.
PREPARE FOR POTENTIALLY GREATER DEMAND

As part of good utility practice, BC Hydro has contingency plans in case electricity demand grows faster than forecast, or planned resources don’t come online when expected. The focus here is keeping options open at minimal cost until the future course of events is better understood.

BC Hydro is paying particular attention to major developments in the north where there is potential for even greater load growth from development in the large industrial sector.

North Coast: Liquefied Natural Gas Development and Mining

In addition to the two liquefied natural gas (LNG) facilities included in BC Hydro’s base load forecast, BC Hydro is aware of a number of other LNG and mining projects currently being considered on the north coast. If a third LNG facility is approved and requests electrical service, BC Hydro would need to acquire significant additional energy and provide additional peak capacity to serve the additional load. BC Hydro is studying a range of options to serve this potential future need on the north coast, involving both electricity supply and associated transmission infrastructure.

> Recommended Action: Continue to work with LNG developers to understand their electricity requirements, and keep options open until further certainty on future requirements can be established. Specifically:

- Undertake work to maintain the earliest in-service date for a new 500 kV transmission line from Prince George to Terrace and Kitimat and from the Peace River region to Prince George.
- Develop procurement options for additional clean energy resources, backed up by gas-fired generation (located only in the north coast, or in both the north coast and across the province) for electricity that could be delivered in the 2019 — 2020 time frame, should it be needed.

Northeast: Natural Gas Extraction

BC Hydro is looking at the potential that large new natural gas extraction emerges in the Horn River Basin in northeast B.C. and, in turn, the gas industry seeks electrical power from BC Hydro. The Horn River Basin encompasses a large geographic area northeast of Fort Nelson that is currently not connected to the integrated transmission system. Traditionally, the natural gas industry has met its own energy requirements via burning natural gas or diesel. However, the industry could be electrified — thereby reducing related greenhouse gas emissions and helping to achieve climate change goals.

> Recommended Action: Continue to monitor the northeast gas industry and undertake studies to keep electricity supply options open, including transmission connection to the integrated system, and local gas-fired generation.
Additional Peak Capacity Resources for Contingency Purposes

For contingency planning purposes, BC Hydro must look beyond the base plan and address what if forecast peak capacity is greater than expected or other new resources don’t come online when expected.

> **Recommended Action:** Working with industry, explore pumped storage capacity options to reduce the lead time to in-service dates and to develop an understanding of where and how to site such future resources in the province, should they be needed.

> **Recommended Action:** Working with industry, explore natural gas-fired generation options to reduce the lead time to in-service dates and to develop an understanding of where and how to site such future resources in the province, should they be needed.

Pumped storage projects can be sited in areas that are close to load centres to minimize electricity losses and transmission lines. British Columbia, with its high mountains near the major load centre in the Lower Mainland, is well suited to pumped storage. However, pumped storage has not been built in B.C. before and the construction time for a large hydroelectric project is significant.

Meanwhile, BC Hydro recommends it also works with industry to explore natural gas as a resource option, as it is the next-lowest-cost alternative for adding additional capacity. Natural gas-fired plants can be located close to where the electricity is needed, reducing the need to build new transmission.

**LIQUEFIED NATURAL GAS (LNG) DEVELOPMENT ON THE NORTH COAST**

Several companies are currently working to establish LNG export facilities on the north coast, creating a potential investment of approximately $20 billion in B.C. and the addition of many new jobs. Converting natural gas to a liquefied state is highly energy intensive, so BC Hydro is working with the provincial government and industry to better understand the potential demand from these LNG plants. The provincial government has said it is committed to seeing three LNG plants in operation by 2020. Related provincial goals include ensuring B.C. is competitive in the global LNG market, maintaining leadership on climate change and clean energy, and keeping energy rates affordable.

BC Hydro has sufficient supply to meet the energy needs of the first two of three LNG facilities expected to come into operation in the next five years. BC Hydro is working closely with potential proponents and studying supply options to meet possible additional demand that could emerge if a third LNG plant is established in the longer term or if other additional electricity demand emerges.

**EXPORT MARKET CONCLUSIONS**

As part of its Integrated Resource Plan, the *Clean Energy Act* directs BC Hydro to study the potential to acquire electricity for the purpose of export.

Through its wholly owned subsidiary Powerex, BC Hydro has a long and successful track record of trading electricity for the benefit of B.C. ratepayers. BC Hydro’s reservoirs and the connectivity of its integrated transmission system to Alberta and the western United States have enabled BC Hydro to trade electricity in a way that optimizes its system and that finds a market for electricity that is surplus to domestic needs. Beyond this regular electricity trading, the government asked BC Hydro to examine the opportunity to acquire renewable energy solely for purposes of export, if there is a clear business case demonstrating the economic benefit to British Columbians.

BC Hydro’s analysis shows that current market conditions are not conducive to selling clean electricity into export markets. Made-in-B.C. power faces some relative disadvantages, including longer distances to market and challenging terrain. Also, the U.S. tax credits for renewable energy, decreased interest in advancing greenhouse gas emissions regulations, and low natural gas prices create an unfavourable environment for made-in-B.C. power. However, over the long term, market conditions could change.