

Demand dilemma:

How BC Hydro is responding
to declining load and operational
challenges resulting from COVID-19

Report

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 **BC Hydro**
Power smart

Demand dilemma: How BC Hydro is responding to declining load and operational challenges resulting from COVID-19

The COVID-19 pandemic has resulted in an unprecedented decline in B.C.'s electricity demand. The drop in demand and the spring snowmelt means BC Hydro has to take immediate action to avoid potential flooding and adverse impacts on the environment and its infrastructure over the year from high reservoir levels.

This report will examine the risks of the current situation and the measures BC Hydro is taking to avoid potential safety and environmental risks.

Highlights

- As a result of the COVID-19 pandemic's significant impact on the provincial, national and global economies, electricity demand in B.C. is estimated to be nearly 10% lower.
- With uncertainty around the speed of B.C.'s economic recovery, electricity demand may decrease by 12% or more* by April 2021—more than double the decline in demand following the 2008 recession.
- This has created an immediate challenge for BC Hydro as it is also experiencing significant inflows from the spring freshet (snowmelt) at this time of year, creating surplus energy that will need to be managed at certain times throughout the year.
 - Further adding to the challenge, this time of year is when the majority of the Independent Power Producers (IPPs) BC Hydro has agreements with are producing the greatest amount of energy—accounting for about 29% of BC Hydro's total generation.
- Typically, when BC Hydro has surplus power in its system, its trading subsidiary Powerex will export electricity to other jurisdictions; however, the reduced load in other jurisdictions is also reducing demand for exports from British Columbia, which is particularly problematic in the spring freshet.
- As a result, BC Hydro's larger reservoirs could reach capacity, creating the need for excessive spilling over the next year.
- If not addressed proactively, the growing capacity could lead to large and prolonged spills from its facilities, creating potential environmental risks and impacts to BC Hydro infrastructure.

Solutions

BC Hydro must manage its complex hydroelectric system through this unprecedented uncertainty, and make decisions based on forecasts and models to ensure that it can safely and reliably manage that system going forward throughout the year, based on a range of conditions.

This is why BC Hydro is taking immediate measures to manage its operations to reduce the environmental risks and potential infrastructure damage that can arise when spilling large quantities of water.

THESE STEPS INCLUDE:

- Shutting down operations at some of its smaller plants to reduce generation.
- Spilling water at its facilities, including Seven Mile and Revelstoke, to balance generation and the province's electricity load in real-time when needed.
- Powerex—BC Hydro's trading subsidiary—will export electricity to other jurisdictions.
- Reducing generation from other sources, including invoking provisions within its contracts with some of its large IPPs to reduce power purchases during the spring.

*Edit made post release (May 11, 2020)

COVID-19 and B.C.'s electricity demand

The COVID-19 pandemic has resulted in an unprecedented decrease in energy demand in the province. Since mid-March, BC Hydro has experienced nearly a 10% drop in provincial electricity demand—the steepest drop since the 2008 recession, which resulted in a 5% decrease.

The decline in demand is expected to continue over the coming months and could result in a drop of 12% or more* in load by April 2021. However, much uncertainty remains as electricity demand is largely dependent on B.C.'s relaxation of physical distancing measures, as well as on the global economic recovery, since so much of B.C.'s economic activity is linked to the economic activity of other provinces and nations.

Shifting demand as British Columbians adapt to a new normal

With more British Columbians at home, residential energy demand initially increased by around 7% in late March compared to last year. However, residential demand has since flattened to be at or near normal levels of previous years.

With many businesses in B.C. closed, energy demand from commercial and light industrial sectors has declined around 20% in April compared to March.

THE SECTORS THAT HAVE SEEN THE BIGGEST DECLINE ARE:

- recreation facilities
- restaurants
- hotels
- offices

Major industry—forestry, mining and oil and gas—accounts for approximately 30% of BC Hydro's overall electricity load and energy demand from these customers has decreased by 7% since mid-March.

Forestry is one of the most impacted industries due to temporary partial and full closures of mills. Energy demand from this sector could drop by up to 28%, while mining may see a decline of 22%. The oil and gas industry is expected to be less impacted with an expected drop of up to 7%. These forecasts are dependent on the global response to COVID-19, as much of the load from BC Hydro's largest customers is highly correlated with economic activity outside of BC, particularly in US and Asian markets.

Comparison with other utilities

The challenges with declining domestic electricity load due to COVID-19 are not unique to B.C. **A report** published by the International Energy Agency found partial and full lockdown measures have led global daily electricity demand to decline by 15%.

In North America, utilities are seeing declines of up to 25% from their residential, commercial or industrial customers.

Utility	Electricity demand change (January 1—March 31, 2020)		
	Residential	Commercial	Industrial
NorthWestern Corporation (South Dakota)	-9%	-1%	-25%
CMS Energy Corporation (Michigan)	-7%	-2%	-10%
IDACorp. Inc. (Idaho)	-3%	-1%	0%

Source: Company 10Qs filings for January 1—March 31, 2020; quarterly updates

*Edit made post release (May 11, 2020)

Outside of North America, countries are experiencing load declines of up to 20%, depending on the stage of the pandemic they are in and the severity of measures that have been implemented to stop the spread of the virus. As of the end of March, the United Kingdom and the Netherlands experienced reductions of 10 to 20%, while Germany and France had load reductions of 5 to 10%. Four weeks into shutdowns, Italy's load was down 25%. China, Guangdong reached maximum load reductions of more than 20% after two weeks.

Low demand, high inflows

In addition to the province's energy load, BC Hydro's reservoirs are influenced by a combination of conditions, including precipitation, snowmelt and spring runoff. As a result, this time of year is particularly challenging for BC Hydro to operate its system as there is an increase of water and a lower demand for electricity as days are longer and the province moves out of the winter heating season. This means less water is being moved out of its reservoirs to generate power while snowmelt is bringing the highest inflows into its system.

At the same time BC Hydro's own reservoirs could be reaching capacity in late spring and summer, many of the run-of-river IPPs that BC Hydro has electricity purchase agreements with are generating around full capacity. IPPs are producing approximately 29% of BC Hydro's total generation at this time of year.

This year, the spring freshet began in late April and is expected to last through to July. It is typical for BC Hydro to spill water from its smaller reservoirs during this time of year because inflows can exceed the capacity of the plant to generate electricity, or there is not enough demand for electricity to use all of the water that is flowing. However, the situation this year has been exacerbated by the unprecedented and sudden reduction in demand due to the COVID-19 pandemic.

The risks of too much water

The work that goes into managing BC Hydro's generating system is complex as it must balance a variety of interests, including public safety, fish and wildlife and flood control, while also meeting its power generation requirements. The situation created by significantly lower electricity demand in the province due to COVID-19 and the uncertainty regarding future demand further complicates this already complex task.

The unprecedented uncertainty around the future effects the pandemic will have on electricity demand in B.C. and elsewhere, along with the uncertainty of future inflows into its system create a very wide range of potential operational outcomes. BC Hydro is responsible to have a plan to safely manage all of the potential outcomes. The pandemic has the potential to create a surplus that if not addressed proactively, could lead to large spills from its facilities, creating environmental risks and potential impacts to its infrastructure.

While controlled spilling is an effective means of moving water out, it does come with challenges and requires careful planning. BC Hydro must spill water before a reservoir is full or expected to get full as waiting until it is at capacity can increase the risks of flooding of areas downstream, in the event of significant rainfall.

A prolonged spill can lead to high total dissolved gas pressure (TDG) downstream, which can harm fish. During short-term spilling, fish are able to find refuge in calmer waters, but frequent exposure to high TDG may have a cumulative impact on them. This means prolonged, excessive spilling can increase fish mortality rates.

In addition, while BC Hydro facilities were designed with the ability to spill significant volumes of water to protect the dams in periodic large flood events, prolonged and sustained high volume spills can result in damage to infrastructure at the facility, such as erosion to the spillway.

The financial impact of the loss of energy load

Demand for electricity in the province is a key factor in BC Hydro's rates—when electricity load falls, it puts upward pressure on future rates to ensure BC Hydro recovers its costs. Despite this uncertainty, BC Hydro is in a financially strong position that will allow it to manage through and emerge from the COVID-19 pandemic, and continue to provide reliable power to British Columbians.

BC Hydro has a high credit rating, which means it will continue to have access to cash at low interest costs. In April, credit rating agency DBRS reported the Province continues to receive a AA high credit rating with a stable outlook. This compares favourably to other Canadian jurisdictions.

The Province ceased the requirement for BC Hydro to pay dividends for the foreseeable future, which enables it to retain cash for its operations and capital projects, and help ensure its continued long-term viability.

Solutions

BC Hydro's system is designed and operated to perform safely across a wide range of conditions and extreme events, and its staff are highly trained and experienced to adapt quickly to changing conditions. This approach to operating its system has not changed due to the COVID-19 pandemic. What has changed are the challenges that come with managing a system when there is much uncertainty on how demand will recover over the coming months and future years.

Due to the risk of the current situation, BC Hydro is taking the following immediate measures to address the surplus of generation:

- Shutting down operations at some of its smaller plants to reduce generation.
- Spilling water at its facilities, including Seven Mile and Revelstoke, to balance generation and the province's electricity load in real-time when needed.
- Powerex—BC Hydro's trading subsidiary—will export electricity to other jurisdictions.
- Reducing generation from other sources, including invoking provisions within its contracts with some of its large IPPs to reduce power purchases during the spring.

Spilling from its facilities

BC Hydro will shut down some of its smaller plants and spill from facilities, such as Seven Mile and Revelstoke, to balance generation with provincial energy demand in real-time when required. It will also look to spill water from its largest reservoirs when they are nearing capacity.

Reducing generation from other sources

Another way BC Hydro can address the challenges is to reduce generation from other sources. This includes invoking provisions within its contracts related to situations involving epidemics to reduce its power purchases from some of its large IPPs during the spring freshet period and potentially beyond.

Exporting to other jurisdictions

BC Hydro's hydroelectric system and high-voltage transmission network exists within the Western Interconnection—a connected network of high-voltage transmission that spans from Alberta and B.C. through several western U.S. states to the Baja Peninsula in Mexico. This allows Powerex—BC Hydro's trading subsidiary—to buy and sell wholesale electricity throughout western North America.

Powerex will export surplus power to other jurisdictions. However, the wholesale export markets are typically weak during the spring freshet, a challenge that is further exacerbated this year as these jurisdictions are also experiencing considerably lower demand for electricity due to the economic effects of COVID-19.

Conclusion

BC Hydro is confident these measures will address the risks associated with its excess supply due to the drop in demand and help to avoid potential environmental risks and impacts to plants and facilities that would be created by excessive spilling. It will continue to monitor the situation and take further action if required to ensure its system remain safe and reliable for British Columbians.

