

Weathering the storm:

Many British Columbians not prepared for increasingly severe winter storms



Report

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 **BC Hydro**
Power smart

Weathering the storm: Many British Columbians not prepared for increasingly severe winter storms

Last December, BC Hydro experienced the worst windstorm in its history. The storm caused unprecedented system damage and left around 750,000 customers without power—with some in the hardest hit areas out for more than 72 hours. Despite this, many British Columbians remain unprepared for storm-related power outages.

Highlights

- British Columbians have experienced two of the largest individual storm events in BC Hydro history in the past four years, each causing extensive damage to the province's electrical system and resulting in over 700,000 losing power.
- BC Hydro data shows in 2018, customers on average experienced more storm-related power outages than ever before.
 - In fact, damage caused by adverse weather and trees and vegetation contacting BC Hydro equipment caused customers to lose power for over 11 million hours last year, more than double the five-year average of 5 million hours a year.
- The extent of storm-related damage was largely due to the December 2018 storm – the worst in BC Hydro history—that caused unprecedented system damage and left around 750,000 customers without power – with around 7% of impacted customers out for more than 72 hours.
- Despite this, a survey¹ conducted by BC Hydro found nearly 60% of British Columbians have not taken steps to be more prepared for power outages caused by winter storms.
 - Only 50% of British Columbians have an emergency preparedness kit, and of those without one, only 12% are planning to purchase one this year.
- The survey found the majority of those impacted by the December 2018 storm felt they could have been more prepared for the storm. However, only half have taken steps to be more prepared for winter storms this year.
- Around 30% of those living on Vancouver Island think it is reasonable to be without power for up to 24 hours following a major storm event, while the same number living in Lower Mainland think only three to five hours is acceptable.
 - BC Hydro data shows approximately half of all outages caused by weather events are over three hours in length.
- One-third of British Columbians have encountered a downed power line following a windstorm and 15% have had a power line fall on or near their property.
 - The survey found almost 20% of British Columbians do not know how to tell if a downed power line is live, with over half incorrectly thinking a live power line emits a buzzing sound, movement or sparks.

Solutions

BC Hydro recommends British Columbians prepare for storm-related power outages by having a fully stocked emergency kit. This should include:

- A flashlight and extra batteries
- First aid kit
- Required medications
- Non-perishable food
- Bottled water for each member of the household to last at least 72 hours.
- Warm clothing and blankets

¹ Online survey conducted by Majid Khoury of 800 British Columbians between October 16 and 21, 2019.

With BC Hydro seeing increasing damage to its system caused by storms in recent years, it is important for British Columbians to know what to do if they come across a downed or damaged power line:

- Every downed power line should be treated as an emergency and considered live, even if it is not smoking, sparking or making a buzzing sound.
- Stay back at least 10 metres (33 feet)—about the length of a city bus.
- Dial 9-1-1 and let the dispatcher know a power line has fallen or is damaged.

To improve response times, BC Hydro remains focussed on preparing for storm season year-round. It is using its smart meter network along with introducing new technology and processes, including:

- Enhanced prediction logic: using an algorithm and the smart meter network, BC Hydro's system can confirm an outage and mark its location on a map, which a dispatcher can then analyze and dispatch a crew to investigate and make necessary repairs.
- Remote services apps: tools that allow field crews to communicate restoration progress more efficiently and accurately, including mobile apps and satellite communication devices for use when out of cell range.
- Improved meteorology models: this information provides greater insight into where and when a storm might hit so BC Hydro can ensure crews are ready to respond quickly.

Extreme weather leads to operational challenges, more power outages

BC Hydro has experienced a number of operational challenges in recent years as more frequent weather events are causing more damage to its system, resulting in more power outages for its customers.

Last December, BC Hydro experienced the worst storm in its history. The storm affected more customers and did more damage than any other storm before it. It also required BC Hydro to undertake the largest mobilization of people, equipment and materials to respond to it. The storm generated more than twice the number of storm-related outages than BC Hydro experienced in all of 2013. Over 750,000 customers lost power—the majority in the Lower Mainland, Fraser Valley, Vancouver Island and the Gulf Islands.

In addition to this storm, BC Hydro experienced dozens of other major weather events—high winds, heavy rain, and

snow—between November 2017 and February 2018. In December 2018 alone, crews responded to major storm events in 28 of its districts across the province, from Parksville to Vanderhoof.

An unprecedented ice storm hit the Fraser Valley in December 2017 that created a number of unique challenges for crews. The freezing rain and below-zero temperatures caused ice to form on trees causing them to break and fall on to power lines and knock down power poles. In other cases, BC Hydro equipment became encased with ice, leading to outages. The poor weather conditions and icy roads made for an extremely challenging response for BC Hydro crews who had to pare back work at times to ensure their own safety.

In August 2015, the Lower Mainland and Vancouver Island were hit by an unusual late summer windstorm in 2015 that caused extensive damage to BC Hydro's system. The storm knocked out power to more than 700,000 customers over a three-day period. At the time, it was the single largest outage event in BC Hydro's history, until the December 2018 windstorm hit.

Preparing for power outages

As BC Hydro—like other utilities across North America—continues to face increasingly more severe weather events and more system damage, customers need to be prepared for the possibility for prolonged outages.

A recent survey¹ commissioned by BC Hydro found almost half of British Columbians think winter storms have gotten worse in recent years, leading to more damage and more power outages. The survey found nearly 50% of British Columbians experienced a power outage that resulted from damage caused by a winter storm in the past 12 months, and 60% of those experienced two or more of these types of outages.

Despite this, nearly 60% of British Columbians have not taken steps to be more prepared for power outages that could result from these storms. The survey also found more than half do not have an emergency preparedness kit—and only 12% are planning to purchase one this winter.

The survey found that of those that experienced an outage following the December 2018 storm, 90% had their power out for more than three hours. And of those, 55% felt their household could have been more prepared for the storm and for being without power in the hours and days following. However, more than half have not taken steps since to be more prepared.

Staying safe in the aftermath of a storm

Damage to BC Hydro's electrical system is more common during the fall and winter months as strong wind, heavy rain and snow can cause tree branches to knock down power lines and damage other electrical equipment. One-third of British Columbians have encountered a downed power line in a windstorm and 15% have had a power line fall on or near their property. Still, many do not know what to do in the event of a downed power line.

For example, the survey found almost 20% of British Columbians do not know how to tell if a downed power line is live, and over half of those surveyed incorrectly think a live power line emits a buzzing sound, movement or sparks.

Stronger and more frequent storms increase the potential for emergency situations created by damage to BC Hydro's system, including downed power lines. The danger of downed power lines is more significant given there is no way to tell if the line is live. This is why it is important for the public to assume every down or damaged power line is live and dangerous—even if it is not smoking, sparking, or making a buzzing sound and should be reported to 9-1-1.

Outage causes

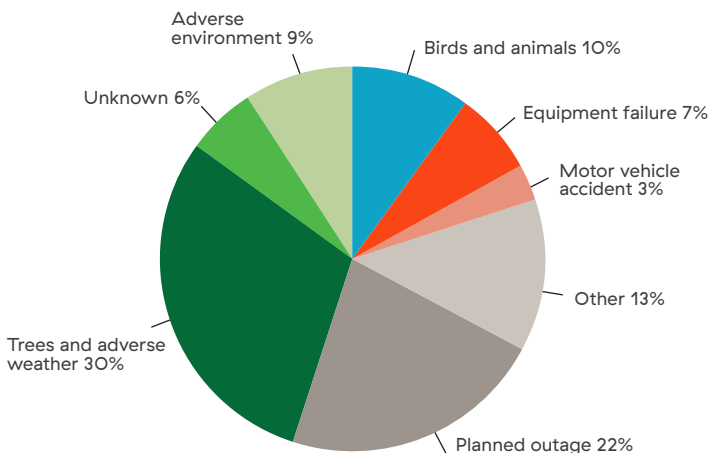
Over the past five years, trees and adverse weather caused BC Hydro customers to lose power for an average of five million hours a year. In 2018, the average number of hours lost was more than double that at 11 million hours.

Province-wide, tree-related outages were up 29% in 2018, compared to the five-year average.

- Vancouver Island saw a 100% increase.
- The Lower Mainland saw a 16% increase.
- The North, Central and South Interior saw a 13% decrease.

Combining the damage caused by trees and branches with adverse weather that B.C. typically experiences during the late fall and winter months, this added up to being the cause of around 30% of outages last year.

TOP OUTAGE CAUSES IN 2018



Adverse Environment: corrosion/rot, fire, flooding/slides, pollution, salt spray and vibration.

Other: construction, dig-ins, customer problems, vandalism, objects, incorrect construction or installation, personnel error, abnormal voltages, etc.

Unknown: causes that could not be clearly identified at the time.

BC Hydro service territory

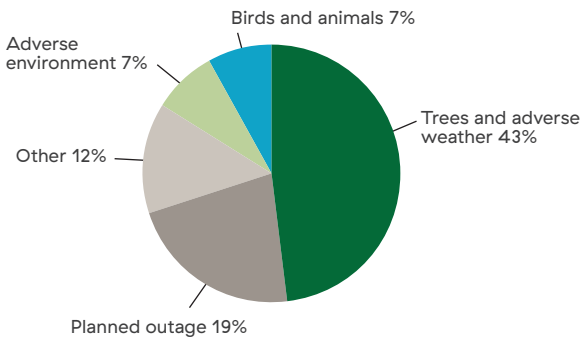


Vancouver Island and Gulf Islands

Vancouver Island and the Gulf Islands were the hardest hit by the December 2018 storm with over 87% of BC Hydro customers experiencing an outage during the event. Those in the hardest hit areas were without power for multiple days.

The storm caused hundreds of trees to fall across the region, making roads impassable in some places. In fact, because of this, BC Hydro data shows the number of tree-related outages on the Island increased by 100% last year compared to the five-year average.

TOP OUTAGE CAUSES ON VANCOUVER ISLAND (2018)



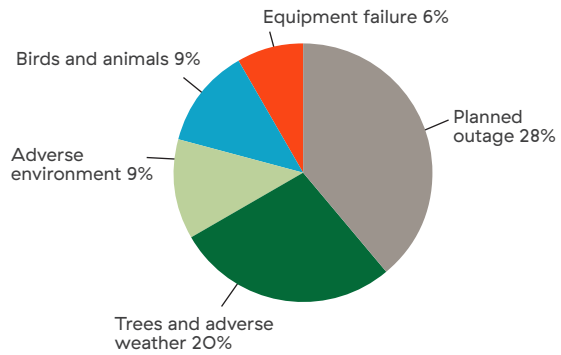
BC Hydro data shows that due to the storm and lengthy power outages that it caused, the average customer on the Island was without power 257% longer than the regions' five-year average. In fact, the average customer was without power for an average of 7.7 hours in 2018—that is 278% longer than the 2.76 hours experienced in 2017.

Lower Mainland and Fraser Valley

The average customer in the Lower Mainland was without power for around 3.8 hours in 2018, this is about 25% longer than 2017, but just 9% above the five-year average of 3.5 hours. Lower Mainland customers experienced the highest average outage duration in 2015 due to the extensive damage caused by the August 2015 windstorm.

As BC Hydro continues to improve the reliability of its system by replacing power poles and performing regular upgrades, planned outages were the number one reason customers in the Lower Mainland were without power in 2018. The second highest cause of outages was adverse weather causing trees and vegetation to come into contact with BC Hydro equipment, responsible for 20% of all outages in the Lower Mainland and Fraser Valley

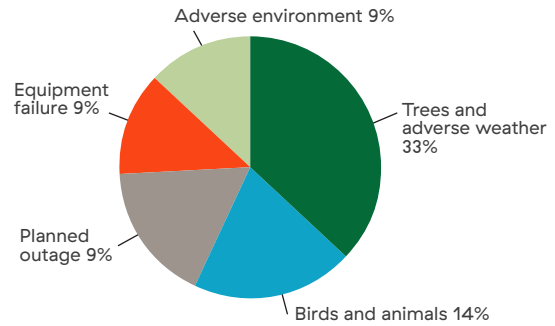
TOP OUTAGE CAUSES IN THE LOWER MAINLAND (2018)



North

Customers in the North were without power for an average of 2.4 hours in 2018 – this is just below the five-year average of 2.8 hours.

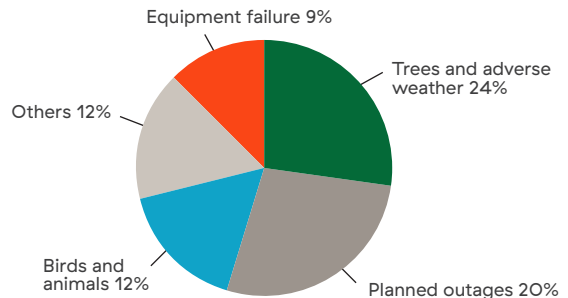
TOP OUTAGE CAUSES IN NORTH (2018)



Central Interior

Customers in Central Interior were without power for an average of 2.4 hours during 2018. This is 23% less than the five-year average and 44% lower than last year's average time of 4.32 hours.

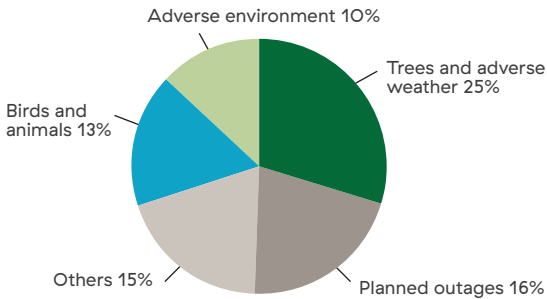
TOP OUTAGE CAUSES IN CENTRAL INTERIOR (2018)



Southern Interior

Customers in the Southern Interior were without power for around 2.34 hours in 2018—this is around 7% lower than the five-year average and around 44% less than 3.1 hours in 2017.

TOP OUTAGE CAUSES IN SOUTHERN INTERIOR (2018)



Outage impacts in rural areas vs. urban centres

BC Hydro serves over four million customers across all regions of the province. Each region is unique and has its own challenges when it comes to outage restoration. For densely populated urban areas, like the Lower Mainland, stormy weather can cause hundreds of small distribution outages that affect a significant number of customers given the high number of customers served by each line. BC Hydro classifies an ‘urban district’ as one that has more than 150 customers served by each square kilometre.

Some of the most damaging storms can result in hundreds of individual distribution outages. This can be very time consuming work for crews as they have to visit each site individually to make repairs—such as repairing power poles or restringing power lines—to restore customers. However, it typically takes less time for crews to travel between locations given the close proximity of BC Hydro’s district offices to urban centres. As the population in urban centres continues to increase, it will increase the likelihood of higher number of customer outages in these areas.

In comparison, BC Hydro’s ‘rural districts’ are those that have less than 20 customers served by each square kilometre, while those with between 20 and 150 customers are considered ‘mixed’. When major events occur that cause damage to BC Hydro’s distribution system in these more rural areas, typically less customers are impacted. However, the time it takes for power to be restored can be longer given the need for crews

to often travel from further distance to access the area. Often these customers are served by long power lines that have very few customers relative the length of the power line.

‘Transmission outages’ are outages that result from damage to BC Hydro’s bulk transmission system. These outages typically affect several thousand customers at one time. Depending on the type of damage, BC Hydro can often perform ‘switching’, which allows it to move affected customers onto a different line while it works on repairs. Repairs to the transmission system following a major storm event can be challenging, as the damaged infrastructure is often located in remote, or hard to access areas. In these cases, BC Hydro may rely upon helicopter flyovers to inspect the damage before developing a plan for repairs. Adverse weather can impact flight conditions and delay crews’ ability to conduct inspections and subsequent repairs.

Despite the increasing challenging storms, BC Hydro’s response times continue to be the best amongst utilities across North America. On average, BC Hydro crews restore over 95% of customers within 24 hours following a storm event.

Given the increasingly challenging storms BC Hydro has experienced in recent years, it is recommended that British Columbians prepare for the possibility of being without power for at least 72 hours by having a fully stocked emergency kit. This should include:

- A flashlight and extra batteries
- First aid kit
- Required medications
- Non-perishable food
- Bottled water for each member of the household for 72 hours.
- Warm clothing and blankets

Solutions

BC Hydro remains focused on preparing for storm season year-round. It is using its smart meter network and introducing new technology and processes to improve its response times, some of which includes:

- Enhanced prediction logic: using an algorithm and the smart meter network, BC Hydro's system can confirm an outage and mark its location on a map, where a dispatcher can then analyze and send a crew to investigate and make necessary repairs.
- Remote services apps: tools that allow field crews to communicate restoration progress more efficiently and accurately, including mobile apps and satellite communication devices for use when out of cell range.
- Improved meteorology models: this information provides greater insight into where and when a storm might hit so BC Hydro can ensure crews are ready to respond quickly. In addition, BC Hydro reviews its response at the end of every storm—regardless of the storm's size.

BC Hydro spends around \$50 million each year on its vegetation management program to help prevent tree-related outages. This includes performing regular inspections of its system to check for trees and other vegetation growing under or adjacent to its system that could pose a risk and lead to power outages. In 2018, crews removed over 52,000 trees that posed a risk to its system.

BC Hydro also performs regular maintenance and upgrades to the system to help ensure reliability and prevent outages. This includes replacing approximately 10,000 power poles each year that become damaged by adverse weather, wildlife or weakened by age.

