DISTRIBUTION SYSTEM PLAN

REVIEW PRIMER
PowerStream is a community-owned energy company providing power and related services to more than 370,000 customers residing or owning a business in Alliston, Aurora, Barrie, Beeton, Bradford West Gwillimbury, Markham, Penetanguishene, Richmond Hill, Thornton, Tottenham and Vaughan as well as Collingwood, Stayner, Creemore and Thornbury through a partnership with the Town of Collingwood in the ownership of Collus PowerStream.
Planning for Future Energy Needs

This primer and consultation concentrates on the short-term plan for PowerStream’s distribution system over the next five years. The graphic below shows the various planning initiatives ongoing within the Province. In addition to the short-term distribution plan being discussed in this primer, there are other planning initiatives undertaken to ensure that the electricity system maintains reliability and works efficiently for the benefit of customers.

Energy planning occurs at the provincial level (by the Ministry of Energy and government agencies such as the Ontario Power Authority) and at the regional and municipal level as well as by each electricity distributor for their service territory and relevant agencies.

If you’re interested in broader medium and long term electricity issues such as Ontario’s Long-Term Energy Plan, regional planning, conservation planning and general energy policy in the province, there are other opportunities to provide your feedback.

Ontario’s Long Term Energy Plan:
The Ontario Government’s plan details how electricity will be generated and the longer-term conservation strategy for the province. It can be found at this website:
http://www.energy.gov.on.ca/en/ltep/

Regional Planning:
The Ontario Power Authority (OPA) looks ahead to the future electricity needs of your region and how those needs can be addressed through Conservation and Demand Management (CDM), local generation, and electricity from outside the authority. You can follow the OPA’s regional planning process at this website:
http://www.powerauthority.on.ca/power-planning/regional-planning

Ontario’s Energy Planning Diagram

Why Are We Here?

The electricity industry in Ontario is regulated by the Ontario Energy Board (OEB), which requires distribution companies, such as PowerStream, to prepare and submit a distribution system plan to show how it will sustain the area’s electricity distribution system over the next five years.

The OEB recently developed a new regulatory requirement for distribution system plans that requires distribution companies, to gather information about customer needs and preferences on distribution system investments and report on how they responded. PowerStream needs your participation to ensure its plan addresses your needs and expectations.

You don’t have to be an electricity expert to participate

This consultation is not about technical issues. The OEB hearing process will allow experts representing various consumer and interest groups (called intervenors) to challenge the detailed engineering and business decisions within PowerStream’s plan. This consultation focuses on the goals of the system. Should PowerStream focus more on reducing the number of outages or the lengths of outages? Should reliability be increased even if rates go higher, or should PowerStream maintain the current level of reliability and keep rate increases lower?

This primer has been developed to guide you through PowerStream’s plan. As you proceed, it asks questions designed to collect your feedback. In order to facilitate this, the primer is divided into several sections that explain the distribution system, the challenges it faces and, more importantly, how PowerStream will be responding to those challenges.

Your input, and PowerStream’s response to your input, will be presented to the OEB and intervenors when PowerStream files its rate application for 2016 to 2020 in the spring of 2015.

PowerStream’s Rate Application Process

PowerStream assesses system needs

Collects customers needs and preferences

Refines plan (where necessary)

Reports on how plan responds to customer input

Files plan with OEB

Interrogatories and OEB rate hearing process

OEB sets PowerStream’s distribution rates

Innovative Research Group Inc. has been engaged by PowerStream to collect participant feedback and will deliver it to PowerStream to assist them in shaping their plans.
Every item and charge on the bill is mandated by the provincial government or regulated by the OEB. There are two distinct cost areas that make up the "Delivery" charge on your bill: distribution and transmission. While PowerStream collects both, it remits the transmission charge to Hydro One. The distribution charges are what PowerStream uses to fund its utility needs.

Distribution charges are one of several charges on your bill. Current monthly distribution charges are approximately $27 for a typical PowerStream residential customer who consumes 800 kWh in a month. The amount you pay varies depending on the amount of electricity you use.

PowerStream's distribution rates are subject to the review and approval of the OEB. The rate revenue covers PowerStream's capital investments and operating expenses.

The plan PowerStream is proposing will maintain reliability at or above its current level. The resulting levels of capital investment and operational spending over the next five years will result in an increase of $2.14 per month or 7.7 per cent annually on the distribution rates charged by PowerStream. At the end of the plan in 2020, the average residential household will be paying an estimated $10.72 more per month on the distribution portion of their electricity bill. Other items on your bill may also increase.

### Feedback

1. How familiar are you with the electricity system in Ontario, and the services PowerStream is responsible for?

   - Very familiar
   - Somewhat familiar
   - Not very familiar
   - Not at all familiar
   - Don’t know

About 20 per cent of the average residential electricity bill goes to PowerStream.
Ontario’s electricity system is owned and operated by public, private and municipal corporations across the province. It is made up of three components: generation, transmission and distribution.

**GENERATION**
Generating facilities convert various forms of energy into electric power.

**EXAMPLES**
- Ontario Power Generation
- TransCanada Energy Ltd
- Bruce Power
- Samsung Renewable

**TRANSMISSION**
Transmission lines (high voltage lines) connect the power produced at generating facilities to transformer stations.

**EXAMPLE**
- Hydro One

**DISTRIBUTION**
Distribution lines (at medium voltages) carry electricity to homes and businesses.

**EXAMPLES**
- PowerStream
- Toronto Hydro
- Newmarket Hydro

**CONSUMERS**
Electricity is delivered to homes and businesses.

**EXAMPLES**
- Residential
- Commercial
- Industrial

---

**Electricity Grid 101**

**Who Does What in Ontario’s Electricity System?**

PowerStream is funded by the distribution rates paid by its customers. Periodically, PowerStream is required to file an application with the OEB to determine the funding available to operate and maintain the distribution system. PowerStream must submit evidence to justify the amount of funding it needs to safely and reliably distribute electricity.

**Who Protects Consumer Interests?**

PowerStream’s evidence is assessed in an open and transparent public process known as a rate hearing. A number of public intervenors with electricity industry expertise submit their own evidence challenging PowerStream’s plans and assumptions. At the end of the process, the OEB weighs the evidence and decides on the rates PowerStream can charge for distribution.
How is Ontario’s Electricity System Regulated?

The Ontario Ministry of Energy sets energy policy. It sets the rules and establishes key planning and regulatory agencies through legislation.

The mission of the Ontario Energy Board (OEB) is to promote a viable, sustainable and efficient energy sector that serves the public interest and assists consumers to obtain reliable energy services at reasonable cost. It is an independent body established by legislation that sets the rules and regulations for the provincial electricity sector. One of the OEB’s roles is to review the distribution plans of all electricity distributors and set their rates.

The Ontario Power Authority (OPA) is responsible for medium and long-term electricity planning to ensure an adequate supply of electricity is available for Ontario residents and businesses. The OPA receives directives from the Ministry of Energy (i.e. energy supply mix, Green Energy Act), but otherwise works at arm’s-length from the government.

The Independent Electricity System Operator (IESO) is responsible for electricity supply over the short-term. It operates the grid in real-time to ensure that Ontario has the electricity it needs, where and when it needs it.

PowerStream’s Grid Today

This section describes the construction of PowerStream’s distribution grid including its overhead, underground and secondary systems. It also explains the corporation’s historical growth and current electrical infrastructure.

The Background of PowerStream’s Distribution Grid

PowerStream owns and operates $1.17 billion in capital assets and is the second largest municipally-owned electricity distribution utility in Ontario. It distributes about eight per cent of Ontario’s electricity demand. PowerStream’s electrical grid is comprised of overhead, underground and secondary systems of various voltages. PowerStream was formed in 2004 from the amalgamation of Hydro Vaughan, Markham Hydro, and Richmond Hill Hydro. Aurora Hydro was purchased in 2005, and in 2009, Barrie Hydro merged with PowerStream.

Each original utility operated independent distribution systems, and as a result, the infrastructure varies from region to region. PowerStream has been working to gradually standardize this equipment, which will help improve reliability and safety across the regions, and make maintaining the system more efficient.

PowerStream is owned by three municipalities and regulated by the OEB. As such, any profits obtained by the utility are provided to the municipalities as a dividend, or reinvested into the distribution system.

A Look at PowerStream’s Growth

PowerStream has been serving York Region since 2004 and Simcoe County since 2009, and has seen remarkable change and innovation through the years. Although PowerStream as an entity dates back to 2004, the first electric system and street lights in the service territory were installed in Barrie in 1888, Markham in 1890-1891, and in neighbouring areas soon after.

PowerStream has a mix of older and newer distribution systems across all of its service territory. PowerStream is systematically and prudently upgrading older areas. Of course, even as this work is completed, the overall system continues to age.

PowerStream is a product of the largest voluntary consolidation of local distributors and is an organization committed to becoming an innovative and socially responsible leader in power distribution and related services. Growth is a key performance driver for PowerStream, and is achieved through increases to its residential and commercial customer bases.

Large projects currently underway include the new Vaughan Metropolitan Centre project at Hwy 7 and Jane Street, the new Vaughan Campus of Mackenzie Health, and the expansion of the Toronto Transit Commission subway into York Region. All of these projects highlight the expansion and growth occurring in PowerStream’s service territory.
PowerStream’s Distribution System

Every system is unique with its own history and challenges. In order to better understand the current PowerStream system, we first have to understand all of the different components and how they impact the way in which you receive electricity when you need it. The image below and following terms and definitions will help guide you through the system from when you turn a switch on to when you receive your bill.

Distribution System Diagram

PowerStream’s distribution system is made up of a number of components which work together to transport electricity to your house or business.

Transformers – Important pieces of equipment that reduce the voltage of electricity from a high level to a level that can be safely distributed to your area, or to your residence/business.

Breakers – Devices that protect the distribution system by interrupting a circuit if a higher than normal amount of power flow is detected.

Switches – Control the flow of electricity and steer the current to the correct circuits.

Feeder Circuits – Are the wires that connect the stations to the broader distribution system in order to deliver electricity to customers.

Transformer Stations and Municipal Substations

PowerStream owns 11 of the 25 Transformer Stations (TSs) that connect PowerStream’s distribution system to the 230 Kilovolt (kV) provincial transmission grid owned by Hydro One and operated by the IESO. In fact, the very first municipally-owned transformer station in Ontario was built in PowerStream’s service territory (Markham) back in 1985.

Municipal Substations (MSs), 54 in total, also play an important role in PowerStream’s distribution system, further transforming higher voltage electricity to a lower voltage that is suitable for local distribution to customers.

PowerStream’s Overhead System

The overhead system is made up of distribution lines that operate at various voltages depending on their purpose and destination. PowerStream has 2,535 km of overhead distribution lines in its service territory. These distribution lines are attached to the top of hydro poles.

Along the distribution line, pole-top transformers step the voltage down to useable levels of 120V-600V. From there, the electricity is delivered to customers through a secondary line that runs from the transformer to an individual home or business.

PowerStream has 3,500 switches, and over 330 pole-mounted remote-controlled switches located throughout its distribution system. These switches, which are controlled from PowerStream’s Main System Control Centre, greatly improve operating efficiencies, and reduce restoration times whenever a power interruption occurs.

PowerStream’s Underground System

PowerStream’s underground system consists of high and low voltage cables, metal enclosed switchgear and transformers situated on concrete pads. In residential areas, underground cables distribute electricity from the TSs or MSs to padmount transformers located on the municipal boulevards. Like the overhead system, these transformers step the electricity down to useable voltages of 120V-600V, and the power is then delivered to customers through over 5,000 km of buried low voltage wires.

When distributing electricity to urban areas or larger customers, larger transformers are used.

PowerStream has 1,800 gears, and over 40 padmounted switchgears that are controlled remotely from its System Control Centre. These remote-controlled switches are critical for improving operating efficiencies and power restoration times in the underground distribution system.
Reliability

Delivering reliable power safely is PowerStream’s fundamental purpose. Three key standard industry measures are used to track system reliability. They include:

SAIFI
System Average Interruption Frequency Index
This measure shows the number of outages an average PowerStream customer experiences in a year.

SAIDI
System Average Interruption Duration Index
This measure shows the amount of time an average PowerStream customer is without power in a year.

CAIDI
Customer Average Interruption Duration Index
This measure indicates on average how long it takes for PowerStream to restore power to a customer after a power outage.

All planned and unplanned sustained interruptions are used to calculate these indices.

How is PowerStream Performing:
For reliability performance, the OEB expects that the distributor’s current reliability performance (SAIDI, SAIFI, CAIDI) should, at minimum, remain within the range of its historical previous three year performance. PowerStream’s plan aims to meet this requirement.

As seen in the chart below, PowerStream’s SAIDI performance has been at par or better than average of the other comparable Canadian urban utilities with the exception of 2013 when PowerStream was hit hard by an unusual weather event (December Ice Storm).

Feedback

2. How well do you feel you understand the important parts of the electricity system, how they work together, and which services PowerStream is responsible for?

- Very well
- Somewhat well
- Not very well
- I don’t understand at all

3. Generally speaking, how satisfied are you with the service you are receiving from PowerStream? Would you say ...

- Very satisfied
- Somewhat satisfied
- Somewhat dissatisfied
- Very dissatisfied
- Don’t know

4. Is there is anything in particular that PowerStream can do to improve its service to you?

PowerStream SAIDI [minutes] Comparison to Other CEA (Canadian Electricity Association) Urban Utilities for All Outages
Controller vs. Uncontrollable Factors
Electricity outages can be caused by factors that PowerStream can and cannot control.

Uncontrollable events include lightning, adverse weather, adverse environment (e.g. salt contamination) and third party created events.

Controllable events include scheduled outages in order to perform work on the distribution system, tree contacts, defective equipment and errors caused by people.

The chart below shows that more than half of the outages PowerStream customers experience are caused by controllable events.

Breakdown of Controllable SAIFI Excluding Loss of Supply and Major Event Days [2008-2013]

Capital Expenditure and Outages
Managing equipment failure is a never-ending race. Each year PowerStream invests in replacement or rehabilitation of its oldest assets and systems. The assets in the poorest condition are identified through an annual inspection programs. However with each passing year the rest of the assets get older and a new set of assets falls into poor condition.

Outages are also targeted as a result of poor performing feeders identified through reliability statistics each year. As these feeders are worked on and reliability improves, a new set of feeders falls to the bottom of the performance ratings.

As you will see in the following pages, over the next five years, PowerStream is planning investments in new equipment and the rehabilitation of existing equipment, such as underground cables, to reduce the number of outages due to equipment failure.

While outages are to some degree chance events, the investment in new equipment matches the aging profile of the system and is expected to sustain the current level of reliability and to achieve reliability improvement in the worst performing areas.

Capital Expenditure and Restoration Times
Restoration time is an area where PowerSteam actively pursues improvement. Restoration times depend on three things - the physical capacity to work around a problem, the speed at which the utility can re-route electricity through that physical network, and the speed by which the broken parts can be repaired.

As PowerStream expands the system through system service updates such as higher voltage lines, new stations and feeder lines or similar system improvements, the utility is building more capacity to work around outages.

As PowerStream adds remote monitors to pin-point where faults are occurring and add remote or automated switches to avoid the need to send a crew to manually flip a switch, the utility is increasing the speed by which power can be restored.

Finally, investments in areas such as equipment standardization, GPS devices and improved scheduling tools all contribute to our ability to replace broken equipment more quickly.
8. Other than outages during unusual weather events, how many outages did you experience in the past year?
- Zero
- One
- Two
- Three
- Four
- Five or more

9. Aside from unusual weather events, if you experienced an outage in the past year, what was the longest you experienced?
- Less than 15 minutes
- 15 to less than 30 minutes
- 30 minutes to less than 1 hour
- 1 hour to less than 3 hours
- 3 hours to less than 6 hours
- 6 hours to less than 12 hours
- 12 hours to less than 24 hours
- More than 24 hours
- Don’t know

10. If you experienced an outage, how satisfied are you with the way PowerStream responded to the outage? Would you say …
- Very satisfied
- Somewhat satisfied
- Somewhat dissatisfied
- Very dissatisfied
- Don’t know

11. Is there anything in particular PowerStream can do to improve its service to you during outages?

12. Most years, the average PowerStream customer loses power due to outages for about 100 minutes over the whole year. This is at or below the average for similar utilities. Do you feel this level of reliability is …
- Very good
- Good
- Acceptable
- Poor
- Very poor
- Don’t know

Feedback

5. As far as you know, in the past year, did you experience any outages due to unusual weather such as the ice storm, microbursts or tornadoes?
- Yes
- No
- Don’t know

6. Whether you were personally affected or not, how satisfied are you with the way PowerStream responded to these events? Would you say …
- Very satisfied
- Somewhat satisfied
- Somewhat dissatisfied
- Very dissatisfied
- Don’t know

7. Is there anything in particular PowerStream can do to improve its service to you during these extreme weather events?

?
Fueled by increased economic development and demand for new housing in York Region and Simcoe County, PowerStream adds over 8,000 new customers to its existing customer base every year. This growth in customers and load puts increasing pressure on PowerStream’s distribution system, which requires extending power lines, upgrading capacity to existing power lines, and adding new capacity to load constrained areas.

The map on the previous page shows the capacity constrained areas of PowerStream’s service territory. Red highlighting indicates areas that require increased investment to provide additional capacity in the near term to ensure system reliability.

Challenges and Solutions

Pressure: Growth

Challenges

- Lines and equipment that cannot carry the increased load and maintain the increased reliability expected by customers.
- Development of new subdivisions resulting from increased demand for new homes, which requires expansion of the distribution system lines and stations.

Solutions

- New substations, transformer stations, and power lines where needed to increase supply capacity.
- Voltage Conversion Projects: existing 8kV and 13.8kV power lines converted to 27.6kV to increase load capacity.
- Station Investments: intended to ensure stations have peak loadings maintained at or below their 10 day Limited Term Rating to prevent damage to station equipment and avoid brownouts and blackouts.
- Need investments to increase station and power line capacity to maintain the loading of existing municipal substations and to ensure sufficient space capacity exists such that if there is a loss of one substation, the neighbouring substations can accommodate the lost capacity.
PowerStream’s distribution system consists of various equipment (poles, transformers, cables, etc.) with different installation date profiles. While the majority of the distribution system was installed or rebuilt after 1980, a significant amount of distribution system equipment was installed in the 1970s, 1960s or even earlier, and is still in service today. While that old equipment continues to operate for the time being, it is well past its intended service life, and much of it will need to be replaced soon.

Equipment that is still operating beyond its intended service life is more likely to fail, and cause long power interruptions. As time goes on, and more of the distribution system assets will be operating past end-of-life, unless replaced. This requires investment in system renewal projects and programs.

### Asset Summary Chart – main assets by quantity

<table>
<thead>
<tr>
<th>Asset Types</th>
<th>Asset Count (approx)</th>
<th>Average Life (approx)</th>
<th>Oldest Assets (approx)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood Poles</td>
<td>46,500</td>
<td>35-75</td>
<td>1940</td>
</tr>
<tr>
<td>Distribution Transformers</td>
<td>44,000</td>
<td>25-60</td>
<td>1956</td>
</tr>
<tr>
<td>Underground Primary Cable</td>
<td>7900 km</td>
<td>20-55</td>
<td>1965</td>
</tr>
<tr>
<td>Distribution Switchgear</td>
<td>1800</td>
<td>30-85</td>
<td>1978</td>
</tr>
<tr>
<td>Station Circuit Breakers</td>
<td>399</td>
<td>35-65</td>
<td>1958</td>
</tr>
<tr>
<td>Municipal Station Primary Switches</td>
<td>66</td>
<td>30-60</td>
<td>1956</td>
</tr>
<tr>
<td>Municipal Station Transformers</td>
<td>65</td>
<td>30-60</td>
<td>1958</td>
</tr>
<tr>
<td>Station Reactors</td>
<td>34</td>
<td>25-60</td>
<td>1986</td>
</tr>
<tr>
<td>Transformer Station Transformers</td>
<td>22</td>
<td>30-60</td>
<td>1986</td>
</tr>
<tr>
<td>Transformer Station 230kV High-Voltage Switches</td>
<td>22</td>
<td>30-60</td>
<td>1986</td>
</tr>
<tr>
<td>Station Capacitors</td>
<td>5</td>
<td>25-40</td>
<td>1990</td>
</tr>
</tbody>
</table>

**Note:** Above data and figures provided from PowerStream Asset Condition Assessment, Rev. 2, November 27, 2012.

### Challenges

**The need to replace poles that are at or nearing end-of-life.**

- Proactive replacement: PowerStream plans to replace or reinforce approximately 400 of the worst condition poles per year in order to minimize risk.

**Underground primary cables that are at, or near, end-of-life, and the resulting high negative impact this has on reliability for affected customers.**

- PowerStream proposes to replace approximately 52 km/year of the worst condition underground cables, and use silicon injection to extend the life of another estimated 47 km/year of underground cables.
- PowerStream’s approach for cable replacement is determined by prioritizing the cable sections that have the worst reliability and the highest customer impact.

**Aging padmounted switchgear cubicles.**

- Proactive replacement: PowerStream plans to replace approximately 31 of the poorest condition switchgear units in 2015, rising to 36 per year in 2016-2020.

**The need to replace padmounted transformers, where concerns about condition have been reported.**

- PowerStream commenced a proactive replacement program in 2013.
- PowerStream proposes to proactively replace approximately 60 padmounted transformers per year.

**Automated/remote-controlled switches, switches that are at, or near, end-of-life and therefore likely to fail compromising the ability to prevent feeder and station overloads during the summer peak.**

- PowerStream proposes to replace five per year.
- These are important for a number of reasons, including preventing station overloads during summer peaks, as well as improving reliability and restoration times.
PowerStream is finding that in general, customers have increased expectations. They want to communicate with us around the clock and in new ways, such as through social media. Some customers are seeking a detailed understanding of their electricity consumption, and how their bill is calculated. PowerStream information systems must support these customer needs.

The delivery model of the distribution system is changing. Renewable or other forms of generation have changed power flow from unidirectional to multidirectional. Managing this fundamental change requires increased technological investments.

### Challenges

<table>
<thead>
<tr>
<th>The requirement to develop and support smart grid technology to meet the high reliability demands of today’s electricity consumers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>An outdated billing system, over 35 years old, that cannot support a growing number of customers, has limited ability for interactive features, and no longer has vendor support.</td>
</tr>
<tr>
<td>The replacement of end-of-life remote-controlled switches to ensure rapid and automatic transfer of loads in emergencies and reduce restoration times.</td>
</tr>
<tr>
<td>The need to replace old and difficult to operate “mini-rupter” (high capacity isolating) switches in commercial/industrial locations.</td>
</tr>
<tr>
<td>New OEB regulations that require higher intelligence metering equipment for all commercial/industrial customers over 50kW by 2020.</td>
</tr>
</tbody>
</table>

### Solutions

| Improvements to the distribution system to support growing numbers of Electric Vehicles. |
| Improvements to the distribution system to support increased renewable generation and energy storage initiatives. |
| Develop and promote consumer energy management initiatives to reduce energy demand. |
| A new modern billing system, expandable in the future as required, to provide a more efficient platform for customers with increased interactive support and customer information security. A new modern billing system will also provide increased efficiencies by integrating with other systems, and produce long-term cost savings. |
| Installation of new smart remote-controlled power line switches and reclosers. |
| A formal decision-making process for determining the most cost effective quantity of switches, and the optimal locations, for providing the maximum benefit to the largest number of customers. |
| Installation of new high-capacity isolating switches that increase operational efficiencies and reduce the need for costly power interruptions when performing routine maintenance. |
| Replace 4400 meters with new smart technology meters in a pre-planned efficient multi-year program. |

### Pressure: Security

As technology continues to be utilized in every aspect of the utility’s business, there is an increasing risk of cyber security attacks that could potentially affect confidential customer or corporate information, customer privacy, power delivery, and even the safety of employees or customers through the unauthorized use of PowerStream technology. One incident could do serious damage to the corporation and to its corporate image. In addition, there is the on-going risk of physical security; the physical protection of buildings and stations, and the monitoring of critical equipment to protect from impending failure.

### Challenges

| Evolving risks to cyber security of customer information and grid due to aging and unsecure IT equipment. |

### Solutions

| Firewall/Intrusion Detection System/Intrusion Protection System—this is a security checkpoint between the trusted and untrusted network/device/users and is also used to continuously monitor for any malicious activity and can automatically take action in certain instances. |
| Network Access Control—this dynamically monitors and controls devices, applications and users to deny unauthorized external access to the network. |
| Identity and Access Management—this manages user access and privileges granted throughout the PowerStream environment. |
| Security Information and Event Management—this is real-time logging and analysis of security alerts. |
| Vulnerability Assessment Tool—this scans, identifies, quantifies and prioritizes vulnerabilities in the PowerStream environment and suggests remediation solutions. |
| Mobile Device Management—this controls mobile devices connected to our network and can authorize, wipe, secure and encrypt corporate information as required. |
| Enterprise Change Management—this process and associated technology allows PowerStream to effectively deal with constant change through a structured approach to transitioning systems, applications and technologies from current to desired future states. |

### Risk of vandalism to substations buildings and equipment.

| Install equipment monitoring Infrared cameras at 16 additional stations over the next 6 years. |
| Install perimeter video surveillance cameras at 17 additional stations over the next 6 years. |
Despite an ever increasing number of weather-related interruptions each year, PowerStream has worked hard to stay within the boundary of its average historical reliability performance targets of one outage totalling 60 minutes per customer, per year.

While PowerStream continues to demonstrate strong reliability performance in the operation of its distribution network, it is not without its challenges. There are areas and pockets within the PowerStream distribution system that suffer poor reliability due to the type of legacy construction that was once considered acceptable or even preferable. An example of this would be older houses connected to overhead power lines located in the back lot (rear lot) of those properties.

The reliability of rear lot supply connections is worse under severe weather conditions than the current standard front lot connections. In addition, the cost to maintain these rear-lot connections is much higher than the cost to maintain front lot connections.

Pressure: Obsolescence

Challenges

Rear Lot Conversion program: Capital work required to address reliability, safety, operations and customer service concerns on rear lot supply connections.

Solutions

• There are 49 areas of rear lot construction scattered among eight of the municipalities of PowerStream. Most of those areas were constructed in the 1950’s, 1960’s and 1970’s. The oldest dates back to 1948.
• PowerStream proposes to replace the worst areas of rear lot connections on an annual basis over many years until all areas are converted.
• The average cost of this conversion work is estimated to be $1.2M per rear lot area.
• Elimination of rear lot supply connections will result in long-term operational efficiencies and reduced maintenance costs.

Pressure: Major Events

PowerStream’s system is built to quickly restore power after the loss of one or two key elements in the electricity grid. But what happens when there is a major disruption to the system?

PowerStream has been severely impacted by weather-related events over the past year. The December 2013 ice storm, microbursts in York region and tornados in the North service area have all highlighted the risk to the grid from major events. Major events are rare events that have a major impact. The Insurance Bureau of Canada reports that severe weather is likely to increase over the next 40 years.

The December 2013 Ice Storm in Ontario severely tested the emergency preparedness of electrical utilities in Southern Ontario including the Greater Toronto Area where hundreds of thousands of customers were left without power, some for as long as a week, or even longer. An independent assessment of PowerStream’s response to that storm highlighted a number of areas where improvements are required at PowerStream to be better prepared for future severe storms and emergency events. Key areas identified for improvement include:

1. Improve external communications with customers.
2. Improvements to Customer Care systems and staffing.
3. Improve Outage Management Systems and utilize outage reporting via existing Smart Meters.
4. Improve vegetation management.
5. Elimination of rear lot services, and convert to front lot.
6. Upgrade or underground key distribution lines.

Challenges

The need for emergency preparedness during unplanned events and expenses.

Solutions

• Prepare contingency plans for the immediate replacement of assets (i.e. poles, transformers, etc.) due to unanticipated failure, storms, motor vehicle accidents, vandalism, etc.
• Ensure adequate levels of spare equipment and materials are available for emergencies.

The need to improve the supply to those customers who are more vulnerable to outages and duration of outages, specifically rear lot supply.

Solutions

• Plan to replace rear lot supplies on an annual basis until all are remediated.

The need to make changes to key distribution lines to withstand increased severity of weather events.

Solutions

• Plan to increase structural integrity of key assets (i.e. tension cables designed to add stability to poles).
• Upgrade or underground key wires.

The investments discussed earlier in the primer are focused on minimizing day-to-day outages and increasing the speed by which electricity is restored. Additional investments could help “harden” the system and speed up power restoration during a major event. There is no practical limit to potential ways of making the system more resilient in a major event, it is fundamentally a question of money.
13. A significant amount of PowerStream’s distribution system equipment was installed in the 1970s, 1960s or even earlier, and is still in-service today. PowerStream works hard to extend the life of our existing equipment because it helps to keep rates down, but as equipment gets older it becomes more likely to fail. PowerStream has two approaches to older equipment.

• If the failure of a piece of equipment will impact a large number of people, result in a long outage or if an inspection shows the equipment is in poor condition, PowerStream does initiate equipment replacement before failure.
• When an equipment failure has only a limited impact and can be quickly replaced, PowerStream’s policy is to leave the equipment in place until it breaks down to get all the value possible from that equipment.

What do you think of this policy?
- I am willing to pay more to replace all equipment before it fails.
- I support the current approach of allowing equipment to run to failure when that failure impacts only a few customers for a limited period of time.
- Don’t Know

14. When it comes to replacing aging equipment, which of the following points of view is closest to your own?
- PowerStream should invest what it takes to replace the system’s aging infrastructure to reduce the risk of power outages; even if that means my electricity bill will increase by a few dollars per month.
- PowerStream should scale back their investment in renewing the system’s aging infrastructure to reduce the size of any bill increase; even if that means more or longer power service interruptions.
- Don’t Know

15. While there are clear benefits from new technology, there are also costs. The system functions well on the old technology. Do we want to pay more to secure the benefits new technology can deliver?

When it comes to investing in new technology, which of the following points of view is closest to your own?
- Investments in new technologies are more a luxury than a necessity and should be a low priority for PowerStream.
- I think the benefits of new technology are important and investments in new technology should be a priority for PowerStream.
- Don’t know

16. The investments discussed earlier in the primer are focused on minimizing the day-to-day outages and increasing the speed by which electricity is restored. There are additional investments that could help “harden” the system and speed up power restoration during a major event. There is no practical limit to potential ways of making the system more resilient in a major event, it is fundamentally a question of money.

Currently, the average residential customer pays $27 a month to PowerStream to operate and maintain the local distribution system. How much more are you willing to pay each month for investments that would help the system better withstand major events such as extreme weather?

$
The chart below compares the revenue from rates using the PCI to the revenue needed to fund utility operations on a cost of service basis. Over 2014 and 2015, there will be a revenue shortfall of approximately $13.2 million. This shortfall is being funded by PowerStream’s municipal shareholders from past earnings retained in the company.

However, using savings to make up for the missing revenue will restrict PowerStream’s ability to make the necessary future investments to maintain its system and the level of service provided to its customers. The catch-up will enable PowerStream to fund those needed investments.

### Revenue Shortfall (Millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Revenue Deficiency (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>$166.3</td>
</tr>
<tr>
<td>2015</td>
<td>$168.4</td>
</tr>
</tbody>
</table>

### Increased Capital Spending

PowerStream has developed a list of capital investment drivers and proposes capital investment programs based on these key drivers. The definitions of the key drivers are below.

#### Service Requests

PowerStream has an obligation to connect a customer to its distribution system. This includes both traditional demand customers and distributed generation customers. Requests also can include system modifications to support infrastructure development by government agencies, road authorities and developers. Normal connection costs are recovered through the revenue from new customers. Unusual connection costs are paid by the customer being connected.

#### Increased Delivery Capacity

As new customers are connected, PowerStream needs to expand the core elements of its distribution system, including expanded or new distribution stations and enhanced or new feeder lines. This is the fundamental infrastructure that allows new customers to be hooked up to the distribution system and is paid for by the extra revenue from new customers served over time.

#### System Efficiency

To provide customers with the best service possible, there is always a need to improve restoration capability. As the population in PowerStream’s service territory continues to grow, the system also needs to grow in order to be able to handle new connections.

#### Mandated Compliance

Environmental, reliability and safety standards are updated on a regular basis and PowerStream’s system must be updated to keep up with these standards. Agencies that impact PowerStream include the Ministry of Energy, Measurement Canada, the OEB and/or other regulators.

### Obsolescence

Improvements in technology can require PowerStream to replace equipment that is still functional but no longer meets current operating practices or current standards. Reasons for replacement include:

- the equipment is no longer manufactured;
- there are no spare parts;
- are unable to have maintenance performed on them;
- there are operational constraints or conflicts, which can result in increased reliability and/or safety-related risks.

### Aging or Poor Performing Equipment

Where there is the imminent risk of failure due to age or condition deterioration, and these potential failures will result in severe reliability impacts to customers as well as potential safety risks to crew workers or to the public, refurbishment or replacement is required.

### Business Support Costs

PowerStream is not just the local electricity grid itself, it is the business that operates that grid. The utility needs storage facilities for equipment, workshops to maintain and repair equipment and offices for people who manage your accounts and the electricity system. PowerStream needs vehicles for its crews, as well as computer systems to manage customer accounts, track equipment and operate the grid. While this is a relatively small slice of the capital spending over the next several years, it is just as critical to have IT systems identify where an outage is and where the needed parts are stored as to have the replacement parts themselves.
Looking ahead at the next five years and all the categories identified above, PowerStream is proposing to spend $641 million on new capital investments. This will result in an annual increase of about 6 per cent on the distribution portion of your bill which is about three quarters of the proposed rate increase.

The Impact on Your Bill

Residential customers with an average monthly consumption of 800 kWh will see an increase of $2.14 per month or 7.7 per cent annually on the distribution portion of their bill over the next five years. As such by 2020, the average residential household will be paying an estimated $10.72 more per month on the distribution portion of their electricity bill.

2016 - 2020 Forecasted Capital Expenditures ($ millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>General Plant</th>
<th>System Access</th>
<th>System Renewal</th>
<th>System Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>$150.3</td>
<td>$86.2</td>
<td>$146.9</td>
<td>$257.6</td>
</tr>
</tbody>
</table>

With the proposed levels of capital and operating budgets for 2016 to 2020, in 2020 PowerStream will continue to operate on less revenue per customer than the average Ontario local distribution company.

Feedback

17. Given what you know and what you have read so far, how well do you feel you understand the challenges facing the PowerStream system and what they are planning to do to meet those challenges?

- Very well
- Somewhat well
- Not very well
- I don’t understand at all

18. From what you have read and what you may have heard elsewhere, does PowerStream’s investment plan seem like it is going in the right direction or the wrong direction?

- Right direction
- Wrong direction
- Don’t know

19. And why do you feel that way?

- The rate increase is reasonable and I support it
- I don’t like it, but I think the rate increase is necessary
- The rate increase is unreasonable and I oppose
- Don’t know

20. Considering what you know about the local distribution system, which of the following best represents your point of view:

- The rate increase is reasonable and I support it
- I don’t like it, but I think the rate increase is necessary
- The rate increase is unreasonable and I oppose
- Don’t know

21. And why do you feel that way?

- The rate increase is reasonable and I support it
- I don’t like it, but I think the rate increase is necessary
- The rate increase is unreasonable and I oppose
- Don’t know
PowerStream values your feedback. This outreach is a new requirement, so this is the first time that the utility has conducted a review about its upcoming investment plan in this type of format.

General Impression - Overall, what did you think about this primer?
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________

Volume of Information: Did PowerStream provide too much information, not enough, or just the right amount?
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________

Content Covered: Was there any content missing that you would have liked to have seen included?
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________

Outstanding Questions: Is there anything that you would still like answered?
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________

Suggestions for Future Consultations: How would you prefer to participate in these consultations?
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________
______________________________________________________________________________________

Final Thoughts

Glossary

Breakers: Devices that protect the distribution system by interrupting a circuit if a higher than normal amount on power flow is detected.

Feeder Circuit: Is a wire that connects stations to the broader distribution system in order to deliver electricity to customers.

Generation Station: A facility designed to produce electric energy from another form of energy, such as fossil fuel, nuclear, hydroelectric, geothermal, solar, thermal, and wind.

Kilowatt (kW): 1000 watts.

Local Distribution Company (LDC): In Ontario, these are the companies that take electricity from the transmission grid and distribute it around a community.

OM&A: Operations, Maintenance and Administration

Stations: These include transformer stations and distribution stations. They are used to switch generators, equipment, and circuits or lines in and out of a system. It also is used to change AC voltages from one level to another.

Switches: These control the flow of electricity—they direct which supply of electricity is used and which circuits are energized. Distribution systems have switches installed at strategic locations to redirect power flows for load balancing or sectionalizing.

System Access: Projects required to respond to customer requests for new connections or new infrastructure development. These are usually a regulatory requirement to complete.

System Renewal: Projects to replace aging infrastructure in poor condition.

System Service: Primarily projects that improve reliability.

General Plant: Investments in things like tools, vehicles, buildings and information technology (IT) equipment that are needed to support the distribution system.

Transmission lines: Transmit high-voltage-electricity from the generation source or station to another station in the electricity grid.

Transformer: A piece of equipment that reduces the voltage of electricity from a high level to a level that can be safely distributed to your area or to your residence/business.

Underground Cable: A conductor with insulation, or a stranded conductor with or without insulation and other coverings (single-conductor cable), or a combination of conductors insulated from one another (multiple-conductor cable).

Volt (V): A unit of measure of the force, or ‘push,’ given the electrons in an electric circuit. One volt produces one ampere of current when acting on a resistance of one ohm.

Watt (W): The unit of electric power, or amount of work (J), done in a unit of time. One ampere of current flowing at a potential of one volt produces one watt of power.

Wire: A conductor wire or combination of wires not insulated from one another, suitable for carrying electric current.
If you have any additional questions or comments about PowerStream’s Distribution System Plan Review please email:

CustomerFocus@powerstream.ca

or send your questions or comments to:

PowerStream
Attn: DSP Review
161 Cityview Boulevard,
Vaughan, Ontario
L4H 0A9