Chapter 25
SaskPower—Maintaining Above-Ground Assets Used to Distribute Electricity

1.0 Main Points

Both industry and households rely on the availability of power by way of electricity. Power helps us communicate, heat our homes, cook our food, and enjoy technology; it is also critical to economic growth and security.

SaskPower maintains one of the largest electricity distribution systems in Canada.[1] Effective maintenance reduces the risk of unplanned power outages or power blackouts during peak times and higher costs of supplying power, so customers have a safe, reliable source of electricity.

By March 2022, we found SaskPower made good progress by implementing five of seven recommendations we first made in 2018 about its processes to maintain above-ground distribution assets.

SaskPower is implementing a broader strategy for managing its distribution assets to focus on an asset's lifecycle from purchase to decommission. Adopting this strategy resulted in changes in many areas, including changing how employees complete maintenance work and how senior management makes key maintenance decisions. SaskPower formally assessed risks to support its strategies for inspections and preventative maintenance; determined and gathered condition and other information about above-ground distribution assets; and formally prioritized maintenance to support a risk-informed allocation of resources over the longer term.

While we found SaskPower made significant progress in its processes to analyze and report on maintenance status for above-ground distribution assets, it needs to formally determine the consequences of deferring corrective maintenance.

SaskPower's regular quarterly reports to senior management also need to include all planned maintenance activities and the consequences of not completing planned preventative and corrective maintenance. Senior management needs robust reports to effectively assess whether the right maintenance is being done at the right time to help reduce the risk of power outages and safety issues, and manage costs.

2.0 Introduction

SaskPower is the principal supplier of electricity in Saskatchewan, under the mandate and authority of *The Power Corporation Act*. Each year, it generates, transmits, and distributes power to nearly 545,000 customers over approximately 652,000 square kilometres.[2]

[1] SaskPower, *2022 and 2023 Rate Application*, p. 15.
[2] SaskPower, *SaskPower 2020–21 Annual Report*, pp. 3 and 11.

SaskPower is responsible for the maintenance and capital replacement/refurbishment of assets used to distribute electricity—both above ground and below. SaskPower planned to spend about $14 million on maintenance and $157 million on capital replacement/refurbishment in 2021–22 for approximately $2.8 billion of distribution assets.[3,4] It must spread these costs across a modest number of customers (i.e., average of three customer accounts per circuit kilometre).[5,6]

Figure 1 describes the above-ground assets used to distribute electricity included in our follow-up audit.[7]

Figure 1—Description of Above-Ground Distribution Assets Included in Follow-Up Audit

Asset Type	Purpose
Voltage Regulator	• Continually adjusts (raises or lowers) the voltage on the distribution system to ensure customers receive power within acceptable limits
Recloser	• Automatically isolates the distribution system to protect the public and prevent irreparable damage to assets from a sustained short circuit • Improves service continuity by automatically isolating and restoring power to power lines during momentary interruptions, such as from lightning or wildlife contacts
Overhead Switch	• Enables isolation of a power-line section, resulting in fewer customers affected when an outage is required for scheduled maintenance or repairs; allows customers to be serviced from different feeders during a power outage so electricity can be restored while repairs are ongoing
Capacitor Bank	• Stores electrical energy to help tune and optimize the operation of the distribution network, thereby deferring the need and expense of additional capacity on the electrical delivery system
Poletop Transformer	• Transforms higher voltages from distribution power lines down to a useable voltage that end users can utilize; provided as close to customers' sites as possible to avoid energy losses amplified at lower voltages
Power-Line Conductor	• Electrical wires and associated hardware that transmit electrical energy along long distances; consists of one or more conductors (i.e., physical wire) suspended by towers or poles, often in groups of three.

Source: Developed by the Provincial Auditor of Saskatchewan based on research, and SaskPower's records.

Planning for and completing required maintenance is essential for providing customers with a reliable source of power in a safe and cost-effective way.

2.1 Focus of Follow-Up Audit

This chapter describes our first follow-up audit of management's actions on the seven recommendations we made in our *2018 Report – Volume 2*, Chapter 25, about maintaining above-ground assets used to distribute electricity.[8]

To conduct this audit engagement, we followed the standards for assurance engagements published in the *CPA Canada Handbook—Assurance* (CSAE 3001). To evaluate SaskPower's progress toward meeting our recommendations, we used the relevant criteria

[3] SaskPower, *SaskPower 2020–21 Annual Report*, p. 81.
[4] SaskPower's financial records.
[5] SaskPower, *SaskPower 2020–21 Annual Report*, p. 13.
[6] By comparison, Manitoba Hydro has seven customer accounts per circuit kilometre and Enmax in Alberta has 80 customer accounts per circuit kilometre. SaskPower, *2022 and 2023 Rate Application*, p. 15.
[7] Wood poles were excluded from this follow-up audit as we did not find significant gaps in SaskPower's processes related to this type of asset in our original audit.
[8] *2018 Report – Volume 2*, Chapter 25, pp. 169–189.

from the original audit. SaskPower's management agreed with the criteria in the original audit.

To conduct this follow-up audit, we discussed actions taken with management, examined supporting documents (e.g., asset-management risk framework, lifecycle asset management plans, maintenance plans, reports to senior management), and assessed data analysis completed by SaskPower about its asset inventory and inspections.

3.0 STATUS OF RECOMMENDATIONS

This section sets out each recommendation including the date on which the Standing Committee on Crown and Central Agencies agreed to the recommendation, the status of the recommendation at March 4, 2022, and SaskPower's actions up to that date.

3.1 Risks Formally Assessed

> ***We recommended Saskatchewan Power Corporation formally assess the risks associated with its inspection and preventative maintenance strategies for above-ground assets used to distribute electricity.*** *(2018 Report – Volume 2,* p. 177, Recommendation 1; Standing Committee on Crown and Central Agencies agreement September 17, 2019)
>
> **Status**—Implemented

SaskPower developed and used an asset-management risk framework to formally assess the risks associated with its inspection and preventative maintenance strategies for above-ground assets used to distribute electricity.

In 2019, SaskPower developed its *Distribution Line Asset Management—Risk Framework* based on industry good practice identified through SaskPower's participation in an international power utility working group (i.e., CEATI: Centre for Energy Advancement through Technological Innovation). The Framework sets out a process for assessing the likelihood and impact of risk for each type of above-ground distribution asset. SaskPower assesses impact based on its key business values such as: company disruption, public safety, employee safety, financial return and benefits, asset risk, environmental stewardship, and security. SaskPower also uses an industry standard to quantify impacts based on actual outage data as well as customer type and power usage profiles. SaskPower's engineers use their judgment and knowledge to develop a risk matrix to determine the prioritization of each asset type.

We found SaskPower used its Framework to assess risk for each of the above-ground distribution asset types, and used the resulting risk assessment to determine asset maintenance priorities. SaskPower also used the risk assessment to support the frequency of preventative maintenance, including inspections. For example, SaskPower considers reclosers as higher risk and requires annual preventative maintenance (including inspections, repairing contacts, and replacing backup batteries). Whereas it considers overhead power-line conductors lower risk that do not require preventative maintenance.

Formal risk assessments to support preventative maintenance help ensure SaskPower completes the right maintenance at the right time to limit asset failure and safety issues, and effectively use maintenance resources.

3.2 Expected Asset Condition Documented

We recommended, for above-ground assets used to distribute electricity that Saskatchewan Power Corporation plans to maintain, it determine the condition to which it expects to maintain each type of those assets. *(2018 Report – Volume 2,* p. 179, Recommendation 2; Standing Committee on Crown and Central Agencies agreement September 17, 2019)

Status—Implemented

SaskPower determined the condition to which it expects to maintain each type of above-ground asset used to distribute electricity.

In 2019, SaskPower developed its *Distribution Line Asset Management—2019/20 Life Cycle Asset Management Plans* for each of the six above-ground distribution asset types outlined in **Figure 1**, along with several other asset types. These plans include an asset health/condition index based on industry good practice (i.e., CEATI) for each asset type that requires maintenance.[9] In addition, the plans document the condition parameters (i.e., the expected asset condition) indicating when corrective action, such as repair or replacement, is required. In 2022, SaskPower expanded these plans to include additional distribution asset types.

Determining the acceptable condition for assets helps to focus maintenance resources on assets with an asset condition index below the optimal level.

3.3 Asset and Condition Data Maintained in IT Systems

We recommended Saskatchewan Power Corporation consistently maintain in its IT systems key information about its above-ground assets used to distribute electricity to support evidence-based decision-making. *(2018 Report – Volume 2,* p. 181, Recommendation 3; Standing Committee on Crown and Central Agencies agreement September 17, 2019)

Status—Implemented

We recommended Saskatchewan Power Corporation maintain up-to-date information about the condition of its above-ground assets used to distribute electricity to support risk-informed asset planning. *(2018 Report – Volume 2,* p. 182, Recommendation 4; Standing Committee on Crown and Central Agencies agreement September 17, 2019)

Status—Implemented

[9] Asset health indexing is an asset condition assessment technique which uses a grading scale from 0 (very poor condition) to 100 (very good condition) based on probability of asset failure and severity of asset degradation. Source: *SaskPower Distribution Line Asset Management—2019/20 Life Cycle Asset Management Plans*.

SaskPower maintained key information about its above-ground assets used to distribute electricity in its IT systems, including up-to-date condition information.

In 2019, SaskPower developed a plan to improve its data collection processes based on a review of its business processes to determine how it should be planning and completing maintenance, and what IT systems it requires to support that work. As a result of this plan, SaskPower began updating various IT systems in 2019, with some identified changes to improve its IT capabilities still ongoing at March 2022.

Unique Identifier Used For New Assets

To support efficient data collection and analysis, SaskPower created a standard asset tag with a unique identifier that SaskPower's above-ground distribution asset manufacturers attach to all newly purchased assets. As SaskPower replaces assets, all above-ground distribution assets will gradually have these unique identifier asset tags installed.

The manufacturers also provide required information (e.g., asset tag identifier, manufacturer, model, year manufactured, serial number) about each asset so SaskPower can upload it into its IT systems at the time of purchase. SaskPower's employees check this data for completeness and accuracy before they upload the data. A unique identifier enables linking or matching of key information between systems.

Periodic Inspections Used to Obtain Up-to-Date Asset and Condition Information

SaskPower uses periodic inspections to gather data about existing assets, as well as to update information about asset conditions. To increase data quality and efficiency, SaskPower improved its existing digital forms, and also added more digital forms for documenting its maintenance activities.

Employees update information about the assets and document inspection results using digital forms. The forms use drop-down menus to make updating information easier and more consistent to support data analytics. The forms also include built-in checks to help ensure employees document all steps of the inspection. Employees upload the inspection results to the corporate network, where office employees monitor it to ensure timely upload of all inspection data.

While doing inspections, SaskPower employees scan the barcode of newer assets using portable IT devices or input the asset number of older assets to obtain information about them (e.g., manufacturer, age, location, previous inspection results). The employees check that the asset information is accurate and complete, or update this information as needed.

SaskPower uses quarterly reports of inspections to monitor the status of inspection completion. We found the two quarterly reports we tested showed most inspections occurring as planned. **Figure 2** sets out a comparison of 2021–22 planned and actual inspections completed by December 31, 2021.

Figure 2—Inspection Completion at December 31, 2021

Asset Type	2021–22 Annual Inspection Target (%)	Actual Inspections Completed at December 31, 2021 (9 months) (%)[A]
3-Phase Voltage Regulators	95	54
1-Phase Voltage Regulators	95	44
Reclosers	90	69
Overhead Switches	90	80
Capacitor Banks	95	91
Poletop Transformers	N/A – run to fail[B]	
Power-Line Conductor	N/A – run to fail[B]	

Source: Developed by the Provincial Auditor of Saskatchewan based on SaskPower's records.
[A] Inspections do not occur evenly throughout the year.
[B] Run to fail assets do not have routine maintenance completed as it is cheaper to replace them if they fail, and they do not pose significant risk of outage or to public safety.

Asset Data Completeness and Quality Monitored

During 2021, SaskPower prepared reports to monitor completeness and quality of its asset data. For example, management analyzed data to identify whether information was missing for an asset or unacceptable (e.g., location unknown is an invalid response). Employees then obtain or update the data based on inspections.

We found the two reports we examined indicated SaskPower had reasonably complete data for the majority of its above-ground distribution assets. **Figure 3** outlines SaskPower's assessment of its data completeness at December 29, 2021.

Figure 3—Asset Data Completeness at December 29, 2021

Asset Type	Quantity	Data Completeness (%)[A]
Voltage Regulator	1,250	68.2
Recloser	2,972	69.1
Overhead Switch	3,972	66.3
Capacitor Bank	1,140	90.6
Poletop Transformer	117,100	83.2
Power-Line Conductor	89,967 km	98.2

Source: Developed by the Provincial Auditor of Saskatchewan based on SaskPower's records.
[A] SaskPower determines the number of assets with valid data for each attribute (e.g., asset identifier, date manufactured) of each asset type, and applies a weighted average to determine the overall data completeness percentage for each asset type.

SaskPower also updated its processes to reconcile asset data between different IT systems. For example, it reconciled the number of voltage regulators and reclosers between its asset inventory and financial IT systems, and investigated differences to resolve issues. As shown in **Figure 4**, we found significantly fewer differences between these systems at February 2022 compared to our original audit in 2018.

Figure 4—Difference in Number of Regulators and Reclosers in IT Systems at February 2022 and 2018

	February 2022		February 2018	
	Voltage Regulators	Reclosers	Voltage Regulators	Reclosers
Asset System (Electric Office)	1,244	2,978	1,217	2,572
Work Order System (SAP)	1,303	3,004	1,580	4,035
% Difference	4.7%	0.9%	30%	57%

Source: Developed by the Provincial Auditor of Saskatchewan based on information available in SaskPower's IT systems.

Consistently maintaining key information about above-ground distribution assets (such as manufacturer, age, asset condition) within IT systems helps ensure sufficient information is available to support risk-based maintenance planning.

3.4 Maintenance Formally Prioritized

We recommended Saskatchewan Power Corporation formally prioritize its maintenance of above-ground assets used to distribute electricity to support risk-informed allocation of resources over the longer term. *(2018 Report – Volume 2,* p. 183, Recommendation 5; Standing Committee on Crown and Central Agencies agreement September 17, 2019)

Status—Implemented

SaskPower formally prioritized maintenance of its above-ground assets used to distribute electricity to support risk-informed allocation of resources over the longer term.

SaskPower created five-year rolling and annual preventative and planned corrective maintenance plans based on risk assessments and available budget. Maintenance deferred from prior years was given a higher priority than new maintenance with a similar priority level.

SaskPower's employees identify corrective maintenance while completing inspections or other work. The employees assess the urgency of these maintenance issues (e.g., public safety or outage risk). If the issue can wait more than six months to be addressed, the employee records that in the inspection form so it can be scheduled as part of the next year's maintenance plan (i.e., planned corrective maintenance). We found SaskPower included planned corrective maintenance in the annual plan based on its prioritization level—**Section 3.5** discusses completion of this maintenance. Planned corrective maintenance for all distribution assets represented about 13% of budgeted costs for all preventative and corrective maintenance for all distribution assets in 2021–22.

If an issue identified during inspection is urgent, the employee requests corrective maintenance occur right away and the manager approves this work (unplanned corrective maintenance). If it is not highly urgent, but requires correction in the near term (less than six months), the employee enters the request into an IT system where the manager schedules the work in the near term (unplanned corrective maintenance). We found reports for the nine-month period ending December 31, 2021 showed SaskPower generally

completed unplanned corrective maintenance (over 70% of unplanned corrective maintenance activities for all distribution assets including above-ground distribution assets), supporting this maintenance was given priority as expected.

Prioritizing maintenance helps to focus maintenance resources on the highest risk assets.

3.5 Consequences of Deferring Corrective Maintenance Not Formally Assessed

We recommended where Saskatchewan Power Corporation does not follow its plan for maintaining above-ground assets used to distribute electricity, it formally assess the consequences of not completing such maintenance. *(2018 Report – Volume 2,* p. 185, Recommendation 6; Standing Committee on Crown and Central Agencies agreement September 17, 2019)

Status—Partially Implemented

SaskPower formally assessed the consequences of not completing preventative maintenance for above-ground distribution assets, but did not formally assess the consequences of not completing corrective maintenance for these assets.

SaskPower uses quarterly reports from its inspection IT system to monitor completion of preventative and corrective maintenance work compared to plans.

When SaskPower identifies a change or cancellation is required for preventative maintenance (e.g., inspections, cleaning and oiling an operational asset part), management prepares a Planned Maintenance Change Control Communication Form.[10]

This form documents:

- Maintenance to be deferred or cancelled, and why
- When maintenance will be completed or alternate action taken to manage related risks
- How deferring or cancelling maintenance may impact residual asset risk scores
- What consequences may occur (e.g., public safety risk, outage)

While SaskPower did not have significant changes in 2021–22 to its planned preventive maintenance for above-ground distribution assets, we found it used this process to document consequences of not completing maintenance for other distribution assets (e.g., some padmount switch cleaning for underground distribution assets cancelled due to unavailability of contractors to complete the work along with a replacement strategy used to manage the resulting short-term risk).

At December 31, 2021 (nine months into the fiscal year), SaskPower reported it completed over 70% of unplanned and less than 10% of planned corrective maintenance. SaskPower acknowledged it has not implemented a process to assess the consequences of not

[10] For minor maintenance deferrals (e.g., standing water interfering with ability to complete maintenance tests), SaskPower builds the deferred maintenance into its next annual maintenance planning cycle, and does not require the form to be completed.

completing corrective maintenance. Management indicated it has initiated process development for planned corrective maintenance that it intends to implement in 2022–23, which will include assessing the consequences of not completing corrective maintenance.

Formally determining the consequences of not completing planned corrective maintenance, decreases the risk of failure of distribution assets that can contribute to more and/or longer unplanned power outages and higher costs for repairing or replacing assets.

3.6 Reports to Senior Management Improving

We recommended Saskatchewan Power Corporation regularly report to its senior management on the status of its maintenance activities and, if applicable, the consequences of not completing planned maintenance for above-ground assets used to distribute electricity. *(2018 Report – Volume 2,* p. 187, Recommendation 7; Standing Committee on Crown and Central Agencies agreement September 17, 2019)

Status—Partially Implemented

SaskPower reported quarterly to its senior management on the status of its maintenance activities, but the reports did not include all maintenance activities and did not include the consequences of not completing planned maintenance for above-ground distribution assets.

Although SaskPower does not have a written policy or guidance setting reporting requirements (e.g., to explain differences between planned and actual results, and the related consequences), it reports quarterly to its Operations Executive Advisory Committee about the status of maintenance activities. The reports include, for each asset type and total, comparisons of budgeted to actual costs and planned to actual number of activities (e.g., number of inspections) completed, including percentage of activities completed and budget spent.

However, the reports provided to the Committee did not provide forecasts to year end or written explanations of differences between planned and actual results. Nor did the reports explain the consequences of deferred maintenance (e.g., public safety risks, potential outages, impact on future maintenance or capital asset costs). Management indicated that it provides verbal explanations of differences between planned and actual results discussed at meetings. We found speaking notes contained some information that explained differences, but did not explain consequences of deferring maintenance. Written reports support effective discussion and reference for decision-making.

We found the quarterly reports did not include maintenance activities formally cancelled or deferred. In addition, the reports did not include certain preventative maintenance activities (e.g., rural poletop transformer grounding tests) set out in separate planning documents from the main annual maintenance plan.

We found SaskPower's reporting processes on unplanned corrective maintenance were less mature. SaskPower did not separately budget for unplanned corrective maintenance, so it used the average actual costs from the prior three years as a proxy for the budget. These unplanned corrective maintenance activities were not prioritized using the same

method as preventative and planned corrective maintenance, so SaskPower approximated the prioritization categories. Management advised us it plans to review corrective maintenance processes in 2022–23, which will consider information needed to support better reporting.

Complete reports to senior management explaining differences between planned and actual maintenance completed and about the consequences of not completing expected maintenance for above-ground distribution assets helps senior management to correctly assess whether the right maintenance is being done at the right time to help reduce the risk of power outages and safety issues, and manage costs.