

Chapter 23

SaskPower—Planning to Shut Down and Decommission Boundary Dam

1.0 MAIN POINTS

SaskPower is the principal supplier of electricity in Saskatchewan. It operates under the mandate and authority of *The Power Corporation Act*. In 2019-20, coal-fired electricity generation represented 31 percent of SaskPower's total available generating capacity.

Coal is the most widely used power source in the world and coal-fired power plants produce 40 percent of the world's electricity. However, coal-fired electricity is also a significant source of greenhouse gas emissions. Increased concentrations of greenhouse gas emissions are the major contributing factors to increasing global temperatures and climate change. In 2018, coal-fired electricity was responsible for 63 percent of greenhouse gas emissions from the electricity sector in Canada.

Phasing out coal-fired units and decommissioning related power stations is complex and technical. To do so successfully and safely depends on SaskPower having effective planning processes.

At September 2020, SaskPower had, other than in the following area, effective processes for planning the safe shut down of coal-fired electricity generating Units 4 and 5 and decommissioning of the Boundary Dam Power Station site.

SaskPower needs to use the cost estimate classification system adopted by the Saskatchewan Environmental Code to determine the contingency used to estimate costs for decommissioning and reclaiming the Boundary Dam Power Station site. Based on the suggested contingency range of between 20 percent and 50 percent, the estimated total contingency could be as much as \$20.6 million higher than SaskPower's current estimate of \$13.8 million.

SaskPower has well-defined and documented project planning processes that align with good practice. The use of these project planning processes will provide SaskPower with a solid foundation to develop detailed planning for the shutdown of its conventional coal-fired electricity generating units, and in turn, for the decommissioning of the Boundary Dam Power Station site.

Overall, other than the contingency estimate noted above, SaskPower's planning completed to July 2020 reasonably considered project scheduling and budget, along with the impact of the shut-down and decommissioning of Boundary Dam Power Station site on the environment, the community, and its human resources.

Effective planning processes reduces the risk of overruns in costs, delays in timelines, safety concerns, and the impact on workers, families and communities. It also ensures the reliability of the power supply during shut downs and decommissioning.



2.0 INTRODUCTION

This chapter reports on the results of our audit of processes SaskPower uses for planning the safe shut down of Boundary Dam coal-fired electricity generating Units 4 and 5 and decommissioning the Boundary Dam Power Station site.^{1,2}

2.1 Federal Requirement to Transition from Coal-fired Electricity to Reduce Greenhouse Gas Emissions

Reducing carbon dioxide emissions is an important action to help mitigate the effects of climate change.

Coal is the most widely used power source in the world and coal-fired power plants produce 40 percent of the world's electricity. However, coal-fired electricity is also a significant source of greenhouse gas emissions.³

Increased concentrations of greenhouse gas emissions, mainly carbon dioxide and methane, are the major contributing factors to increasing global temperatures and climate change.⁴ In 2018, despite accounting for less than 7 percent of total electricity generation, coal-fired electricity was responsible for 63 percent of greenhouse gas emissions from the electricity sector in Canada.⁵

To reduce Canada's greenhouse gas emissions, Federal regulations generally require the elimination of coal generation as a source of electricity by 2030. Federal regulations expect the phase out of the use of conventional coal-fired electricity generating units. Conventional coal-fired electricity generating units are those not equipped with carbon capture and storage (CCS) technology.⁶ CCS technology is designed to capture up to 90 percent of the carbon dioxide (CO₂) emissions produced from the use of fossil fuels (like coal) in generating electricity and industrial processes and prevent the CO₂ from entering the atmosphere.⁷ The Federal regulations allow units equipped with CCS technology to operate beyond 2029.

Also, Federal regulations expect timing of the phasing out of a conventional coal-fired electricity generation unit to depend on its age. In this report, we refer to the phasing out of a conventional unit as shutting down.

SaskPower, a Saskatchewan crown corporation, is subject to these Federal regulations. At July 2020, it has six conventional coal-fired electricity generating units it must shut down under these regulations.

¹ Shut down includes the processes to retire a coal-fired electricity-generating unit so that it no longer produces electricity; the assets of a unit may remain in place.

² Decommissioning refers to the process of dismantlement, environmental remediation, and reclamation of a plant site, which takes place after a unit or plant, is retired.

³ www.canada.ca/en/environment-climate-change/news/2017/11/taking_action_tophase-outcoalpower.html (30 September 2020).

⁴ climate.nasa.gov/causes/ (19 October 2020).

⁵ www.nrcan.gc.ca/science-data/data-analysis/energy-data-analysis/energy-facts/energy-and-greenhouse-gas-emissions-ghgs/20063 (14 October 2020).

⁶ *Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations* (Canada).

⁷ www.ccsassociation.org/what-is-ccs/ (18 October 2020).

2.2 Phasing Out of Conventional Coal-fired Electricity Generation in Saskatchewan

SaskPower is the principal supplier of electricity in Saskatchewan. It operates under the mandate and authority of *The Power Corporation Act*. SaskPower's corporate mission is to ensure reliable, sustainable, and cost-effective power for its customers and the communities it serves.⁸

SaskPower-owned electricity generation facilities include three coal-fired stations, five natural gas-fired stations, seven hydroelectric stations, and two wind farms. These facilities have a capacity to generate a total of 4,121 megawatts (MW) of electricity.⁹

In 2019-20, coal-fired electricity generation represented 31 percent of SaskPower's total available generating capacity.¹⁰ Two of SaskPower's coal-fired power stations are located near Estevan, and one is near Coronach. As shown in **Figure 1**, SaskPower has seven coal-fired electricity generating units at the three power stations. At July 2020, one of the seven units is equipped with CCS technology—Unit 3 at the Boundary Dam Power Station; the rest are conventional units.

SaskPower has a commitment to reduce carbon dioxide emissions by 40 percent from 2005 levels by 2030.¹¹ Shutting down coal-fired electricity generating units and transitioning away from coal-fired electricity generation is part of SaskPower's plan to achieve this commitment.

In May 2019, the Government of Saskatchewan signed an *Agreement with the Federal Government on the Equivalency of Federal and Saskatchewan Regulations for the Control of Greenhouse Gas Emissions from Electricity Producers in Saskatchewan* (commonly referred to as the Equivalency Agreement). The Agreement came into force on January 1, 2020, and terminates December 31, 2024.¹²

Under the Agreement, SaskPower has the flexibility to achieve its carbon dioxide emissions reduction from coal-fired electricity generating units by having the Federal Government regulate its emissions on a system-wide basis as opposed to on a unit-by-unit basis. In addition, the Agreement gives SaskPower more flexibility in determining the retirement date for each of its coal-fired units.^{13,14}

Also, in July 2018, SaskPower announced its decision to not equip Boundary Dam (BD) Units 4 and 5 with CCS technology.¹⁵ As shown in **Figure 1**, in conjunction with this decision, SaskPower largely determined the expected shut down years of its conventional coal-fired electricity generating units. It has made this public.

⁸ SaskPower, *2019-20 Annual Report*.

⁹ *Ibid.*, p. 10.

¹⁰ *Ibid.*, p. 10.

¹¹ *Ibid.*, p. 26.

¹² www.canada.ca/content/dam/eccc/documents/pdf/cepa/Canada-SaskatchewanEquivalencyAgreement-eng.pdf (30 September 2020).

¹³ SaskPower, *2019-20 Annual Report*, p. 12.

¹⁴ Prior to the Equivalency Agreement coming into force, federal regulations required SaskPower to shut down Boundary Dam Units 4 and 5 by December 31, 2019; the Agreement allowed SaskPower to extend those dates.

¹⁵ leaderpost.com/news/saskatchewan/sask-not-moving-forward-on-carbon-capture-expansion (30 September 2020).



As of September 2020, SaskPower had not decided whether it will equip any of the remaining conventional coal units with CCS technology to extend how long they can operate.¹⁶

Figure 1—Power Capacity, Location and Expected Year of Shut Down of SaskPower’s Coal-Fired Power Stations and Electricity Generating Units at December 2019

Power Station	Location	Power Capacity (MW)	Electricity Generating Unit	Year Commissioned	Expected Year of Shut Down
Boundary Dam ^A	Estevan	672	Unit 3	1970 and retrofitted with CCS technology in 2014	Unknown given CCS technology
			Unit 4	1970	2021
			Unit 5	1973	2024
			Unit 6	1978	2027
Poplar River	Coronach	582	Unit 1	1981	2029
			Unit 2	1983	2029
Shand	Estevan	276	Unit 1	1992	2029

Source: www.saskpower.com/Our-Power-Future/Our-Electricity/Electrical-System/System-Map and docs.legassembly.sk.ca/legdocs/Legislative%20Committees/CCA/Debates/190917Debates-CCA.pdf (30 September 2020).

^A SaskPower retired Boundary Dam Unit 1 in 2013 and Unit 2 in 2014.

The shaded cells are units within the scope of this audit.

SaskPower expects to decommission the Boundary Dam Power Station once it shuts down all units at this location, which is in 2029 or later.

Phasing out conventional coal-fired units and decommissioning related power stations is complex and technical with implications beyond SaskPower and its operations. Not having effective planning processes could result in increased costs, delayed timelines, safety concerns, and not sufficiently considering impacts on workers, families and communities. Also, inadequate planning processes could affect the reliability of the power supply during shut downs and decommissioning.

3.0 AUDIT CONCLUSION

For the 19-month period ended July 31, 2020, SaskPower had, other than in the following area, effective processes for planning the safe shut down of coal-fired electricity generating Units 4 and 5, and decommissioning of the power station site at Boundary Dam.

SaskPower needs to use the cost estimate classification system adopted by the Saskatchewan Environmental Code when determining the contingency used in estimating the cost for decommissioning and reclaiming the Boundary Dam Power Station site. At July 2020, SaskPower was at early stages in planning for the decommissioning and reclamation of this Station. It did not have detailed plans in place. Also, it had not yet undertaken an environmental site assessment of this site. These factors increase the uncertainty of the accuracy of its cost estimate.

¹⁶ docs.legassembly.sk.ca/legdocs/Legislative%20Committees/CCA/Debates/200624Debates-CCA.pdf (30 September 2020).

The planning processes in place as of July 2020 should provide SaskPower with a solid foundation to develop detailed planning for the shutdown of the above units, and in turn, for the decommissioning of the Boundary Dam Power Station site.

Figure 2—Audit Objective, Criteria, and Approach

<p>Audit Objective:</p> <p>To assess the effectiveness of Saskatchewan Power Corporation's processes for the 19-month period ended July 31, 2020 for planning the safe shut down of coal-fired electricity generating Units 4 and 5 and decommissioning of the Boundary Dam Power Station site.</p> <p>Audit Criteria:</p> <p>Processes to:</p> <ol style="list-style-type: none"> 1. Set out accountability for managing shut down and decommissioning <ol style="list-style-type: none"> 1.1 Define key roles and responsibilities (e.g., staff, committees, authority) 1.2 Establish reporting relationships (e.g., who, timing) 1.3 Set expectations for reporting progress (e.g., key content, timing) 2. Prepare risk based shut down and decommissioning plans <ol style="list-style-type: none"> 2.1 Identify risks (e.g., costs, safety, environmental, reliability of power grid, workforce and community) 2.2 Plan key elements (e.g., cost, timeframe, milestones, system reliability, safety, workforce and community) 2.3 Identify resources required (e.g., people, financial, physical) 2.4 Align plans with relevant legislative requirements, good practice, and SaskPower's strategic direction 2.5 Manage risks 3. Adjust shut down and decommissioning plans <ol style="list-style-type: none"> 3.1 Regularly evaluate progress on key elements 3.2 Adjust plans as required (e.g., scope, actions, timelines) 3.3 Consider impact on plans for other coal-fired units 3.4 Regularly report progress to senior management and other external stakeholders (regulator, public) <p>Audit Approach:</p> <p>To conduct this audit, we followed the standards for assurance engagements published in the CPA Canada Handbook—Assurance (CSAE 3001). To evaluate SaskPower's processes, we used the above criteria based on our related work, reviews of literature including reports of other auditors, and consultations with management and an external advisor with subject matter expertise. SaskPower's management agreed with the above criteria.</p> <p>We examined SaskPower's policies and procedures relating to planning for shut down and decommissioning. We interviewed SaskPower staff responsible for planning the shut down and decommissioning. In addition, we discussed regulatory requirements related to planning for shut down and decommissioning with the Ministry of Environment.^A We also reviewed related documentation (e.g., SaskPower's project management standards and templates, shut down planning documentation, decommissioning plan, risk assessments and other analysis used in SaskPower's planning processes). We used an external consultant with expertise in the area to help us identify good practice and to assess SaskPower's planning processes.</p>
--

^A Boundary Dam Power Station is permitted as an industrial waste works facility under *The Environmental Management and Protection Act, 2010*. The Ministry of Environment is responsible for regulating these facilities.

4.0 KEY FINDINGS AND RECOMMENDATION

4.1 Applicable Legislation Identified and Considered

SaskPower identified and considered federal and provincial legislation applicable to its planned shut down of Boundary Dam (BD) Units 4 and 5 and its eventual decommissioning of the Boundary Dam Power Station site.



SaskPower's primary priority is to shut down these units and decommission the Power Station site in compliance with applicable federal and provincial legislative requirements, and in an environmentally responsible way.

In its planning, SaskPower is considering regulations related to the removal and storage of polychlorinated biphenyls (PCBs) as required by *The PCB Waste Storage Regulations*, as well as the Federal regulations related to reducing CO₂ emissions from coal-fired electricity generation. We found its preliminary plans for the shutdown of BD Unit 4 specifically identified the need to remove equipment and cables with PCBs in a way that complied with relevant regulations.¹⁷

With respect to provincial legislative requirements, SaskPower:

- Identified and acted on the requirement to submit a decommissioning and reclamation plan to the Saskatchewan Ministry of Environment by January 1, 2020.^{18,19} It submitted the plan in October 2019 and the Ministry accepted it in December 2019.

We noted SaskPower built into the approved plan the requirement to submit an updated decommissioning and reclamation plan to the Ministry every five years, or when significant changes are made to the Boundary Dam Power Station site, and the requirement for completing an environmental site assessment and corrective action plan.²⁰

- Considered the need to determine whether changes to the Boundary Dam Power Station's operating permit or the Environmental Protection Plan it had filed with the Ministry would be required.²¹

Furthermore, SaskPower acknowledges in its planning the need to monitor and respond to potential changes in legislative requirements that may occur before it completes each shut down and the decommissioning.

Identifying and building in the implications of legislation applicable to the shut down of coal-fired electricity generating units and decommissioning the Boundary Dam Power Station site reduces the risk of not complying with applicable legislative requirements, or not carrying out the shutdown and decommissioning in an environmentally responsible way.

4.2 Key Stakeholders Identified and Considered in Planning

In addition to regulatory bodies, SaskPower has identified communities affected by the shut down of the coal-fired electricity generating units and its workforce as key stakeholders to consider in its planning processes.

¹⁷ PCBs are highly toxic industrial chemicals that pose serious health risks (e.g., cause cancer). PCB's are found in many of the cables located in Unit 4.

¹⁸ The Ministry of Environment regulates industrial waste facilities. The Ministry has permitted the Boundary Dam Power Station to operate as an industrial waste works facility under *The Environmental Management and Protection Act, 2010* (i.e., Industrial Waste Works permit).

¹⁹ *The Environmental Management and Protection Act, 2010* and *The Environmental Management and Protection (General) Regulations* require the submission of a decommissioning plan.

²⁰ *The Environmental Management and Protection Act, 2010*, ss. 13 & 14.

²¹ *The Environmental Management and Protection Act, 2010*, s.27 requires SaskPower to maintain an environmental protection plan. The purpose of this Plan is to describe the methods to be used to prevent and monitor potential damage to the environment during operations.

SaskPower estimates the phasing out of coal-fired electricity generation could negatively affect over 1,300 workers in Saskatchewan coal-producing communities.²²

We noted SaskPower had set up a committee in 2018 called Transition to 2030 with a mandate:

*To determine how SaskPower will transition from its current reliance on conventional coal-fired generation to a system that complies with changing environmental regulations and will meet our strategic goals to build a cleaner, reliable, modernized electricity grid in the most cost-effective way possible.*²³

As of July 2020, the Committee had a written strategy for communicating with impacted communities (e.g., the City of Estevan). We noted the strategy included actions to maintain positive working relationships with impacted communities and demonstrate its commitment to them.

Our review of 2019-20 Committee minutes found it actively considered the implications of the shutdown of BD Units 4 and 5 and the decommissioning of Boundary Dam Power Station site on the affected communities and its workforce. It had regular discussions with officials from these communities. For example, SaskPower staff, including the President and Chief Executive Officer, met with community leaders and attended community events (e.g., Estevan Economic Development Group meetings) during 2019-20.

We also found SaskPower responded to requests for information to help the impacted communities prepare for transitioning away from coal (e.g., gave the City of Estevan workforce data to support its socio-economic impact study).²⁴

In addition, SaskPower considered the potential impact on its workforce. Management anticipates an estimated reduction of 41 positions because of the shutdown of BD Units 4 and 5.²⁵ In September 2019, SaskPower publicly committed to no layoffs because of these workforce reductions.²⁶ At July 2020, it was developing plans to handle the anticipated reduction in workforce. Its plans include managing position reductions through attrition (i.e., as staff retire or move to different positions).

SaskPower also recognized the elimination of coal-generated electricity may decrease its ability to retain a sufficient number of qualified staff (e.g., power engineers). During 2019-20, SaskPower was considering strategies to retain these qualified staff.

Identifying key groups and communities affected by the shut down of coal-fired electricity-generating units and power stations and their needs provides key information to inform the development of the shut down and decommissioning plans.

²² www.saskatchewan.ca/~media/news%20release%20backgrounders/2019/oct/2019%20throne%20speech%20english.pdf (30 September 2020).

²³ SaskPower's Transition to 2030 committee is comprised of senior management and management from throughout SaskPower (e.g., operations, asset management, and internal audit).

²⁴ www.estevan.ca/2020/03/02/socio-economic-impact-assessment/ (6 October 2020).

²⁵ It estimates a reduction of ten positions when unit 4 is shut down and 31 additional positions when unit 5 is shut down.

²⁶ docs.legassembly.sk.ca/legdocs/Legislative%20Committees/CCA/Debates/190917Debates-CCA.pdf (6 October 2020).



4.3 Appropriately Structured Project Management Approach in Place

SaskPower has appropriate written project management guidance in place to support the use of a structured approach to planning for and managing projects.

SaskPower's Corporate Project Management Office maintains guidance about project management, and various templates to support the implementation of the guidance.

Our review of the guidance found it current, sufficiently comprehensive, and consistent with good practice for project management.

We found the project management plan guidance includes clear and understandable guidance on fundamental aspects of planning for and managing a project.

SaskPower's Project Management Plan guidance provides a structured planning framework, and clear assignments of responsibilities. See **Figure 3** for brief description of content requirements for a project management plan. For example, the guidance expects the development and approval of a robust project charter or plan. It also expects the responsibility for a project be assigned to a single individual—a project manager (consistent with good practice).

Figure 3—Brief Description of SaskPower's Content Requirements for a Project Management Plan

<p>Project governance—who has responsibility and authority to make decisions; who is accountable for the project</p>
<p>Communications management—how, when and in what format project information will be communicated to various members of the project team and key stakeholder groups</p>
<p>Stakeholder management—identifies key stakeholders and their role in the project; includes templates for a stakeholder register and stakeholder management plan</p>
<p>Procurement management—outlines general approach to what materials or services will be needed, how they will be procured and timing, and how interactions with related procurement functional areas will be handled</p>
<p>Resource management—identifies resource requirements and for internal resources, staff assignments (timing, role)</p>
<p>Risk management—identifies, tracks, prioritizes, mitigates and/or resolves project risks over the course of the project; includes templates for a risk register and project risk management plan</p>
<p>Quality management—identifies the process by which the quality of project deliverables and general project execution will be managed; expects use of defined standards</p>
<p>Scope management—identifies the approach and process about managing the detailed scope of the project</p>
<p>Schedule management—identifies how the detailed schedule of the project will be defined, documented, verified, managed and controlled; includes a schedule management template</p>
<p>Cost management—identifies the process about budget creation, communication, and management; includes templates for cost management plan, and a cost workbook</p>
<p>Change control management—identifies how changes to the project will be managed and controlled on an ongoing basis; sets out what triggers changes to a plan (e.g., changes to the project scope, significant unforeseen circumstances) and how staff must document these changes (e.g., complete project change request template, issue and decision log), and who has authority to approve changes</p>
<p>Health, safety, and security—identifies how these requirements will be defined, documented, verified, managed and controlled over the course of the project</p>

Source: Adapted from SaskPower Project Management Plan Standard (30 September 2020).

Our assessment of the content of the risk register, a key template, found it consistent with good practice. The risk register template includes the following:

- Clear written guidance about identifying risk including a list of potential areas of risks to help the project team identify risks. Potential areas of risks listed include accuracy of estimates, engineering schedules, environmental impact and regulatory requirements.
- A standard framework for evaluating and documenting risks identified (using a standard approach to ranking probability and impact) along with planned actions to respond to risk (including who is responsible for those actions and when).

The risk register forms part of the cost workbook, which is part of a monthly reporting package.²⁷

SaskPower's Baseline project management guidance defines a baseline as a project's approved scope, schedule and/or costs. It expects the use of a baseline to monitor a project's success. It expects a project manager to report weekly and monthly on the status of a project. It includes supporting templates. For example, the project progress report template documents:

- An executive summary and project update including any highlights and progress
- Key risks and issues that are impacting or may impact the project
- Cost information (i.e., baseline, forecast and actual costs) including variance explanations.
- Schedule information (i.e., baseline, forecast and actual) for project events
- A scorecard with key project indicators used to monitor project progress

We found the project progress report template includes information key to assess the status of a project, and the expected timing of reporting supports appropriate monitoring.

In addition, SaskPower's project management guidance appropriately requires project teams to identify and document lessons learned when finishing a project. It includes a template for this purpose. Our assessment of the guidance and template found they were consistent with good practice.

Furthermore, SaskPower's guidance on addressing issues (including a related reporting template—a project issue log) is clear and practical. It defines reasonable thresholds to prompt alerting staff about budget overages or delays (e.g., if the project is 20 percent behind schedule, it is highlighted in the project progress report). It expects staff to escalate identified issues about these key indicators, as well as any other issues identified, through SaskPower's reporting process and regular meetings. It includes clear guidance on documenting project issues and decisions made to resolve those issues.

²⁷ The cost workbook contains key project information such as cost summary (budget, forecast and actual), risk register and progress reporting.



Having comprehensive project management guidance in place decreases the risk of projects being late or over budget and enables successful project completion. Providing templates for key aspects of project management helps ensure staff apply the guidance as intended, and document their basis for key decisions in a clear and consistent way.

Successful projects depend on rigorous planning to define the scope of work, and have a clear understanding what needs to happen and at what cost to deliver the desired results safely and on schedule. Appropriately identifying and managing project risks allows management to identify potential issues earlier in the process, address them and keep the project on track.

4.4 Incremental Approach Suitable for Shutdown and Decommissioning Projects

SaskPower is using an incremental approach to plan for the shutdown of BD Units 4 and 5, and the decommissioning of the Boundary Dam Power Station site.

We found SaskPower's project management guidance supports an incremental planning approach. Under this approach, the assigned project manager and a core project team can carry out various planning activities and make decisions over time. Activities include the development of the project charter or plan (which sets out the scope of the project, identifies key deliverables and related tasks, and general project timetable or schedule), identifying risks, and making preliminary estimates of costs.

Under the incremental planning approach, planning becomes more detailed as the project moves closer to the expected date of formal approval of the project. Detailed planning would be completed before the project is formally approved and before the project starts.

SaskPower plans to use this structured approach in its shutdown of coal-fired electricity generating units, and may use it in the decommissioning of the Boundary Dam Power Station site. At July 2020, it has not yet decided since the start of decommissioning activities is at least ten years away.

We found this incremental approach to planning suitable for projects where SaskPower has made decisions well in advance such as the shutdown of its conventional coal-fired units. In its case, SaskPower decided in July 2018 when to shutdown certain units—three years before the earliest planned shutdown (i.e., BD Unit 4 in 2021). SaskPower estimates it will take about 12 months to complete activities to phase out the unit permanently.

Starting to plan for the shut downs and decommissioning early reduces the risk of failure. The technical and environmental complexities of phasing out BD Units 4 and 5 and decommissioning the Boundary Dam Power Station site, along with managing implications on the workforce and surrounding communities, increases the importance of starting to plan early.

4.5 Preliminary Planning for BD Unit 4 Consistent with Structured Approach and at Appropriate Stage of Completion

As of July 2020, SaskPower's planning for the shutdown of BD Unit 4 is at an appropriate stage given its planned shutdown date of December 31, 2021.

As of July 2020, SaskPower did not yet have a complete or approved project charter or plan for the shutdown of BD Unit 4 or BD Unit 5. Its overall plan is to shut down its BD Unit 4 and BD Unit 5 by putting them in a safe state and by de-energizing them (i.e., isolating equipment from sources of energy) so the units are structurally sound and safe.

SaskPower plans to use similar processes and lessons learned from planning for and managing the shutdown of BD Unit 4 in its planning for the shut down of BD Unit 5. It expects to have completed all of the shutdown activities related to BD Unit 4 about two years in advance of shutting down BD Unit 5. See **Figure 1** for expected shut down year.

By July 2020, SaskPower had made and documented a number of preliminary planning decisions about the shutdown of BD Unit 4 using SaskPower's project management planning guidance. One key decision is when it expects to complete its detailed planning for this project.

SaskPower expects to complete detailed planning for BD Unit 4 shutdown in 2021 based on various planned key dates. As shown in **Figure 4**, the planned shutdown date is December 31, 2021, and SaskPower expects to complete all shut down activities to phase out the unit by December 30, 2022.

Figure 4—Planned Key Timing for Boundary Dam Unit 4 Shut Down Activities

January—July 2021: Assigned staff will complete detailed planning for shutting down and de-energizing specific aspects of the unit and pieces of equipment (e.g., turbine, boiler, electrical systems). Staff will enter these detailed plans into SAP as individual work orders[^]

November 2021: Project sponsor will approve the project plan, including the budget. The project team will base the project budget on the work orders generated from the detailed planning.

December 31, 2021: SaskPower will shut down electricity generation of BD Unit 4.

January—December 2022: Assigned staff will complete planned work orders (shut down activities) to phase out the unit.

December 30, 2022: All shut down activities will be completed.

Source: Adapted from planning information provided by SaskPower.

[^] SAP is a multi-functional system that SaskPower utilizes for its business. SAP stands for Systems, Applications and Products in data processing.

As of July 2020, SaskPower has initiated and partially completed the following aspects of its project management plan for the shut down of BD Unit 4. We found these aspects relevant to the preliminary planning stage of the project.

With respect to project governance, SaskPower has assigned key positions and roles. These include a project manager (Project Manager, Power Production Project Delivery), executive sponsors (e.g., Vice President of Power Production) and project sponsor (Director, Generation Asset Management & Planning).



SaskPower clearly made the project manager responsible for managing the project consistent with its project management guidance (e.g., completing detailed planning, making sure project is meeting timelines, monitoring risks, monitoring actual cost compared to budget). We note the assigned project manager has a Project Management Professional (PMP) certification from the Project Management Institute.²⁸ We also found senior management presence in key roles (e.g., executive and project sponsors) on the project seemed suitable.

With respect to stakeholder and resource management, SaskPower started to complete a project stakeholder registry using the project management template. The registry lists names and positions of individuals with technical or functional expertise identified as necessary to complete related aspects of planning for shut down activities (e.g., preparation of detailed budget, environmental specialist).

SaskPower does not expect to finalize the assignment of responsibilities for preparing these detailed plans until January 2021. It expects key Boundary Dam staff (e.g., chief engineer, director) to review the assignment of staff prior to finalization.

Our assessment of key project roles and responsibilities listed in its registry found them reasonable for this stage of project planning. It suitably includes senior SaskPower staff from areas key to developing a robust plan, such as Finance, Environment, and Human Resources.

With respect to risk management, SaskPower has started to complete the project management risk register template. It has identified and assessed some preliminary risks related to the shut down of BD Unit 4, such as resource availability, environmental incidents, and SaskPower personnel leaving resulting in a lack of qualified personnel to operate these units safely until they are shut down. It followed guidance to rank these risks based on the probability of the risk occurring and the potential impact. In addition, the project team identified risk owners and actions to take if a risk event occurs.

Starting in 2021, senior management expects the project manager to provide an updated risk assessment monthly.

We found the project team was aware of other risk management activities of SaskPower. It was aware of risks identified through those activities, and was considering those risks when completing the project risk register. SaskPower has identified related risks as part of both its corporate, and Boundary Dam Power Station risk management activities.

SaskPower's overall corporate risk register includes risks arising from transitioning away from coal-generated electricity, such as the risk of uncertainty resulting in staff turnover. We noted SaskPower's electricity supply planning process considered risks related to system reliability when SaskPower decided in 2018 to shut down BD Units 4 and 5 (rather than equip them with CCS technology). SaskPower targets a 15 percent reserve margin in its supply plan (i.e., it plans for its supply of electricity to be greater than its expected electricity demand by 15 percent). As the North American Electric Reliability Corporation 2019 long-term reliability assessment notes SaskPower has sufficient generation capacity to 2029.²⁹

²⁸ The Project Management Institute is a not-for-profit professional management association for project management.

²⁹ www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2019.pdf (5 October 2020). The North American Electric Reliability Corporation is a not-for-profit international regulatory authority that works to assess the reliability and security of North America's electricity grid.

The risk registry kept by staff responsible for operating the Boundary Dam Power Station identifies and evaluates risks related to the operation of the plant. We found the station's registry includes environmental risks such as non-compliance with environmental regulations and safety risks such as possible injury.

With respect to scope and schedule management, SaskPower determined its approach to the shut down of BD Unit 4. It based this approach on its internal guidelines for removing generation units from service along with actions taken in the past to shut down other units at Boundary Dam (i.e., Units 1 and 2). See **Figure 4** for planned timing for key shut down phases.

It has also developed a preliminary overview of work that SaskPower staff must carry out to shut down the unit. For example, staff identified:

- A list of specific assets and pieces of equipment in the unit, (e.g., steam generation, drains, vents, boiler, etc.)
- Plan of key activities to take place to safely shut down the unit (e.g., disconnecting power supply, draining oil, etc.) along with general timing
- Other areas to consider such as updating equipment records, evaluating inventory levels and cancelling licences to operate equipment

Our assessment of the approach found it consistent with internal guidelines. Our assessment of SaskPower's internal guidelines for removing generating units from service found they provided robust guidance for removing all types of coal-fired generating equipment from service and are consistent with good practice.

With respect to cost management, in March 2020, SaskPower has made a preliminary estimate of costs for shutting down BD Unit 4 of \$7.36 million. This amount includes about \$0.61 million for shut down activities, and \$6.75 million for removal of PCB cables. It noted it based this estimate on actual costs incurred for the previous shut down of a unit at the Boundary Dam Power Station in 2013-14. We found this to be reasonable. It expects to refine cost estimates and complete a detailed project budget in 2021.

With respect to health, safety and security, SaskPower expects staff to incorporate these considerations into the detailed planning for shutting down specific equipment. It expects staff to follow SaskPower's standard protection code as part of shutting down and de-energizing individual assets.

We found the standard protection code sets out SaskPower's standard processes for working with the electrical system safely.

Taking an incremental approach to developing the plan to shutdown BD Unit 4 will help ensure SaskPower takes sufficient time to consider each of the key aspects set out in the project management plan. Following the structured approach will help ensure it documents the basis of key planning decisions. In addition, use of a structured planning approach increases the likelihood SaskPower will execute the shut down of BD Unit 4 safely, on schedule and on budget with enough consideration of the impact on the environment, the community, and human resources.



4.6 Progress on BD Unit 4 Shut Down Planning Reported Periodically

The project manager assigned to the BD Unit 4 shut down project kept senior management sufficiently informed about the status of the project.

For the 19-months ending July 2020, the project manager used periodic meetings with senior management responsible for the shut down to keep them informed of the status of the planning.

We found this informal process reasonable given the early stage of the project (preliminary planning stage).

We also found the project manager has a clear understanding of reporting expectations once more detailed planning begins (expected to begin in January 2021- see **Figure 4** for key dates of project). The project manager expects to give management an updated project progress report on a weekly basis, and discuss the updated report at weekly meetings with management in SaskPower's Power Production Division. The project's executive are part of these meetings.

Robust and regular reporting helps management effectively monitor the project. Effective reporting identifies emerging risks and issues so management can help resolve them and keep the project on track.

4.7 Planning for Decommissioning Boundary Dam Power Station at Appropriate Stage of Completion

As of July 2020, SaskPower's planning for the decommissioning of the Boundary Dam Power Station site is at an appropriate stage given its planned decommissioning timeframe is at least ten years away.

SaskPower expects to start work to decommission Boundary Dam once all four coal-fired electricity-generating units at this location are shut down. At July 2020, the exact date is currently unknown, given BD Unit 3 is equipped with CCS technology; SaskPower anticipates decommissioning of the site to be 2029 at the earliest.

Regardless, decommissioning of the Boundary Dam Power Station site will be a complex and expensive project. SaskPower estimates it will cost almost \$83 million to decommission the power station.³⁰

SaskPower appropriately recognizes it must start planning early.

By July 2020, SaskPower has done the following preliminary planning activities. SaskPower:

- Prepared and submitted its 2019 Decommissioning and Reclamation Plan to the Ministry of Environment as required by law.³¹ SaskPower is scheduled to next update the decommissioning and reclamation plan in 2024 (i.e., five years from October 2019).

³⁰ SaskPower Decommissioning and Reclamation Plan Boundary Dam Power Station.

³¹ The Ministry of Environment approved SaskPower's 2019 Boundary Dam Power Station Decommissioning and Reclamation Plan.

- Developed a process map to assist it in developing detailed decommissioning plans. We found the map sets out the steps and timelines (at a high level) SaskPower expects to follow in the decommissioning planning process along with approvals required for key steps. For example, the process map indicates SaskPower's plan to complete environmental site assessments about one year before finalizing and implementing its decommissioning plan. It also indicates who is expected to complete each step in the process.

Preliminary long-term decommissioning planning helps SaskPower to identify key considerations such as cost, regulatory requirements, and environmental impact at an early stage, and increase its likelihood of readiness. Preliminary planning allows SaskPower to build on this work, and further define these considerations as they move closer to the decommissioning date.

In addition, preliminary planning increases the likelihood of SaskPower having a clear understanding of what is expected to decommission the Boundary Dam Power Station site, when, and at what cost. Earlier understanding is particularly beneficial for costly projects.

4.8 Content of Boundary Dam Power Station Site Decommissioning Plan Generally Reasonable

The content of SaskPower's October 2019 Decommissioning and Reclamation Plan for Boundary Dam Power Station is consistent with the Ministry of Environment Guidelines and good practice.

SaskPower suitably based its 2019 Decommissioning and Reclamation Plan on the Ministry of Environment's *Guidelines for Decommissioning and Reclamation of Industrial Waste Works* because Boundary Dam Power Station is permitted as an industrial waste works facility.³² SaskPower used an external consultant that had previous experience developing similar plans for other industries to prepare the 2019 Plan and the cost estimate included in the Plan.

We found the Ministry Guidelines provide an overview of the Ministry's expectations for decommissioning plans and the relevant legislative requirements.

We found SaskPower's 2019 Decommissioning and Reclamation Plan sufficiently considered the relevant Guidelines. For example, it includes expected information such as predicted timelines for work to be conducted, monitoring programs during the decommissioning and post-decommissioning phases, and cost estimates.

We also found SaskPower's 2019 Decommissioning and Reclamation Plan appropriately considered planning decisions fitting for this stage of the project, and included content reflective of good practice. The Plan:

- **Sets out clear expectations and deliverables**—The Plan's purpose is to identify Boundary Dam Power Station deliverables such as infrastructure to be decommissioned, expected condition of reclaimed site and to set out a high-level cost estimate to decommission the site.

³² publications.saskatchewan.ca/api/v1/products/89710/formats/106549/download (6 October 2020).



- **Sets out a high-level timeline for activities**—The Plan indicates SaskPower estimates decommissioning activities and monitoring of the site to take up to five years, and of the ash lagoons to take up to 15 years.³³
- **Outlines the conditions to which remediation is to be completed**—The Plan outlines conditions for specific areas at the site (e.g., building, landfills, ash lagoons) as well as for the site overall (e.g., SaskPower currently expects to reclaim the site to reflect the surrounding land use).
- **Considers the impact on the environment**—The Plan notes SaskPower has identified the need for a strategy to manage and dispose of water from the ash lagoons, and consider the disposal of contaminated equipment and infrastructure.
- **Identifies key activities SaskPower still needs to complete that will further define environmental risk**—The Plan notes SaskPower must complete an environmental site assessment and corrective action plan as required by *The Environmental Management and Protection Act, 2010* before starting decommissioning activities.³⁴
- **Makes a preliminary estimate of resources required**—The Plan includes estimated decommissioning costs for all related infrastructure on the site (e.g., buildings, storage areas) (see **Figure 5**), and key assumptions used to estimate all of the activities other than the determination of the contingency cost. See **Section 4.9** for discussion about contingency.

Figure 5—2019 Boundary Dam Power Station Site Decommissioning and Reclamation Cost Estimate

Activity	Cost (in millions)
Ash Lagoon Reclamation	\$ 41.96
Power Plant and Other Facilities Reclamation	20.31
Project Management	6.26
Site Investigation/Reclamation Plan	0.26
Public Participation/Open House	<u>0.01</u>
Subtotal	68.80
Contingency	<u>13.76</u>
Total	<u>\$ 82.56</u>

Source: SaskPower 2019 Boundary Dam Power Station Decommissioning and Reclamation Plan

Appropriate content in the plan allows SaskPower to meet its regulatory requirements and plan its decommissioning activities consistent with good practice.

³³ Ash lagoons are structures used at coal-fired power stations to properly dispose of ash which is a product of the process of burning coal to produce electricity. This ash contains contaminants like mercury, cadmium, and arsenic. Without proper management, these contaminants can pollute water and air.

³⁴ *The Environmental Management and Protection Act, 2010*, ss. 13 & 14. Section gg of the Act defines a site assessment as any activity to determine the cause, nature, or extent of a potential or existing adverse effect [contamination exceeding an environmental standard]. Corrective action plans detail what will be done to prevent, mitigate, or reclaim damage to the environment.

4.9 Boundary Dam Decommissioning and Reclamation Plan Missing Rationale for Cost Contingency

SaskPower did not have rationale to support the selected contingency percentage in the 2019 Decommissioning and Reclamation Plan used to determine its contingency costs. Also, the selected contingency percentage does not align with good practice.

As shown in **Figure 5**, the estimated \$82.5 million total cost to decommission the Boundary Dam Power Station site includes a 20 percent contingency of \$13.8 million. SaskPower indicated that it determined the contingency based on guidance from the Ministry of Environment.

Ministry guidance suggests best practice is to follow the process for cost estimates set out in the Saskatchewan Environmental Code.³⁵ The Code uses a standard cost estimation classification system to make cost estimates, and suggests contingency ranges for each class (see **Figure 6**).

Figure 6—Cost Estimate Classes and Suggested Contingency Ranges

Class	Level of Project Definition ^A	Suggested Contingency Range
Class 1	50—100%	3—15%
Class 2	30—70%	5—20%
Class 3	10—40%	10—30%
Class 4	1—15%	20—50%
Class 5	0—2%	30—100%

Source: Adapted from Standard Classification for Cost Estimate Classification System established by ASTM International.
^A Level of project definition means the amount of detailed engineering or architectural planning (e.g., drawings, designs) that is done compared to the total amount of planning expected. The level of project definition determines what class the project should fall. For example, Class 1 represents a high amount of detail planning completed which results in a low uncertainty in the cost estimate, Class 5 represents a low amount of detailed planning which results in high uncertainty.

The Ministry expects the preparer of a decommissioning and reclamation plan to determine the appropriate class and select a contingency percentage appropriate to the project when estimating decommissioning contingency costs.

However, SaskPower did not set in either the 2019 Decommissioning or Reclamation Plan or other supporting documents what cost-estimate class (i.e., class 1 through 5) it used, or the basis it used when selecting the 20 percent contingency. SaskPower's consultant who prepared the Plan told us the 2019 cost estimate is a class 4 estimate.

Our assessment of the Boundary Dam decommissioning project against the Standard Classification for Cost Estimate Classification System found the project had characteristics most consistent with class 4. For example, it estimated the amount of work required at a high-level based on preliminary understanding of the site.

However, our assessment of the 20 percent contingency against the suggested contingency range found selecting the lowest percentage (i.e., 20 percent) inconsistent with the uncertainties related to the Project costs at October 2019.

³⁵ The Ministry of Environment's Environmental Code adopted Standard Classification for Cost Estimate Classification System as established by ASTM International. ASTM International is an international standards organization. pubsaskdev.blob.core.windows.net/pubsask-prod/89761/89761-Adoption_of_Standards_Chapter.pdf (6 October 2020).



For example, at October 2019, SaskPower had not developed detailed plans for decommissioning such as specific steps or equipment needed for demolition. As well, SaskPower had not completed key steps such as an environmental site assessment. Not having detailed plans or the results of an environmental site assessment increases the likelihood of costs being higher than estimated hence warranting the need for a higher contingency percentage or providing a potential range of contingency costs.

Based on a suggested contingency range of between 20 percent and 50 percent, the estimated total contingency could range between a low of \$13.8 million and a high of \$34.4 million. A 5 percent increase would increase the contingency by \$3.5 million.

Not having sufficient rationale for the contingency percentage chosen or following good practice when selecting contingency percentages increases the risk of SaskPower not making reasonable estimates of contingency reclamation costs, and of SaskPower not having enough resources available at the time of decommissioning the Boundary Dam Power Station site.

1. **We recommend SaskPower use the cost estimate classification system adopted by the Saskatchewan Environmental Code to determine the contingency percentage used to estimate costs for decommissioning and reclaiming the Boundary Dam Power Station site.**

5.0 SELECTED REFERENCES

- Burns McDonnell. (2018). *Planning and Executing Coal-Fired Power Plant Decommissioning and Demolition Projects*. cdn2.hubspot.net/hubfs/477837/BenchMark2018_Q4_07389/PDFs/BM18-4-TechBrief-Slideshare-Planning-Executing-Coal-Fired-Power-Plant-Decommissioning-Demolition-Projects.pdf (24 January 2020).
- Project Management Institute. (2017). *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)–Sixth Edition*. Philadelphia: USA: Author.
- Provincial Auditor of Saskatchewan. (2017). *2017 Report Volume 1, Chapter 5 – Ministry of Finance – Implementing the Revenue Administration Modernization Project*. Regina: Author.
- Provincial Auditor of Saskatchewan. (2017). *2017 Report Volume 2, Chapter 21 – Ministry of Education – Managing the Construction of P3 Joint-use Schools*. Regina: Author.
- Provincial Auditor of Saskatchewan. (2015). *2015 Report Volume 1, Chapter 12 – Government Relations – Coordinating Emergency Preparedness*. Regina: Author.
- Provincial Auditor of Saskatchewan. (2015). *2015 Report Volume 2, Chapter 37 – Saskatchewan Liquor and Gaming Authority – Managing Projects with Significant IT Components*. Regina: Author.
- Provincial Auditor of Saskatchewan. (2013). *2013 Report Volume 1, Chapter 10 – Government of Saskatchewan - Identification and Management of Contaminated Sites*. Regina: Author.
- Raimi, Daniel. (2017). *RFF Report, Decommissioning US Power Plants, Decisions, Costs, and Key Issues*. Washington, DC: Author.