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**ORAL ARGUMENT SCHEDULED FOR APRIL 17, 2016**

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No. 15-1381 (and consolidated cases)

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**IN THE UNITED STATES COURT OF APPEALS  
FOR THE DISTRICT OF COLUMBIA CIRCUIT**

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STATE OF NORTH DAKOTA, *et al.*,

*Petitioners,*

V.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, *et al.*,

*Respondents.*

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On Petitions for Review of Final Agency Action of the  
United States Environmental Protection Agency  
80 Fed. Reg. 64,510 (Oct. 23, 2015) and 81 Fed. Reg. 27,442 (May 6, 2016)

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**BRIEF OF *AMICUS CURIAE* SASKATCHEWAN POWER  
CORPORATION, OPERATOR OF BOUNDARY DAM CARBON  
CAPTURE AND STORAGE (CCS) FACILITY, IN SUPPORT OF  
RESPONDENTS**

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**December 21, 2016**

## **CERTIFICATE AS TO PARTIES, RULINGS, AND RELATED CASES**

### **A. Parties and Amici**

With the exception of *Amicus Curiae* Saskatchewan Power Corporation, all parties, intervenors, and amici appearing before this court are listed in the Respondent EPA's Initial Brief.

### **B. Rulings Under Review**

References to the rulings at issue in this case appear in the Respondent EPA's Initial Brief.

### **C. Related Cases**

References to related cases appear in the Respondent EPA's Initial Brief.

## **CIRCUIT RULE 26.1 DISCLOSURE STATEMENT**

SaskPower is wholly owned by the Government of Saskatchewan. The Corporation was established in 1929 and is the leading electricity supplier in the province of Saskatchewan. As of December 31, 2015, the Corporation serves approximately 552,000 customers spread across a geographic service area of nearly 252,000 square miles. SaskPower owns and maintains approximately 98,000 miles of power lines, 55 high voltage switching stations and 194 distribution substations and has interties at the borders with Manitoba, Alberta and North Dakota.

SaskPower owns and manages over \$10 billion CAD in generation, transmission, distribution and other assets. SaskPower owns and operates five natural gas generating stations, three coal-fired power stations, seven hydroelectric stations and two wind facilities. They have a combined capacity of 3,542 megawatts (MW). SaskPower also has power purchase agreements in place with independent power producers for an additional 895 MW giving a total generation capacity of 4,437 MW. The corporation has approximately 3,150 full time employees and annual revenues of \$2.296 billion CAD.

**RULE 29(c)(5) STATEMENT**

Pursuant to Fed. R. App. P. 29(c)(5), Saskatchewan Power Corporation states that no party or party's counsel authored this brief in whole or in part, that no party or party's counsel contributed money that was intended to fund preparing or submitting the brief, and that no other person besides amici or their counsel contributed money that was intended to fund preparing or submitting the brief.

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### **INTEREST OF *AMICUS CURIAE***

The *amicus curiae* is Saskatchewan Power Corporation (“SaskPower”). The *amicus curiae* wishes to supply the Court with information regarding its Boundary Dam Carbon Capture and Storage (“CCS”) Facility in Saskatchewan, Canada. References to the business decisions and operational results of this facility have been included by Parties to this proceeding. The *amicus curiae*, having first-hand knowledge of practical application of CCS, can inform the Court on its experience, lessons learned and cost considerations for the technology that is a foundational element of the actions of the U.S. Environmental Protection Agency (“EPA” or “Agency”) under the Clean Air Act (“CAA”), published at 80 Fed. Reg. 64,510 (Oct. 23, 2015) (“Rule”).

The *amicus curiae* is interested in this case because it owns a major, showcase post combustion CCS facility on a coal-fired power plant and has successfully captured and stored carbon at an amount of over one million tonnes of carbon dioxide (CO<sub>2</sub>) in just over a year of operations. The *amicus curiae* does not own the technology and thus has no direct business interest in its sale in the United States as a result of the EPA Rule.

## SUMMARY OF THE ARGUMENT

Under CAA § 111, 42 U.S.C. § 7411, there is a requirement for EPA performance standards to be based on “adequately demonstrated” systems of emission reductions that take into account cost and energy requirements. The *amicus curiae* has been operating a CCS facility and intends to provide insight on business considerations behind SaskPower’s decision to apply CCS; current system operation status; and the future application of, and potential cost reductions related to, the technology.

Established in 1929, SaskPower is Saskatchewan’s leading energy supplier. SaskPower manages over \$10 billion CAD in generation, transmission, distribution and other assets. SaskPower operates five natural gas stations, three coal-fired power stations, seven hydroelectric stations and two wind facilities. Combined they generate 3,542 megawatts (MW) of electricity. SaskPower also buys power from various independent power producers bringing the total of available generating capacity to 4,437MW. As of December 31, 2015, the company serves approximately 552,000 customers spread across a geographic service area of nearly 252,000 square miles. SaskPower owns and maintains approximately 98,000 miles of power lines, 55 high voltage switching stations and 194 distribution substations and has interties at the borders with Manitoba, Alberta and North Dakota.

Traditionally, coal has been widely used in Saskatchewan as it is a secure, economical, well-developed and extremely reliable source of baseload energy. Today SaskPower has approximately 1,400MW of coal-fired generation capacity, which accounts for 38% of its total generating capacity.

On July 1, 2015, new Canadian Federal Government performance standards came into effect in Canada that apply to new coal-fired electricity generating units and units that have reached the end of their useful life, nominally 50 years. As a result of these regulations and a recent Canadian Federal Government announcement (November 2016), the long-term operation of conventional coal generation is no longer an option in Canada.

In October 2014, SaskPower launched the Boundary Dam Integrated Carbon Capture and Storage project. The project transformed an existing generating unit at SaskPower's aging Boundary Dam Power Station into a long-term producer of 115 MW of baseload electricity. The addition of carbon capture and storage (CCS) represents the largest environmental upgrade for a coal-fired power station in Canada. Captured CO<sub>2</sub> from the CCS plant is transported by pipeline to nearby oil fields in southern Saskatchewan where it is used for enhanced oil recovery (EOR). CO<sub>2</sub> not used for EOR is stored in a deep saline formation known as Aquistore.

Months after the initial start-up of the capture facility, SaskPower experienced various issues with a number of sub-systems within the process;

however, the company worked to develop solutions to fix them. Such challenges are not uncommon in a large-scale industrial project during the early stages of operation.

The CCS facility has proven the nameplate 90 percent capture rate. Current operations allow SaskPower to meet its regulatory and off-taker commitments. As of November 30, 2016, the capture facility has captured a total of 1.275 million tonnes of CO<sub>2</sub> with the capture of 800,000 tonnes in a twelve consecutive month period. As well, as of November 30, 2016, Aquistore has received a total of 100,000 tonnes of CO<sub>2</sub>.

SaskPower has a significant interest in the outcome of the present case, and insight into its CCS-related business decisions, operating history, expertise and lessons learned will assist the Court in evaluating the claims of the parties.

SaskPower is in a unique position because the Corporation actually owns the CCS facility and knows the actual facts and outlooks including cost assumptions.

SaskPower is currently considering its next CCS retrofit, and estimates that there may be a 20-30% cost savings compared with the first.

## ARGUMENT

### **I. BUSINESS CONSIDERATIONS BEHIND SASKPOWER'S DECISION TO APPLY CARBON CAPTURE AND STORAGE**

The business case for SaskPower's Boundary Dam Unit 3 was developed in 2009-10. SaskPower's obligation to its shareholder (Government of Saskatchewan) and the people of Saskatchewan required the quantification of economic, reliability, environmental and sustainability values along with relevant socio-economic indicators.

The business case was established within SaskPower's short term supply requirements, cognizant of the potential for pending Canadian Federal regulations related to coal-fired generation. The business case utilized a levelized cost of electricity (LCOE) methodology which is an industry accepted practice for comparing projects of differential technologies, size, investments and life spans. The LCOE is an evaluation of the life cycle energy costs and life cycle energy production. In addition, sensitivity and risk assessments related to market volatility, technology, capital costs and contracts were assessed.

A key element essential to the business case analysis was the retrofit of the power station. The price of labour and materials were at levels that reflected a growing economy thereby making a retrofit a preferred option, in contrast to a greenfield option, along with the fact that there was a skilled labour force in place to operate a retrofitted plant, which may or may not be the case in another location.

In addition, the retrofitting of the plant would be undertaken close to the time of full depreciation of the unit. This opportunity allowed SaskPower to provide reliable and efficient electrical generation without incurring the ancillary infrastructure costs of a green-field plant (*e.g.*, switching yards and transmission facilities).

SaskPower's analysis also took into consideration the value that would be realized over the next 30 years of operating the retrofitted power plant from the sale of electricity and by-products from the generation and capture of CO<sub>2</sub> and other by-products which would help to offset the costs. The forecasted potential for CO<sub>2</sub> sales and price over the next few decades was such that a long-term contract was not required to be in place before a decision was made. The business case further assumed that the capture plant would operate at 90 percent capacity and produce approximately 3,250 tonnes of CO<sub>2</sub> per day, all of which would be sold.

Additionally, the business case considered the macro-economic implications for Saskatchewan, which included the continuing jobs at the coal mine, as well as the construction jobs associated with the conversion. An independent third party review validated estimates, assumptions and operating parameters.

A further enabling factor for the business case was the contribution of \$240 million CAD in funding provided by the Federal Government of Canada which initially represented approximately 20 percent of the capital cost. The remainder

of the project cost was borne by SaskPower and considered within the rate base. There was no direct provincial contribution. The Federal contribution was part of a much larger subsidy to projects in Alberta that were proposed at approximately the same time. This was considered one off, with no implications for future CCS investments.

The decision to proceed with the Boundary Dam Integrated Carbon Capture and Storage project was based on many years of research into various CCS options that reflected the most strategic and sustainable choice at that time.

## **II. CURRENT SYSTEM OPERATIONS AT SASKPOWER'S BOUNDARY DAM CCS FACILITY**

The Boundary Dam Integrated Carbon Capture and Storage project became operational on October 2, 2014. The project has transformed the aging Unit #3 at Boundary Dam Power Station near Estevan, Saskatchewan into a reliable, long-term producer of 110 - 115 MW of base-load electricity. Unit 3 at Boundary Dam has a designed capacity of one million tonnes of CO<sub>2</sub> per year. CO<sub>2</sub> from the project is primarily sold and transported via pipeline for enhanced oil recovery in nearby oilfields. CO<sub>2</sub> not utilized for enhanced oil recovery is transported via pipeline, injected and stored in a safe, permanent, deep saline formation, known as Aquistore.

After the October 2014 launch, SaskPower anticipated issues as it moved from commissioning the process to ongoing full time standard operations. Some of

the issues that arose after start up and into mid-2015 included: design defects; deficient equipment; flue gas heat issues; and, amine degradation challenges.

SaskPower continuously monitors the chemistry at the capture plant, the fundamental core of the facility. The chemistry solution worked “right out of the box” on start-up; however, since then the facility experienced some challenges. The immediate difficulty was inadequate cooling as the flue gas entered the capture plant at an excessive temperature, which then created a number of problems in combination with the remaining particulates in the flue gas that various processes did not remove. While the particulate removal systems worked to design, the remaining contamination in the flue gas affected the capture rate and required more frequent cleaning of the facility than had been anticipated. While these problems were not specifically anticipated, there was the expectation that some practical difficulties would arise after the plant was commissioned. Since a major outage in September – October 2015, the facility’s performance has been much improved and a further outage in the summer of 2017 will address a number of remaining deficiencies. These outages were, and will be, part of the normal two-year cycle of planned maintenance outages that all SaskPower’s coal-fired units undergo. SaskPower anticipates daily capture rates and reliability to be significantly improved after next year’s planned outage.

The fall of 2015 outage was specifically designed to deal with the early operating problems that arose in the first months of operation, as noted above. This outage involved five main components: regularly scheduled maintenance; mechanical fixes related to a variety of system components that were needed to achieve full capture capacity; relocating various vents for safety reasons; cleaning of various components; and replacing the containment vessel that holds the main chemical solution used by the process.

The capture unit was brought back online and from November 14-16, 2015, SaskPower successfully tested the maximum capacity of the process, capturing approximately 3,240 tonnes per day of carbon dioxide or 90% of the daily CO<sub>2</sub> produced by the power unit. The design parameters have, therefore, been demonstrated.

The operational issues faced are not a unique experience with any industrial process. As issues were identified, SaskPower worked to develop solutions and gained meaningful insights into operations and efficiencies. The lessons learned during this time will be helpful for any future carbon capture and storage projects, whether undertaken by SaskPower or another party, which should result in reduced costs and even better and more reliable performance.

SaskPower celebrated a milestone in July 2016, when the company captured the millionth tonne of carbon dioxide from inception. As of November 30, 2016,

the company has captured 1.274 million tonnes of CO<sub>2</sub>. SaskPower captured 800,000 tonnes in the twelve months from November 2015 to October 2016, being the objective for the period. Since bringing the facility back online in 2015, taking into account regular maintenance and unscheduled down time resulting from the power unit and/or the capture facility, the CCS process has operated at a 80% percent capacity level at the designed reliability factor of 85% (which accommodates derates at the power plant as well as any unexpected down time at the Carbon Capture Facility). It needs to be noted that planned and unplanned maintenance and outages are not unique to the capture facility but are a standard operating reality with any generation unit. The operating target of 800,000 tonnes of CO<sub>2</sub> captured has allowed SaskPower to meet its offtaker and regulatory commitments. SaskPower has also delivered over 100,000 tonnes of carbon dioxide to Aquistore, where it is stored permanently and safely underground.

Today, SaskPower is focusing on consistent, reliable operations. This includes routine scheduled maintenance to ensure both the plant and the capture processes are working efficiently and safely. The company will also continue to assess the various levels of operation that will make the process as efficient and cost-effective as possible.

### **III. SASKPOWER PROSPECTUS ON FUTURE APPLICATION OF CCS AND COST REDUCTIONS RELATED TO THE TECHNOLOGY**

The investment in additional carbon capture and storage facilities by SaskPower will require a sound business case. SaskPower continues to evaluate options for the remainder of its coal fleet as part of its long-term business plan with consideration of regulatory requirements and parameters of an equivalency agreement between Saskatchewan and the Federal Government of Canada. Conceptually, the notion of an equivalency agreement is to allow the province to administer regulations pertaining to greenhouse gas (GHG) emissions from coal-fired generation units on a fleet wide basis rather than by the age of each individual turbine. This promises to minimise the cost to the province and provided critically needed flexibility. The expectation is that an equivalency agreement will be reached in early 2017.

The analysis will once again involve a business case LCOE that will be a point in time analysis with forecasting over the 30-year life cycle time horizon along with sensitivity, risk and socio-economic analyses. SaskPower anticipates a decision on its next carbon capture and storage project by the end of 2017 for the next two oldest turbines in the fleet, Boundary Dam Units 4 and 5. As with any SaskPower business case, recent lessons learned from design, construction, commissioning and operations from past investment will inform the analysis. SaskPower has maintained, based on current experience, that savings of 20-30

percent could be realized with the retrofit of the next plant. As with all projects these savings would translate differently in various jurisdictions dependent of their working, environmental, technology selection and economic constraints/opportunities.

SaskPower is currently recognizing that carbon capture and storage has the potential to move beyond coal-fired generation as research is currently being contemplated or underway in other jurisdictions around the world with natural gas fired generation, biomass and other renewable options. Research is also underway for CCS options for other GHG emitting industries, such as cement. SaskPower will actively monitor the progress of these advancements and look for opportunities that support innovative, effective and efficient solutions for SaskPower as it maintains and expands its infrastructure while meeting provincial and federal regulatory requirements.

## **CONCLUSION**

For the foregoing reasons, the *amicus curiae* submits this brief in support of the Respondents.

Respectfully submitted,

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**CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME LIMIT,  
TYPEFACE REQUIREMENTS, AND TYPE-STYLE REQUIREMENTS**

I hereby certify that the foregoing brief complies with the type-volume limitations set forth in D.C. Cir. R. 32(e)(3) and Fed. R. App. P. 29(a)(5) because this brief is 2,480 words, excluding the parts of the brief exempted by Fed. R. App. P. 32(a)(7)(B)(iii) and D.C. Cir. R. 32(e)(1). The foregoing brief complies with the typeface requirements of Fed. R. App. P. 32(a)(5) and the type style requirements of Fed. R. App. P. 32(a)(6) because this brief has been prepared in a proportionally spaced typeface using Microsoft Office Word 2010 in 14-point Times New Roman font.

Respectfully submitted,

/s/ Jonathan K. Tycko

**CERTIFICATE OF SERVICE**

I hereby certify that on December 21, 2016, I filed Saskatchewan Power Corporation's *Amicus Curiae* Brief in Support of Respondents through the Court's CM/ECF system, which will send a notice of filing to all registered CM/ECF users.

I also caused the foregoing to be served via first-class mail on counsel for the following parties at the following addresses:

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