



## Boundary Dam 3 – Upgrades, updates and performance optimization of the world’s first fully integrated CCS plant on coal

Stavroula Giannaris  
The International CCS Knowledge Centre

Much of the world’s current energy needs are supplied by the combustion of non-renewable energy sources which release of enormous quantities of greenhouse gases, particularly carbon dioxide, to the atmosphere. Anthropogenic emissions of carbon dioxide (CO<sub>2</sub>) have been identified as a significant greenhouse gas contributor. The International Energy Agency (IEA) has estimated that CCS must be able to mitigate 94 giga-tonnes (GT) of CO<sub>2</sub> before 2050 to limit the global temperature rise to 2°C [1]. Large-scale CCS is the only technology that can reduce CO<sub>2</sub> emissions from existing infrastructure. Capturing the most carbon possible using affordable technology is key for CCS to be considered a major climate change mitigation option. Currently, CCS technologies have been applied to two utility-scale, coal-fired power plants worldwide; SaskPower’s BD3 Project and W.A. Parish’s Petra Nova Project.

Boundary Dam Power Station (Boundary Dam), located near Estevan, Saskatchewan, Canada, is one of three coal-fired power plants in the province. Boundary Dam consisted of six units, commissioned between 1959 and 1978 and had a total capacity of 882 MW. In 2010, SaskPower considered the future of its fleet and the implications of potential new environmental regulations and made the decision to retire Units 1 and 2 in 2013 and 2014 respectively. In addition, upgrades along with studies for a retrofit of carbon capture technology were considered and subsequently implemented at Boundary Dam Unit 3. Among carbon capture technologies considered for Boundary Dam Unit 3, post-combustion capture was the most promising. In October 2014, SaskPower’s Boundary Dam Unit 3 Carbon Capture Facility (BD3) went on line and became the world’s first utility scale, fully integrated post-combustion carbon capture facility on a coal-fired power plant. The captured CO<sub>2</sub> was to be used for enhanced oil recovery (EOR) in a nearby oil field and for test injection into a deep saline reservoir at a research project called Aquistore. CO<sub>2</sub>-EOR injection continues today. Overall the BD3 demonstration project transformed Unit 3 at Boundary Dam Power Station into a long-term producer of more than 110 megawatts (MW) of clean, base-load electricity, while demonstrating EOR potential in a fully integrated process.

As carbon capture and storage technologies seek to expand into other industries it is necessary to identify, review, and eliminate process bottlenecks that degrade the performance of the capture facility. Consequently, performance evaluation is becoming increasingly important. The capture





facility at Boundary Dam, has been operating since 2014, almost four years. During this time, there have been difficulties with the plant being able to supply the contracted CO<sub>2</sub> to its off-taker.

Corrections have been implemented to address operation issues. These corrections resulted in improvements that witnessed the following milestones:

- Operation for 3 days at design capacity (>3200 tonnes per day) by the end of 2015;
- Capture of 800,000 tonnes of CO<sub>2</sub> in the twelve months between November 2015 and October 2016;
- Total capture of 2,000,000 tonnes of CO<sub>2</sub> by March 2018; and
- Operation of the capture facility 98.3% of the time between January and April 2018.

