

SaskPower

CATCHING CARBON





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SaskPower, the electricity generating authority of the Canadian province of Saskatchewan, is in the final stages of completing a truly innovative programme that has attracted the attention of environmentally aware power utilities from across the world

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Boundary Dam
power station

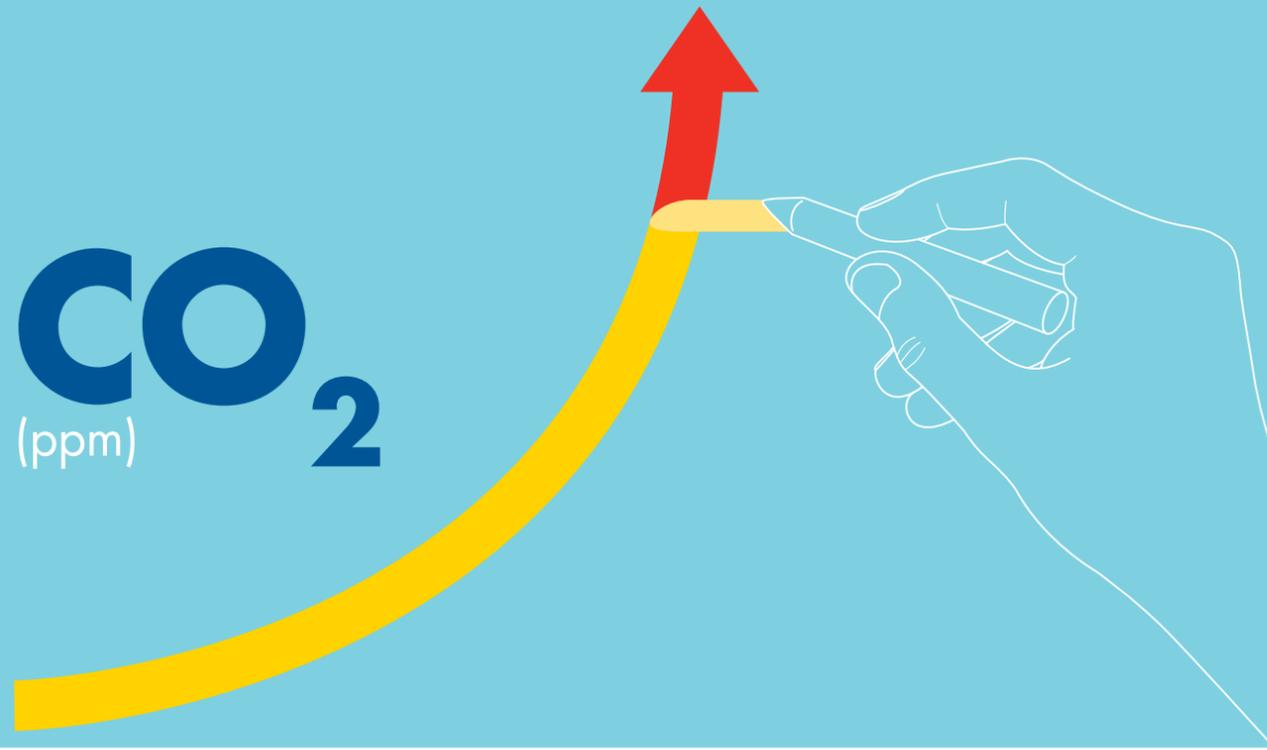
Saskatchewan covers a similar area to Texas, the largest of the United States barring Alaska, but while Texas has nearly 26 million people Saskatchewan is home to just 1.1 million. Some might say that would make it much easier to supply power to everyone, but considering the power grid covers the entire province from the 49th to the 60th parallel that is not necessarily so. “We have a significant infrastructure to maintain,” says the CEO of SaskPower Robert Watson, “and I think we do a good job.”

This is a growing province. Its energy consumption increased last year by 6.4 percent so SaskPower has all the normal problems of keeping the lights burning over a huge area and in conditions that has just experienced one-in-60 severe winter conditions. To do that the utility has a mix of generating options on stream: no nuclear but 25 percent hydro and 30 percent gas fired generation. The strategy is to maintain and increase that diversity and there are a number of options here. Manitoba to the east has huge hydroelectric resources

“Five years ago SaskPower started to guarantee production from private suppliers: today it has eleven such agreements”

that Saskatchewan could buy into, and five years ago SaskPower started to guarantee production from private suppliers: today it has eleven such agreements including three gas plants and two windfarms in the scheme, and will continue to encourage small scale enterprises of this sort, through its Small Power Producers programme says Watson.

However the lion’s share of power is, and will continue to be, provided by coal. The company’s three coal fired power stations, Boundary Dam, Poplar River and Shand, are

CO₂ Concentration evolution in atmosphere

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Poplar River
power station

“There are hardly any logistical challenges or supply risk – we just bring it to the surface and burn it”

all situated on the southern Saskatchewan coalfield, right on top of the reserves that feed them. That is a considerable bonus for the company says Watson: “There are hardly any logistical challenges or supply risk – we just bring it to the surface and burn it.”

Of course it is not quite as simple as all that. Coal is supposed to be in the descendant, being phased out by greener alternatives. But there are ways coal can continue to be viable in the face of ever more rigorous environmental legislation – indeed ways its disadvantages can be turned into positives. Saskatchewan is in front in America and globally in realising that vision. Its Boundary Dam Carbon Capture and Storage (CCS) project is leading the way to make a viable, technical, environmental and

economic case for the continued use of coal.

The project is the world’s first and largest post-combustion capture, coal-fired energy generation project of its kind, a \$1.35 billion partnership between the Government of Canada and SaskPower. At last, power utilities will be able to study the full integration of a rebuilt coal-fired generation unit with carbon capture technology into the operation of a commercial power station, resulting in low-emission electricity and at the same time producing carbon dioxide (CO₂) for enhanced oil recovery operations or storage in a deep saline formation underground.

In late 2010, SaskPower kick started the project by committing to rebuild the ageing Unit 3 boiler at Boundary Dam, installing a



Robert Watson
President and CEO

Before joining SaskPower in August 2010, Mr. Watson served as president and CEO of SaskTel. Prior to that appointment he held several senior executive positions in the Canadian communications industry. Mr. Watson is a graduate in electrical technologies from Ryerson University. He has attended the international executive development program at the INSEAD Centre in Fontainebleau, France, as well as the executive management program at Ashridge Business School in the United Kingdom. He also holds an ICD.D designation from the Institute of Corporate Directors. Mr. Watson currently serves as a Board Member for the Canadian Electricity Association, Energy Council of Canada and the Canadian Nuclear Association. In the community, Robert is a recipient of the Saskatchewan Centennial Medal, serves on the Prostate Cancer Canada Board and on the Board for One Life Makes a Difference.

“It is to SaskPower’s credit that with the support of provincial and federal governments it has turned a problem into an opportunity”

state-of-the-art steam turbine, extending the plant’s lifespan by 30 years and at the same time ensuring it can operate with the planned carbon capture system. Early the following year Babcock & Wilcox were contracted to carry out that work, which has proceeded much as planned, though rebuilding the power facility is taking a little longer than anticipated. “When you take these old units apart you don’t know what you are going to find,” admits Watson.

SNC Lavalin and Shell subsidiary Cansolv Technologies Limited were selected in March 2010 to oversee EPC activities and in July 2011 SaskPower placed a \$30 million contract with Stantec for engineering consultancy during the design and construction of the system. The good news is that the new facility for capturing sulphur dioxide (SO₂) and CO₂ will be ready to run as soon as the remaining work on upgrading the boilers and associated steam pipework has been completed.

It is to SaskPower’s credit that with the support of provincial and federal governments it has turned a problem into an opportunity. Doing nothing was not an option. Canadian federal legislation being introduced in 2015 says that old coal-fired power stations must close down if they can’t meet new performance standards fixed at 420 tonnes of carbon dioxide per gigawatt hour. “Our unit is expected to achieve emissions in the



Shand power station

region of 150 tonnes of CO₂/GWh. It will beat almost any gas plant out there for emissions,” Watson enthuses.

Sulphur dioxide will be made into sulphuric acid and sold, and the CO₂ that till now was nothing but a nuisance will start to earn its living. Using a pioneering amine-based carbon capture process developed by Cansolv, the gas will be sold to the Canadian oil extraction company Cenovus which will pump it 1.5 kilometres down into its adjacent oil resources. Enhanced oil recovery (EOR) using CO₂ is a well tried technology that Cenovus has been using at its Weyburn facility for ten years: the CO₂ molecules attach to the heavy oil, reducing its viscosity of the oil, forcing more of it to the surface, where it is stripped out and recycled by the oil company. The proportion

Did you know?

5 million
Hours worked
without LTI

1 million tonnes
of CO₂ will be
captured annually
by Boundary
Dam CCF

of the gas that is not reused stays underground permanently, so one way or another it is all kept from re-entering the atmosphere. The project will thus transform the Boundary Dam power station into a reliable, long-term producer of 110 megawatts (MW) of base-load electricity and the CCS facility will capture approximately one million tonnes of CO₂ per year (the equivalent to taking 250,000 vehicles off the road every year).

CO₂ from the project not used in enhanced oil production will be stored in a safe, permanent deep saline formation, the nearby Aquistore Project, hosted by SaskPower and run by the Petroleum Technology Research Centre (PTRC). Research has shown that CO₂ can be safely and permanently stored in underground geological formations: what the combination of

Boundary Dam
power station

“We aim to create a real centre of excellence here in southern Saskatchewan”

what is the world’s first post-combustion coal-fired carbon capture facility with Aquistore and the EOR plant will finally demonstrate is the commercial viability of carbon capture to energy authorities across the world. The final piece of the jigsaw is a joint venture with Mitsubishi Hitachi Power Systems located at SaskPower’s Shand facility. The Carbon

Capture Test Facility (CCTF) which will test a range of carbon capture technologies and assess their viability. What makes the CCTF unique is that it has been sized to manage measurement uncertainty and is the only facility emerging from a full-scale project.

It should be in operation around the same time as the Boundary Dam facility comes

on line. “We will get the project running this year and then we will run it for a couple of years to just ensure its integrity and precisely what level of efficiency we can get out of our carbon capture facility,” says Robert Watson. “We aim to test not only the technology itself but also the operating processes, the financial model and the regulatory model creating a real centre of excellence here in southern Saskatchewan.”

Totally focused this year on completing not one but three big coal projects, he is looking forward to unveiling his vision and SaskPower’s leadership at a symposium to be held at the end of September in the Saskatchewan provincial capital Regina. It will

be a great opportunity not only to showcase SaskPower as a company but to pay tribute to the teams that have delivered the facility, to whom he gives all credit, and will not fail to mention their outstanding safety record with over 5 million hours worked without a single lost-time incident. **BE**

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