Extending the Life of the Sundance Generating Station in Alberta using Coal-to-Gas Conversion

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The Sundance generating station (**Sundance**) is the largest coal-fired generating facility in Alberta. It is located about 70 kilometres west of the City of Edmonton, and has a generating capacity of 1,861 MW – down by about 280 MW after the January 1st retirement of one of its coal units. It is also the oldest operating coal generating facility in Alberta. The first of six generating units at Sundance was commissioned in 1970, and the sixth and final generating unit was commissioned in 1980. Sundance is 100% owned by TransAlta, one of the oldest generators in Alberta, with roots that trace back over 100 years to the original electrification of the province.

Ontario readers might think of Sundance as being Alberta's Nanticoke, albeit Nanticoke was about twice the size of Sundance. Both generating facilities were commissioned around the same time, and built out over the 1970s. Everyone knows what happened to Nanticoke. It was shut down between 2010 and 2013, and the current expectation is that Nanticoke will be permanently decommissioned. Like Nanticoke, absent a fundamental change in climate policy or an emissions reduction breakthrough, Sundance's life as a coal-fired plant will soon come to an end. This is because Alberta has decided to phase out coal by 2030 and, more importantly, Canada's federal government requires that coal units be retired after 50 years, if they cannot meet strict emissions standards.

TransAlta is a publicly held generator employing smart people to think about how best to optimize, repurpose and leverage the assets it owns at Sundance. Those assets include, among other things, a permitted brownfield site that is interconnected to existing transmission lines, access to fresh water from Lake Wabamun, and a skilled and experienced workforce drawn from a supportive local community. Anyone trying to greenfield a new thermal power project in Canada, or anywhere in the world for that matter, understands why TransAlta is not about to walk away from those Sundance assets.

One option is for TransAlta to build a new power plant near the Sundance site. You won't be surprised to hear that TransAlta teamed up with MidAmerican Energy Holdings Company, from the United States, to develop Sundance 7. Sundance 7 is an 856 MW combined cycle natural gas-fired generating station proposed to be located close to

Sundance, and that has already been approved by the Alberta Utilities Commission. Sundance 7 will make use of the Sundance assets if TransAlta decides to proceed with its construction, a decision that has been put on hold for now.

The other option for TransAlta, perhaps as a bridge to one day constructing Sundance 7, is to extend the life of Sundance by converting the generating facility from coal to natural gas. That appears to be the path that TransAlta will take for Sundance. According to TransAlta, coal-to-gas () conversion at Sundance makes sense because:

1. CTG conversion will reduce CO2 emissions intensity at Sundance by about 50%, and almost eliminate particulate emissions completely. The reduction of CO2 emissions means real savings for TransAlta given Alberta's $30 per tonne carbon price, and Alberta's recent move to an output-based methodology for calculating the carbon levy that has, on average, tripled the cost of carbon for coal generation. Yes, the fuel cost (natural gas instead of coal) will likely increase after a Sundance CTG conversion, but that increase will be more than offset by savings in carbon costs at Sundance. Plus, those carbon savings become even bigger if we move to a $50 per tonne carbon price in 2022 as Canada's federal government is proposing for the country.
2. CTG conversion is proven technology that can be implemented quickly (18 month total process but only 60 days to build), and cheaply, as the cost of a CTG conversion is less than 10% of the cost to build a new combined cycle gas plant with the same generating capacity. It also results in lower operating, maintenance and sustaining capital costs than would be incurred if Sundance continued to be fueled by coal.
3. CTG conversion will also likely work well in the capacity market that Alberta will introduce in 2021. The low capital cost to convert Sundance should help TransAlta clear and earn capacity payments from that new capacity market. In addition, if TransAlta gets cheap natural gas prices going forward, and some decent power pool prices (perhaps with some nice price spikes), a converted Sundance plant could also earn a profit in the wholesale energy market that will co-exist with the new capacity market.
4. CTG conversion will extend the life of the units at Sundance by up to 15 years. As noted above, some of the units at Sundance are already pushing up against the federal government's 50 year life. CTG conversion will allow them to continue to operate as gas-fired plants until certain other existing federal emission standards applicable to converted coal plants become difficult to meet down the road.

For these reasons TransAlta told its investors in December that it intends to convert 2,600 MW of its Alberta coal fleet to natural gas by 2022. By our count that is the conversion of Sundance units 3 through 6, and Keephills (another TransAlta coal generating station located near Sundance) units 1 and 2. TransAlta has already signed a letter of intent with Tidewater Midstream to construct a 120 kilometre 130 MMcf/d natural gas pipeline from Tidewater's Brazeau River Complex to the Sundance and Keephills facilities. This pipeline will be in service by 2020. TransAlta has also begun retiring and mothballing some of the units at Sundance, as it prepares to convert them to natural gas for offer into the new capacity market. It has announced that by April 1st four of the six units at Sundance will either be retired or mothballed, leaving only about 800 MW of capacity at Sundance generating electricity. TransAlta believes that CTG

conversion will cumulatively extend the life of its coal fleet by about 75 years, and add over $1 billion of incremental cash flow to its operations between 2021 and 2039.

TransAlta is not alone in this regard. ATCO has also announced that it will convert its coal plants (Battle River and Sheerness) to natural gas in the same time period. Capital Power, which owns (in some cases jointly with TransAlta) the newer supercritical coal-fired and less carbon emitting generating stations, has said the question is not if it will convert its coal plants to natural gas, but when it will convert them to natural gas. AlbertaPowerMarket.com expects Capital Power's newer coal plants to operate longer, perhaps right up until 2030, either as pure coal plants or as plants that are co-fired with a mixture of coal and gas or biomass.

One could say that TransAlta, and the other coal plant owners, hope to make lemonade out of the lemons that climate change dropped on their doorstep. After all, we do live in a time where repurposing assets and adapting to change is commonplace. In any event, they are definitely going to leverage the assets that exist at their coal facilities, and not simply throw in the towel and send them to the dump.

There are of course some external factors that may impact CTG conversion plans. Capacity market design is one of those factors. In particular, whether or not the design of the capacity market, including its impact on the energy market, will be favourable for CTG conversion. Also, some stakeholders are asking whether old CTG converted plants, as opposed to new gas-fired plants or new hydro or other forms of dispatchable power plants, should be the future source of electricity in Alberta. We will leave that for the Alberta Electric System Operator (AESO) and the market to sort out, but it seems clear to AlbertaPowerMarket.com that CTG conversion is a low cost alternative for the province to extract some of the remaining value out of its coal generating stations, like Sundance. CTG conversion could also buy us some time, and serve as a short-term bridge for Alberta to transition to other cleaner sources of dispatchable electricity. Those cleaner sources might include the on-demand or dispatchable renewable, with energy storage, sources of electricity that are maturing, and that the AESO announced last week it is investigating for the province.

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