

Innovation: Applied Technologies

TransAlta has been at the forefront of innovation in the power generation sector since the early 1900s when we developed hydro assets. To add context, these assets were developed at the same time as the automobile. We have been an early adopter and developer of wind technology in Canada and are now one of the largest wind generators in the country. Today we run a Wind Control Centre, the only one of its kind in Canada, that monitors, to the second, each and every wind turbine we operate across North America. In 2015, we made our first investment in solar technology with the purchase of a 21 MW solar facility in Massachusetts.

As we move towards our vision of becoming the leading clean power corporation in Canada by 2025, we continue to seek solutions to innovate and create value for investors, society and the environment. This is evidenced by our announcements of the accelerated coal-to-gas conversion plans, the expansion of our Kent Hills wind farm in New Brunswick, the 90 MW Big Level and 29 MW Antrim wind development projects in the US, the 207 MW Windrise wind development project in Alberta, proposed solar development on our reclaimed mine site at our Centralia facility in Washington State, and the exploration of hydro expansion.

We are keeping up to date with power technologies that have the potential to redefine power markets today and in the future. Innovation is constantly happening on a more micro scale at TransAlta. For more information on innovation at TransAlta, please visit www.transalta.com/about-us/innovation.

In addition, our teams continuously explore the use of applied or new technologies to find solutions to expand or adapt our fleet in an ever-changing world, which helps protect our shareholder value and maintain delivery of reliable and affordable electricity. The following are further examples of how we have developed innovative solutions to optimize and maximize value from our fleet:

Operations Diagnostic Centre

TransAlta has run its Operations Diagnostic Centre ("ODC") since 2008. The ODC monitors coal-fired, gas-fired and wind-generating assets across Canada, the United States and Australia. A centralized team of engineers and operations specialists remotely monitors our power plants for emerging equipment reliability and performance issues. ODC staff are trained in the development and use of specialized equipment monitoring software and can apply their experience in power plant operations. If an equipment issue is detected, the ODC notifies plant operations to investigate and remedy the issue before there is an impact to operations. The monitoring, analysis and diagnostics completed by the ODC are focused on early identification of equipment issues based on longer-term trend analysis and complements day-to-day plant operations.

Operational Integrity Program

Our Operational Integrity program is the integration of sustainability, specifically safety, into asset management. It is a program designed to achieve process and equipment safety by understanding and monitoring key operational risks and implementing mitigation measures. Consider it proactive safety. In 2017, we put into place our Total Safety Management System, which integrates our work in process safety with our existing strength in occupational safety programs. We continue to see a positive increase in self-reporting and addressing process safety hazards as awareness and new tools are being introduced. This is evidenced by our trend in safety incidents, which decreased in 2018 to an IFR of 0.54 (2017 - 0.72). This was one of our best safety performance years in our history. Our goal is zero and the Operational Integrity program is a tried and tested tool to help propel us closer to this goal.

Social and Relationship Capital

Creating shared value for our stakeholders is the key to social and relationship value creation at TransAlta. The most material impacts on our social and relationship performance are public health and safety, anti-competitive behaviour and fostering better relationships with Indigenous neighbours, communities, stakeholders, governments, industry and landowners where we operate.

Public Health and Safety

We seek to ensure public health and safety through measures that include restricting physical access to our operating sites and minimizing our environmental impact. It is our goal to keep safe our employees and the peoples and communities where we operate.

We specifically look to minimize the following risks:

- harm to person(s),
- damage to property,
- increased liability due to negligence, and
- loss of organizational reputation and integrity.

We actively monitor air emissions from our coal and gas plants. Our large coal facilities have Continuous Emissions Monitoring Systems in place, which help us monitor our pollutant emission levels to ensure they are in line with acceptable limits. When we are in breach of regulatory limits we report this to regulatory bodies and conduct a root cause analysis to understand how we can eliminate future breaches from occurring. In 2018, we had two mercury exceedance events at our Centralia coal plant and one NOx stack breach at our Sundance facility. All of the events were captured through our monitoring systems and resolved quickly as a result. These incidents were all reported to regulatory bodies and were deemed to be minor.

Of note, our coal plants currently capture 80 per cent of mercury emissions and the majority of particulate matter emissions. Both mercury and particulate matter emissions have been deemed harmful to human health, which we recognize and work to minimize through capture. The health impact risk from emissions that do reach our environment is minimized due to the location of our plants, which are located away from urban environments. Independent studies dated Nov. 19, 2015, and conducted by University of Alberta scientist Dr. Warren Kindzierski, using provincial government monitoring data over nine years, also show that approximately 10 per cent or less of all particulate matter in the airshed in the largest urban environment close to our facilities, Edmonton, can be attributed to coal combustion emissions. Chemical "signatures" for emissions pointed to several sources of air quality concern in Edmonton, including local industry, vehicles and wood-burning fireplaces.

Assuming reasonably anticipated growth and operating scenarios, we expect future GHG emissions and air pollution emissions performance will be dramatically reduced in respect of our existing assets as we execute our coal-to-gas conversion strategy. GHG emissions from coal are expected to be cut within the range of 60 per cent or 12 million tonnes carbon dioxide equivalent (CO₂e). We currently capture 80 per cent of mercury emissions at our coal plants and mercury emissions will be eliminated following the coal-to-gas conversion. Particulate matter and sulphur dioxide emissions will be virtually eliminated or considered negligible post-coal-to-gas conversion and diesel burn. Our nitrogen dioxide emissions will also be reduced in the range of approximately 50 per cent.

Indigenous Relationships and Partnerships

The focus of our efforts in this area is to fulfill TransAlta's principles for engagement and ensure we live up to its commitments with Indigenous neighbours. Efforts are focused on building and maintaining solid relationships and establishing strong communication channels that enable TransAlta to share information on operations and growth initiatives, gather feedback to inform project planning and understand priorities and interests to better address concerns.

Specifically, our Aboriginal Relations team continues to develop and enhance aboriginal relations in areas of employment, economic development, community engagement, and investment.

Each year, TransAlta provides seven \$3,000 bursaries for post-secondary and three \$1,000 bursaries for trades students to support the success of Indigenous students in their educational programs. TransAlta's criteria for accessing the bursary includes any educational pursuit that will support the wellbeing of Indigenous peoples and communities. The bursary is open to all Indigenous applicants that have completed high school. Through agreements and ongoing relationship commitments TransAlta makes information on employment positions available to Indigenous communities and provides sub-contractors terms and conditions to include Indigenous content considerations for procurement initiatives.

In 2017, we once again achieved the Canadian Council for Aboriginal Business's silver-level Progressive Aboriginal Relations (PAR) certification. Certification occurs every three years. In 2016, we introduced our STAR tracking program, which functions as a communication record-keeping and engagement measurement tool. This capacity fulfills our requirements for consultation with stakeholders and aboriginal groups alike, and is capable of producing reports (notably, government reports) as proof of engagement and consultation efforts.

In 2018, to further support access to education TransAlta created an Indigenous Gap program with the Southern Alberta Institute of Technology (SAIT) to provide support to Indigenous students who need high school upgrading in order to enter a trade program.

In 2017, we supported an Indigenous Leadership Program at Banff Centre for Arts and Creativity. Approximately 250 Indigenous leaders from over 120 communities attended the leadership programs with help from TransAlta and other supporters.

Over the past five years, TransAlta's support has provided 39 scholarships for members of Indigenous communities to attend the programs and take that learning back to their communities. Those participants have come from communities across Alberta and British Columbia including the First Nations of Alexis Nakota Sioux, Bearspaw, Chiniki, Enoch Cree, Ermineskin Cree, Fort McKay, Kainai, Montana, Paul, Piikani, Samson Cree, Siksika, Squamish, Tsuu T'ina, and Wesley.

Stakeholder Relationships

Relationships matter to TransAlta. Driven by our values, we seek to maximize value creation for our stakeholders and TransAlta.

TransAlta Stakeholders

Regardless of who our stakeholders are or who they represent, our goal is to act in the best interests of the Corporation and to create either financial, environmental or social value for both our stakeholders and TransAlta. Major stakeholder categories can be summarized as shareholders, debt holders, business partners, contractors, consultants, customers, community organizations, employees, governments, Indigenous groups, industry and professional bodies, media, NGOs, public and regulatory affairs, residents and suppliers. This too encompasses our value chain. Our mindset is value creation across this chain through the development of relationships and partnerships.

Engagement Framework

Our stakeholder engagement framework is modelled and closely tied to the stakeholder engagement aspect of ISO 14001, which is an internationally recognized environmental management standard. This framework is a streamlined corporate-wide approach to ensure that engagement and relationship-building practices are consistent across TransAlta's locations and types of work.

Methods of Engagement

In order to run our business successfully, we are in consistent two-way communication with the majority of our stakeholders, some more than others. As an example, our dialogue with customers is daily, iterative and takes on many forms including meetings (in-person, virtual, and one-one), calls, emails, newsletters and feedback systems (online loops). It is both proactive and reactive. Our approach and our goal is to be proactive, which is communicating consistent messaging and information, while being transparent. There are often times we will need to be reactive, such as to a customer complaint, and we commit to timely and professional resolution using values-based dialogue. We then work to identify how to mitigate further issues, moving back to our proactive approach.

Part of our business is growth, which we achieve by developing or purchasing new assets. We proactively engage with many stakeholders in all of our geographic operating areas in Australia, Canada and the United States in order to develop and maintain relationships; assess needs and fit; and to seek out collaborative and sustainable value creation opportunities.

Recently we completed construction of our South Hedland 150MW combined-cycle plant in Western Australia. The project took four years from RFP to commercial operation. Achieving construction and commercial operation was the outcome of successful stakeholder engagement and collaboration. We recently announced our coal-to-gas transition plan, secured by way of collaborative stakeholder engagement. This plan involved signing a Memorandum of Understanding with the Alberta government, which highlights the project fit for Alberta, not just TransAlta. The coal-to-gas project is expected to significantly reduce the environmental impact from coal (a reduction in air pollution and GHG emissions) while enabling the transition and addition of 5,000 MW of renewable energy by 2030.

More details on our stakeholder engagement activities can be found via our social media channels.

Engagement Tracking and Reporting

Our Stakeholder and Indigenous Relations tracking program functions as a Corporation-wide communication record-keeping tool, which is managed by our Stakeholder and Indigenous Relations team. This capacity fulfills our requirements for consultation with stakeholders and aboriginal groups alike, and is capable of producing reports (notably, government reports) as proof of engagement and consultation efforts. Built as an in-house application, this tool has no operating cost or fees and has the ability to grant different levels of access to information. Furthermore, the tool can store email conversations, documents and voice-mail messages related to any project, event or issue, and use them in reports. It can also produce an array of statistical reports showing frequencies and volumes of engagement based on project, stakeholder, stakeholder group, issue or keywords.

Engagement and Board Communication

The Board believes that it is important to have constructive engagement with its shareholders and other stakeholders and has established means for the shareholders of the Corporation and other stakeholders to communicate with the Board. For example, employees and other stakeholders may communicate with the Board, through the Audit and Risk Committee ("ARC"), by writing to the ARC; employees and other stakeholders may also communicate with the Board, through the ARC, by making submissions via the Corporation's toll-free telephone or online Ethic Helpline (see the Whistleblower System below for more details). Shareholders are also invited to communicate directly with the Board under the Corporation's Shareholder Engagement Policy, which outlines the Corporation's approach to proactive director-shareholder engagement at and in between the Corporation's annual shareholders meetings. Under the Shareholder Engagement Policy, shareholders can request meetings with members of the Board and can submit questions or inquiries to the Board, which the Corporation will respond to. A copy of the Shareholder Engagement Policy is available on our website at <https://www.transalta.com/about-us/governance/shareholder-engagement-policy/>. Shareholders and other stakeholders may, at their option, communicate with the Board on an anonymous basis. In addition, the Board has adopted an annual non-binding advisory vote on the Corporation's approach to executive compensation (say-on-pay). The Corporation is committed to ensuring continued good relations and communications with its shareholders and other stakeholders and regularly evaluates its practices in light of any new governance initiatives or developments in order to maintain sound corporate governance practices.

Customers

In early 2018 we launched our new energy services for customers. Our customer solutions team has partnered with best-in-class energy service providers to help businesses achieve:

- energy consumption and energy cost management;
- market price risks and volume exposure mitigation;
- sustainability initiatives such as self-generated electricity; and
- monitoring of energy market design changes, price signals and applicable and available incentives.

Our energy services include solar, energy-efficiency audits, distributed generation and building automation. To learn more, please visit the Energy Services customer page on our website at <https://www.transalta.com/customers/>.

Supply Chain

We continue to seek solutions to advance supply chain sustainability. In 2017 we partnered with Ivalua Inc. to optimize our global supply chain management operations. After an exhaustive review of all leading vendors, Ivalua was selected for its comprehensive Source-to-Pay platform, flexible architecture and overall ability to give TransAlta a competitive advantage. Key business values that we expect include increased supply chain efficiency, reduced lead times, lower costs and improved supplier performance.

We continue to offer our business units optional sustainability terms and conditions for inclusion within supplier agreements. These terms and conditions include suppliers communicating their sustainability policies, strategy and performance; documented systems for labour practices; environmental management systems; disclosure of environmental infringements; disclosure of anti-competitive behaviour; disclosure on climate change management; third-party certifications on products; and demonstration of community investments. Furthermore, as we explore major projects, we are assessing vendors both at the RFP evaluation stage and in up-front information requests on such elements as safe work practices, environmental practices and Indigenous spend. This means, for example, getting information on:

- estimated value of services that will be procured through local Indigenous businesses (in RFP template);
- estimated number of local Indigenous persons that will be employed (in RFP template);
- understanding overall community spend and engagement; and
- understanding through interview processes and stakeholder work the state of community relations.

In addition, in early 2019, the Board of Directors adopted a Supplier Code of Conduct that applies to all vendors and suppliers of TransAlta. Under the Code, suppliers of goods and services to TransAlta are required to adhere to our core values, including as it pertains to health and safety, ethical business conduct and environmental leadership. The Code also allows suppliers to report ethical or legal concerns related to the Code via TransAlta's Ethics Helpline.

Local Communities

TransAlta creates value for local communities through the generation of an essential service. We provide reliable, cost-efficient and clean power in Australia, Canada and the United States.

With the phase-out of coal, communities surrounding our plants will be impacted as our workforce will substantially decline. However, our proposed coal-to-gas conversions provide the opportunity to maintain some jobs at the power plants for substantially longer than would have been possible if the plants continued to only burn coal. Electricity and energy have

always been at the heart of the economy in Alberta, and any changes in the industry must therefore support our communities. Conversion will also help keep municipal, provincial and federal tax revenues supporting these communities. TransAlta advocates for a smart and long-term energy transition in Alberta to minimize disruption and negative economic impact, and to provide support for facility redevelopment, funds for retraining and economic diversification in the province.

Community Investments

During 2018, TransAlta contributed \$2.4 million in donations and sponsorships (2017 - \$2.6 million). One of our major community investments is to United Way campaigns across Canada and the US. This year, TransAlta employees, retirees, contractors and the Corporation raised over \$1.1 million for the United Way.

In 2018, we had a focus on youth education and achieved our target to direct \$0.75 million of community investment to this cause. Some of our partnerships included the University of Calgary, Southern and Northern Alberta Institutes of Technology, Mount Royal University, Banff Centre for Arts and Creativity (Indigenous leadership scholarships), Mother Earth Children's Charter School (Indigenous kindergarten to Grade 9), Calgary Stampede (The Young Canadians - ages seven to 18), national Canada and US Indigenous scholarships (post-secondary for trades and academic) and the Alberta Council for Environmental Education.

On July 30, 2015, we announced a US\$55 million community investment over 10 years to support energy efficiency, economic and community development, and education and retraining initiatives in Washington State. The US\$55 million community investment is part of the TransAlta Energy Transition Bill, passed in 2011. This bill was a historic agreement between policymakers, environmentalists, labour leaders and TransAlta to transition away from coal in Washington State by closing the Centralia facility's two units, one in 2020 and the other in 2025. In order to invest the \$55 million, three funding boards were formed: The Weatherization Board (\$10 million), the Economic & Community Development Board (\$20 million) and the Energy Technology Board (\$25 million). To date, the Weatherization Board has invested \$5.9 million, the Economic & Community Development Board \$12 million and the Energy Technology Board \$3.9 million.

Natural Capital

We continue to increase financial value from natural or environmental capital-related business activities, while reducing our carbon footprint. Comparable EBITDA from renewable energy generation in 2018 was \$322 million (2017 - \$289 million). Our revenue in 2018 from carbon-related offsets was \$21.6 million (2017 - \$27.7 million). In addition, in 2018 the sale of coal byproducts and waste-related recycling generated financial value in the range of \$25 million to \$35 million.

The following are key natural capital KPI trends:

Year ended Dec. 31	2018	2017	2016
Renewable energy comparable EBITDA	322.0	289.0	277.0
Carbon offsets revenue	21.6	27.7	29.0
GHG emissions (million tonnes CO ₂ e)	20.8	29.9	30.7

Natural Capital Management

All energy sources used to generate electricity have some impact on the environment. While we are pursuing a business strategy that includes investing in renewable energy resources such as wind, hydro and solar, we also believe that natural gas will continue to play an important role in meeting energy needs as part of a clean energy transition. We are planning the conversion of our Alberta coal units to natural gas in the 2020 to 2023 time frame.

Regardless of the fuel type, we place significant importance on environmental compliance and continued environmental impact mitigation, while seeking to deliver low-cost electricity. Currently the most material natural or environmental capital impacts to our business are GHG emissions, air emissions (pollutants, metals), and energy use. Other material impacts that we manage and track performance on includes our environmental management systems, environmental incidents and spills, land use, water usage and waste management.

We maintain procedures for environmental incidents similar to our safety practices, with tracking, analyzing and active management to eliminate occurrence, and ongoing support from our Operational Integrity program. With respect to biodiversity management, we seek to establish robust environmental research and data collection to establish scientifically sound baselines of the natural environment around our facilities and closely monitor the air, land and water in these areas to identify and curtail potential impacts.