

Welcome to your CDP Climate Change Questionnaire 2020

C0. Introduction

C0.1

(C0.1) Give a general description and introduction to your organization.

TransAlta Corporation owns, operates and develops a diverse fleet of power generation assets in Canada, the United States and Australia, with a focus on a transition to clean energy and long-term shareholder value. We provide municipalities, medium and large industries, businesses and utility customers with clean, affordable and reliable power. Today, we are Canada’s largest producer of wind power, Alberta’s largest producer of hydro-electric power and a leading producer of cogeneration or combined heat and power. Our mix of power is highly diversified and includes wind, hydro, solar, gas and coal. We will be completely off coal by the end of 2025, while also growing lower carbon power generation solutions, such as renewable energy, battery storage and cogeneration. Our transition to a low carbon business is well underway. Since 2005 we have reduced 21 million tonnes of GHG emissions (scope 1 and scope 2) or 50 per cent of our 2005 total. On a percentage basis, this is more than any country in the world over the same period. For over 100 years, TransAlta has been a responsible operator and a proud member of the communities where our employees work and live. TransAlta aligns eight of its external sustainability goals and targets with goals and targets of the [UN Sustainable Development Goals](#) and two of its external sustainability goals and targets with the Future Fit Business Benchmark. We are also proud to have achieved the [Silver level PAR \(Progressive Aboriginal Relations\)](#) designation through the Canadian Council for Aboriginal Business.

C0.2

(C0.2) State the start and end date of the year for which you are reporting data.

	Start date	End date	Indicate if you are providing emissions data for past reporting years	Select the number of past reporting years you will be providing emissions data for
Reporting year	January 1, 2019	December 31, 2019	Yes	2 years

C0.3

(C0.3) Select the countries/areas for which you will be supplying data.

- Australia
- Canada
- United States of America

C0.4

(C0.4) Select the currency used for all financial information disclosed throughout your response.

CAD

C0.5

(C0.5) Select the option that describes the reporting boundary for which climate-related impacts on your business are being reported. Note that this option should align with your chosen approach for consolidating your GHG inventory.

Operational control

C-EU0.7

(C-EU0.7) Which part of the electric utilities value chain does your organization operate in? Select all that apply.

Row 1

Electric utilities value chain

Electricity generation

Other divisions

Coal mining

C1. Governance

C1.1

(C1.1) Is there board-level oversight of climate-related issues within your organization?

Yes

C1.1a

(C1.1a) Identify the position(s) (do not include any names) of the individual(s) on the board with responsibility for climate-related issues.

Position of individual(s)	Please explain
Chief Executive Officer (CEO)	Climate-related issues are material to our business, especially the impact from climate policy. Hence, issues are addressed directly at our executive level with oversight from our Board, specifically from the Governance, Safety and Sustainability Committee (GSSC) of the Board and Audit, Finance and Risk Committee (AFRC) of the Board. One of our major strategic goals is to be coal

	free by the end of 2025, which involves coal retirements, conversion of coal facilities to gas and , re-powering of coal facilities to gas, while continuing to operate low carbon assets and grow our low carbon portfolio. Executive and Board engagement, management and oversight is crucial to this transition.
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C1.1b

(C1.1b) Provide further details on the board’s oversight of climate-related issues.

Frequency with which climate-related issues are a scheduled agenda item	Governance mechanisms into which climate-related issues are integrated	Please explain
Scheduled – all meetings	<ul style="list-style-type: none"> Reviewing and guiding strategy Reviewing and guiding major plans of action Reviewing and guiding risk management policies Reviewing and guiding annual budgets Reviewing and guiding business plans Setting performance objectives Monitoring implementation and performance of objectives Overseeing major capital expenditures, acquisitions and divestitures Monitoring and overseeing progress against goals and targets for addressing climate-related issues 	<p>Our Governance, Safety and Sustainability Committee has oversight of climate change related issues as is noted in the GSSC Charter. This committee meets on a quarterly basis. To reference the GSSC Charter, one of the mandates is: "monitoring and assessing climate change risks and compliance with associated legislation and public reporting". Also with regard to Environment and Sustainability matters the GSSC shall: "at least annually, review guidelines and practices relating to environmental protection, including the mitigation of pollution and climate change; (b) consider whether TransAlta’s policies and practices relating to the environment are being effectively implemented, and discuss and advise regarding the development of policies and practices regarding climate change, greenhouse gas and other pollutants".</p> <p>There is cross-functionality across our Board and risks are reviewed through our Audit, Finance and Risk Committee (AFRC) and many of our projects, including clean energy projects, are reviewed by other committees of the Board. Hence, from an associated standpoint, climate change related capital expenditures, acquisitions, budgets etc. will also be reviewed at the Board level on a case by case basis. For example, the conversion of coal plants to gas plants is reviewed and requires approval of the full Board.</p> <p>Notably, five of our Board members have identified Environment / Climate Change as being among their</p>

		top four relevant competencies. We have noted this in our skills matrix section of our 2020 Proxy Circular on page 33.
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C1.2

(C1.2) Provide the highest management-level position(s) or committee(s) with responsibility for climate-related issues.

Name of the position(s) and/or committee(s)	Responsibility	Frequency of reporting to the board on climate-related issues
Chief Executive Officer (CEO)	Both assessing and managing climate-related risks and opportunities	Quarterly

C1.2a

(C1.2a) Describe where in the organizational structure this/these position(s) and/or committees lie, what their associated responsibilities are, and how climate-related issues are monitored (do not include the names of individuals).

Climate change related risks are monitored through our TransAlta-wide risk management processes and are actively managed. Climate change risks and opportunities are identified at the Board level, executive and management level, business unit level (coal, gas, wind and solar and hydro) and through our corporate function (for example: government relations, regulatory, emissions trading, sustainability, commercial, customer relations, investor relations). The business unit and corporate functions work closely together and flow risk and opportunities upwards to management, executive and the Board. In addition, management and executive have full support from corporate functions and the business unit level to understand risks and opportunities they have identified. Risks and opportunities are reviewed by our management team quarterly and reported to our Governance, Safety and Sustainability Committee of the Board and Audit, Finance and Risk Committee of the Board.

C1.3

(C1.3) Do you provide incentives for the management of climate-related issues, including the attainment of targets?

	Provide incentives for the management of climate-related issues	Comment
Row 1	Yes	

C1.3a

(C1.3a) Provide further details on the incentives provided for the management of climate-related issues (do not include the names of individuals).

Entitled to incentive	Type of incentive	Activity incentivized	Comment
Corporate executive team	Monetary reward	Emissions reduction project Efficiency project Other (please specify) Growth in renewable energy	<p>Our corporate executive annual incentive plans (short-term incentive or annual bonus and long-term share incentives) are tied to TransAlta's performance (i.e. 'pay for performance'). These incentives are tied to execution of strategic goals. Our compensation philosophy is designed to drive the right actions to achieve our strategic goals. The long-term incentive plan for the period 2017 to 2019 included a strategic goal to 'Transition to Renewable Energy' This goal was measured against the performance of the Company, which included: advancing and executing our coal to gas conversions (that result in significant GHG reductions); deliver growth in our renewables fleet (zero or very low carbon assets); expand our presence in the US Renewables market (zero or very low carbon assets); advance and grow our on-site generation and cogeneration business (decentralized and low carbon / high energy efficiency assets); and continue to improve our already strong financial position and remain disciplined with our capital investment strategy.</p> <p>As such, our incentive program is tied with reducing GHG emissions and climate change management. Further details and highlights of our 'Transition to Renewable Energy' metric can be found on page 87 of our 2020 Management Proxy Circular.</p> <p>Hence, a significant component of executive compensation is tied to achieving our strategic goals, which includes growing renewable energy, reducing GHG emissions through our coal-to-gas transition and supporting our customer sustainability goals to decarbonize through on-site low carbon generation.</p>
All employees	Monetary reward	Emissions reduction project Efficiency project Other (please specify) Growth in renewable energy	<p>As with the noted executive compensation above, our employees are also incentivized with an annual bonus (our annual incentive plan, which is the same structure for executive) and certain employees are also granted long-term incentive share units. Unlike the annual incentive compensation for TransAlta's executive team, which measures their performance exclusively on corporate performance, the annual incentive targets for employees is measured against applicable business unit goals, which includes growth in renewables. The long-term incentive plans are the same for our employees as they are with</p>

			the executive team. As a result, a significant component of an employee’s compensation can be tied to achieving our strategic goals, which includes growing renewable energy, reducing GHG emissions from our coal-to-gas transition and supporting our customer sustainability goals to decarbonize through on-site low carbon generation.
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C2. Risks and opportunities

C2.1

(C2.1) Does your organization have a process for identifying, assessing, and responding to climate-related risks and opportunities?

Yes

C2.1a

(C2.1a) How does your organization define short-, medium- and long-term time horizons?

	From (years)	To (years)	Comment
Short-term	0	3	Our Enterprise Risk Management (ERM) framework focuses on a 3-year horizon. However, in the risk identification phase leaders are encouraged to think of risk longer term, although risk mitigation plans must have near term actionable steps or monitoring plans.
Medium-term	3	10	Our asset plans and maintenance plans focus on the medium to long-term.
Long-term	10	25	Our asset plans and maintenance plans focus on the medium to long-term. We run full life cycle forecasts on all of our assets.

C2.1b

(C2.1b) How does your organization define substantive financial or strategic impact on your business?

Anything that could incur a 'substantive financial impact', 'strategic impact', 'stakeholder or reputational impact' or 'environment, health and safety impact' to TransAlta and its operation is considered a risk. Risks fall within certain categories relative to our business and are evaluated on impact and likelihood. Risks that combine impact and likelihood over set thresholds are our top risks.

The Audit, Finance and Risk Committee (AFRC) of the Board of Directors (Board) provides assistance to the Board in fulfilling its oversight responsibilities with respect to the risk

identification and assessment process conducted by our senior Management (Management) including the programs established by Management to respond to such risk. Management is responsible for the identification and management of TransAlta's risks and the development and implementation of policies and procedures to mitigate such risks. The AFRC's role is to provide oversight in order to ensure that TransAlta's assets are protected and safeguarded within reasonable business limits. The AFRC reports to the Board on its risk oversight responsibilities.

The Board is responsible for ensuring that TransAlta has adopted processes and key policies for the identification, assessment and management of its principal risks. The Board has delegated to the AFRC the responsibility for the oversight of Management's identification, and evaluation, of TransAlta's principal risks, and the implementation of appropriate policies, processes and systems to manage or mitigate the risks within the TransAlta's risk appetite. The AFRC reports to the Board thereon.

Key risks to our business include:

1. Operational risks: Government Policy, Commodity Price, Events, Fuel-Supply, Mining, HR, Legal, Regulatory Reporting & Compliance, Safety, Cyber Security, IT Systems, Procurement, Technology, Volumetric, Environment, Labour, Equipment Plant & Technology, Project, and Transmission
2. Finance risks: Credit, Liquidity, Foreign Exchange, commodity trading, financial reporting and ESG compliance, and Interest Rates
3. Growth risk: prospecting, permitting, construction, customer self-supply/build, asset integration, analysis and forecasting
4. Competitive risks: Industry consolidation, new generation technology, new distribution technology, electricity market design, market rule changes, economy, energy storage, litigation, and tariffs.

These risks comprise normal course of business risks, strategic risks and tail risk events. These risks form a comprehensive risk register. These risks comprise normal course of business risks, strategic risks and tail risk events. One of these risks, or a combination, could have a substantive financial impact on our business. These risks form a comprehensive risk register. Management assesses risk in the context of its strategic objectives. Risks are prioritized based on impact (financial, operational, reputational, health, safety and environment) and likelihood (situation context). Prioritized risks are reported to the AFRC quarterly. Internal Audit creates an annual audit plan that complements enterprise risk assessments to provide additional assurance to the Board on the effectiveness of programs, projects, systems and controls. Additional financial assurance is provided by TransAlta's SOX program which assesses the design, implementation and operation effectiveness of key internal controls over financial reporting.

Additional risks: Reputation, Tax and Legal are reviewed through other oversight processes in the Finance and Commercial groups. Certain functional risk mitigation activity such as Insurance, Human Resources (Compensation), and Environmental Health and Safety audits are also reviewed directly in other Board committees such as the Governance, Safety and

Sustainability Committee (GSSC). For example, our GSSC committee is also responsible for "monitoring and assessing climate change risks and compliance with associated legislation and public reporting".

Relevant to climate change we evaluate risk (and opportunity), which could impact both operations and finance. For example, significant negative regulatory changes could affect our business model. Regulatory permitting challenges for coal-to-gas conversions would impact our ability to convert coal facilities impacting both the environment, our ability to generate capital (coal is devalued by the market and a large risk), longer-term cash flows and a provincial transition to a reliable, affordable and low-carbon electricity grid.

C2.2

(C2.2) Describe your process(es) for identifying, assessing and responding to climate-related risks and opportunities.

Value chain stage(s) covered

Direct operations
Upstream
Downstream

Risk management process

Integrated into multi-disciplinary company-wide risk management process

Frequency of assessment

More than once a year

Time horizon(s) covered

Short-term
Medium-term
Long-term

Description of process

TransAlta's strategy is focused on the operation of its existing assets (wind, hydro, solar, gas and coal) and development of renewable energy and low-carbon natural gas generation. As discussed above, risks are identified and assessed in the context of its strategic objectives. Risks are not viewed in isolation. Prioritized risks are subject to mitigation action plans by management and reported to the AFRC quarterly. Further assurance is provided by Internal Audit and other functional experts such as, tax, safety and compliance teams.

Climate change risks are monitored through our TransAlta-wide risk management processes and are actively managed. We do not have a formal process to review specific climate change risk, rather climate change risks and opportunities are identified at the Board level, executive and management level, business unit level (coal, gas, wind, solar and hydro) and through our corporate function (e.g. government relations,

regulatory, emissions trading, sustainability, commercial, customer relations and investor relations). The business unit and corporate functions work closely together and provide information on risks and opportunities to management, the executive team and the Board. One area that is constantly monitored is climate policy, including the impacts on cost, growth and compliance.

Climate change risks at the asset or business unit level are identified through our Environmental Management Systems, asset management function and systems, our energy and trading business, active monitoring, active participation/communication with stakeholders, liaison with our corporate function, active participation in working groups and more. All identified material risks are added to our Enterprise Risk Management (ERM) risk register. These risks are assessed and scored based on likelihood and impact (what could have 'substantive financial impact', 'strategic impact', 'stakeholder or reputational impact' or 'environment, health and safety impact'). Risks are not considered in isolation. Major risks are the focus of management response and mitigation plans.

Direct Operations Overview

TransAlta has taken significant steps over the last several years to reduce its GHG impact and has announced by end 2025 it will retire coal facilities or transition high GHG emission intensity coal-fired power plants to low emission intensity natural gas-fired power plants, which protects invested capital of our shareholders. TransAlta has continued to invest in, develop, and construct new renewable energy from wind, solar, and battery technology. As discussed below, we are expecting to complete our first battery storage project in 2020, allowing for storage of wind energy produced in off-peak electricity demand and shifting it to peak demand offsetting generation which would otherwise come from GHG emitting sources.

Upstream Overview

Our coal-to-gas asset conversion strategy utilizes existing infrastructure reducing the cost and emissions related to new generation construction and material procurement. Our gas conversions in Alberta will also utilize low carbon gas (Alberta has world-leading plans in place to increasingly capture fugitive methane emissions).

Downstream Overview

Developing renewable energy projects with corporate power purchase agreements allow for the financing and development of these renewable energy sources and permit corporate customers to advance renewable energy targets. Our continued construction and development of renewable projects allow utilities and corporate purchasers to meet renewable energy and GHG reduction targets as they consume energy for their customers and create products and services. Our emission credit and offset trading and marketing business allows customers to receive the environmental attributes of renewable energy generation providing a further revenue stream for these assets and supporting additional renewable energy development.

Transition Risk (Market Risk): Case Study

Changing customer behaviour, such as reduced demand for electricity (digitization and energy efficiency, less travel, less consumerism and associated electricity use for manufacturing etc.) could impact the business. Hence, this is one risk within our risk register we evaluate on an ongoing basis. All risks are scored on their potential to impact the business. Currently, we believe this case study risk is mitigated somewhat by the global trend to increasingly electrify customer products, such as transport, etc. and growing global populations. Our shift to a low-carbon business model supports this type of future and places us as a very essential service in a low carbon world. We do not consider risks in isolation and when considering this transition and market risk, for example, we also evaluate other risk and opportunities in conjunction.

Physical Risk (Acute Risks): Case Study

The TransAlta South Hedland facility in Western Australia was built with climate adaptation in mind and extreme weather. Extreme weather and climate adaption are both risks considered within our risk register for impact on the business, operations or facility/office. South Hedland's infrastructure is designed to withstand a category 5 cyclone, which can frequent the northwest region of Western Australia and could occur more frequently over the long-term. Category 5 is the highest cyclone rating. Floods, which can occur in the area, have been mitigated by constructing the facility above the normal flood levels. In 2019, a category 4 cyclone hit this facility. Operations were not impacted, and we were able to continue generating electricity through the storm, despite wide-spread flooding and shutdown of the nearby port and associated business activities.

C2.2a

(C2.2a) Which risk types are considered in your organization's climate-related risk assessments?

	Relevance & inclusion	Please explain
Current regulation	Relevant, always included	<p>Current environmental and climate specific regulation can and does impact our operations and our business. Both current and emerging regulation is assessed through our ERM. The impact of climate related regulations on our business could vary, for example we could experience impacts to cash flow generation, shareholder value, stranded assets and more. In Alberta, for example, carbon pricing (previously CCIR now TIER in 2020) adds significant operating costs to our GHG intensive coal fleet.</p> <p>Our response has been to advocate for and advance coal-to-gas plant conversions in Alberta, which have significant decarbonization benefits for TransAlta and the province, while supporting reliable electricity in the province and a transition to a low-carbon grid.</p> <p>Our Government Relations and Regulatory teams stay closely</p>

		connected to current regulation in order to stay informed on current challenges and opportunities, while also being prepared for potential changes to regulation. We have experienced significant change to climate related regulations in Canada in the past five years.
Emerging regulation	Relevant, always included	Environmental and climate specific regulation can and does impact our operations and our business. Both current and emerging regulation is assessed through our ERM. Significant carbon market changes, both provincially and federally in Canada, have been both a current and emerging risk in Canada in the last several years. To mitigate these risks TransAlta's market regulation and government relations teams actively engage in official consultation processes, as well as, engage political, department and agency staff one-on-one. In addition, partnerships are fostered with like-minded industry groups and associations. We continue to advocate for smart policy decisions that support our business model (focus on clean, affordable and reliable power for our customers).
Technology	Relevant, always included	<p>Technology could support a low-carbon transition and could impact TransAlta both positively and negatively. Existing and emerging impacts of new and emerging technology is evaluated through our ERM. Examples of technology risk and opportunity include infrastructure changes (shift to distributed energy and away from large-scale power generation infrastructure assets and projects) and digitization combined with greater adoption of energy efficiency (less use of our end product).</p> <p>Cost-competitive battery storage will enable greater adoption renewables and a greater shift to a distributed power generation model. We recently announced our first small-scale battery storage (10 MW) project at one of our wind farms in southern Alberta, which will be completed and online in 2020.</p>
Legal	Relevant, always included	<p>The risk and liability associated with climate change, specific to, for example: regulatory compliance, disclosure, mitigation, adaption, failure to adapt operations or investment decisions are increasingly being evaluated through our ERM process. We are far more mature in areas, such as disclosure and regulatory liability risk.</p> <p>We have noted the trends in increased climate litigation for some time and have mitigated potential risk through alignment of our strategy with decarbonization and we have increased our transparency on climate risks and opportunities over time through disclosure. For example, we have reported to this CDP climate change disclosure request for 10+ years, we have aligned climate disclosure with the Task Force on Climate related Finance Disclosure recommendations (TCFD) in our annual integrated report for four years and we have established a voluntary GHG reduction target to 2030.</p>

Market	Relevant, always included	<p>Market risks are extensively evaluated within our ERM. Within the context of climate change, risks are not considered in isolation, rather we evaluate risks in conjunction. For example, when we evaluate the impact on power prices, commodity prices and contracted power purchase pricing we consider the impacts of carbon pricing, supply and demand impacts due to pricing, science based climate change modelling and growth constraints, customer preference shifts to clean, etc.</p> <p>We continue to invest in and build renewable power resources to support a low carbon transition. We currently have five renewable projects that are either underway or recently completed. In December 2019, we brought into service two wind farms located in the US totalling 119 MW. We also signed an agreement to purchase a 49 per cent stake in another wind farm of 136.8 MW located in the State of Washington. We are presently constructing an additional 207 MW of wind generation in Alberta. We are also developing a 10 MW battery storage project in Alberta with support from Emissions Reduction Alberta. We are aiming to test the technology and acquire knowledge in its application to meet customer needs.</p> <p>We believe that a larger renewable portfolio provides increased flexibility in generation and creates incremental environmental value through Renewable Energy Credits (RECs) or through emission offsets.</p>
Reputation	Relevant, always included	<p>The potential for harming our reputation exists in every business decision and all risks can have an impact on reputation, which in turn can negatively impact our business and securities. Reputational risk cannot be managed in isolation from other forms of risk. Negative impacts from a compromised reputation are evaluated through our ERM and could include revenue loss, reduction in customer base, and decreased value of our securities.</p> <p>We have experienced negative reputational impacts due to our coal operations, which has included shareholder value erosion. Our transition away from coal by the end of 2025 and growth in renewables supports mitigating this risk and value creation for shareholders and stakeholders.</p>
Acute physical	Relevant, always included	<p>Climate change related acute and chronic physical risks and opportunities are assessed through our ERM with support from business unit and subject matter experts. This is a growing area of risk evaluation for TransAlta, which is not to suggest the risk has been neglected, rather that we are increasingly expanding our understanding of climate-related acute and chronic risks. We have operating assets in three countries and varied geographic locations, many of which could be impacted by extreme weather events and these are evaluated</p>

		<p>through our ERM.</p> <p>Our gas facility at South Hedland, Australia is built with climate adaption in mind. The facility operates with a best in class emission intensity for the region, the facility uses less water than traditional gas plants as we use dry cooling towers as opposed to the normal wet cooling towers (wet cooling towers have heavy water consumption). The plant is designed to withstand a category 5 cyclone, which can frequent NW Western Australia (and did in early 2019 - we had no downtime associated with a category 4 cyclone). Category 5 is the highest cyclone rating. Floods, which can occur in the area, have been mitigated by construction above the normal flood levels.</p>
Chronic physical	Relevant, always included	<p>Climate change related acute and chronic physical risks and opportunities are assessed through our ERM with support from business unit and subject matter experts. This is a growing area of risk evaluation for TransAlta, which is not to suggest the risk has been neglected, rather that we are increasingly expanding our understanding of climate-related acute and chronic risks. We have operating assets in three countries and varied geographic locations, many of which could be impacted by extreme weather events and in some cases long-term changes to climate and weather patterns.</p> <p>Examples of longer-term climate change chronic physical impacts evaluated include the impacts of weather on our hydro and wind businesses. Changes to water flow or wind patterns, could power production in the future and associated revenue generation.</p>

C2.3

(C2.3) Have you identified any inherent climate-related risks with the potential to have a substantive financial or strategic impact on your business?

Yes

C2.3a

(C2.3a) Provide details of risks identified with the potential to have a substantive financial or strategic impact on your business.

Identifier

Risk 1

Where in the value chain does the risk driver occur?

Direct operations

Risk type & Primary climate-related risk driver

Current regulation
Carbon pricing mechanisms

Primary potential financial impact

Increased direct costs

Company-specific description

Our Alberta coal fleet has experienced significant increases in operating costs due to carbon pricing increases from \$15 per tonne in 2016 to \$30 per tonne in 2019. In addition, many of our Power Purchase Arrangements (PPA) at our Alberta coal facility have expired, exposing TransAlta to carbon costs that were previously flowed through to the customer. We will continue to expose ourselves to increased carbon compliance costs through the operation of coal and the expiration of PPAs.

Time horizon

Short-term

Likelihood

Virtually certain

Magnitude of impact

High

Are you able to provide a potential financial impact figure?

Yes, an estimated range

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

171,000,000

Potential financial impact figure – maximum (currency)

286,000,000

Explanation of financial impact figure

Carbon costs in Alberta are \$30/tonne CO₂e and are expected to rise to \$40 in 2021 and \$50 in 2022 as per Federal rules. At a \$30 carbon price with a performance standard of 0.37 tonnes CO₂e per MWh our coal related annual GHG emission costs would be approximately \$171 million (takes the difference between the facility emission intensity and the performance standard, multiplied by the carbon price), rising to \$229 million with a \$40 per tonne carbon price and \$286 million with a \$50 per tonne carbon price. This assumes the plants continue to operate as they were operating in 2019 - comparable MWh's and on coal, not natural gas.

Cost of response to risk

900,000,000

Description of response and explanation of cost calculation

We announced our \$2 billion Clean Energy Investment Plan on September 16, 2019. This includes \$800 million to \$1 billion in allocated capital expenditures for coal to gas conversions (boiler conversions and facility repowering). The calculation above assumes a mid-range spend between \$800 million and \$1 billion (hence \$900 million). Associated GHG emission costs per MWh on a converted coal facility (simple boiler conversion, not a repowering of the site) is approximately \$8 per MWh versus approximately \$30 MWh on coal. Conversion of coal units to natural gas is both economic, significantly lowers GHG emissions (and associated cost of carbon) and air pollutants, while supporting the grid in Alberta as it transitions to more renewable energy.

Comment

Identifier

Risk 2

Where in the value chain does the risk driver occur?

Direct operations

Risk type & Primary climate-related risk driver

Market

Changing customer behavior

Primary potential financial impact

Decreased asset value or asset useful life leading to write-offs, asset impairment or early retirement of existing assets

Company-specific description

Our customers are increasingly seeking green solutions, which could impact the future of our natural gas operations

Time horizon

Long-term

Likelihood

Likely

Magnitude of impact

Medium-high

Are you able to provide a potential financial impact figure?

Yes, a single figure estimate

Potential financial impact figure (currency)

771,000,000

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

This is a long-term risk and challenging to evaluate the impact. The number above is the carrying amount asset value of our natural gas fleet. We see natural gas as a critical part of a low carbon transition in markets where we operate, such as Alberta, or in locations where we provide on-site power generation for customers.

Cost of response to risk

24,000,000

Description of response and explanation of cost calculation

Our sustaining and productivity capital for our gas facilities in 2019 was \$24 million. We continue to evaluate solutions to decarbonize gas, which includes evaluation of carbon capture and storage or utilization, hydrogen and carbon offsets.

Comment

In addition, we continue to advance our focus on renewable energy and storage, which supports customers with an ambition for zero-carbon procurement.

Identifier

Risk 3

Where in the value chain does the risk driver occur?

Downstream

Risk type & Primary climate-related risk driver

Acute physical

Increased severity and frequency of extreme weather events such as cyclones and floods

Primary potential financial impact

Decreased revenues due to reduced production capacity

Company-specific description

All facilities are exposed to weather and the possibility of extreme weather events, which could impact our operations and our ability to deliver power to our customers. Increasing severity of extreme weather events could. If plants do not meet availability or production targets specified in their PPA or other long-term contracts, we may be required to compensate the purchaser for the loss in the availability of production or record reduced energy or capacity payments. For merchant facilities, an outage can result in lost merchant opportunities. Therefore, an extended outage could have a material adverse effect on our business, financial condition, results of operations or our cash flows.

Time horizon

Long-term

Likelihood

About as likely as not

Magnitude of impact

Medium-high

Are you able to provide a potential financial impact figure?

Yes, a single figure estimate

Potential financial impact figure (currency)

8,000,000

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

A 1 per cent increase or decrease in production (MWh) has an approximate impact on net earnings to TransAlta of (+/-) \$8 million. The analysis is based on business conditions and production volumes in 2019. If plants do not meet availability or production targets specified in their PPA or other long-term contracts, we also may be required to compensate the purchaser for the loss in the availability of production or record reduced energy or capacity payments. For merchant facilities, an outage can result in lost merchant opportunities. Therefore, an extended outage could have a material adverse effect on our business, financial condition, results of operations or our cash flows. We cannot estimate this cost. Cost implications to both parties would be evaluated on a case by case basis.

Cost of response to risk

164,000,000

Description of response and explanation of cost calculation

We manage this risk by:

- Actively managing our assets and their condition in order to be proactive in plant maintenance so that our plants are available to produce when required;
- Monitoring water resources throughout Alberta to the best of our ability and optimizing this resource against real-time electricity market opportunities;
- Placing our facilities in locations we believe to have adequate resources to generate electricity to meet the requirements of our contracts. However, we cannot guarantee that these resources will be available when we need them or in the quantities that we require; and
- Diversifying our fuels and geography to mitigate regional or fuel-specific events

We continue to build in climate resilience and adaptation where applicable. Our new gas facility at South Hedland Power Station is a good example of our management method, which is built with adaptation in mind. The facility operates with a low emission intensity for the region and the facility uses less water than traditional gas plants as we use dry cooling towers as opposed to the normal wet cooling towers (wet cooling towers have heavy water consumption). The plant is designed to withstand a category 5 cyclone. Cyclones can frequent the northwest region of Western Australia and did in early 2019. Category 5 is the highest cyclone rating. Floods, which can occur in the area, have been mitigated by constructing the facility above the normal flood levels.

In early 2019, the region experienced a category 4 cyclone, which shutdown BHP Port Hedland port facilities for four days and interrupted operation of the transmission line between Port/South Hedland and Karratha. Despite the cyclone and associated weather, our facility stayed online and was able to supply power to the port and town for the duration of the event.

Costs noted above are our sustaining and productivity capital spend in 2019, which supports the ability of facilities continue to operate effectively and efficiently and meet demand from weather. This total includes routine capital, planned major maintenance and productivity capital (projects to improve power production efficiency and corporate improvement initiatives).

Comment

C2.4

(C2.4) Have you identified any climate-related opportunities with the potential to have a substantive financial or strategic impact on your business?

Yes

C2.4a

(C2.4a) Provide details of opportunities identified with the potential to have a substantive financial or strategic impact on your business.

Identifier

Opp1

Where in the value chain does the opportunity occur?

Downstream

Opportunity type

Energy source

Primary climate-related opportunity driver

Use of lower-emission sources of energy

Primary potential financial impact

Increased revenues resulting from increased production capacity

Company-specific description

This opportunity is to expand our renewables fleet. In 2018, we entered into agreements providing for the development and construction of two new wind facilities: i) a 90 MW project located in Pennsylvania, US with a 15-year purchase agreement with Microsoft; and ii) a 29 MW project located in New Hampshire, US with two 20-year purchase agreements with investment grade counterparties. These facilities began commercial operation at the end of 2019. In addition, we entered into a 20-year agreement with the Alberta Electric System Operator (AESO) for the 207 MW Windrise wind project in Alberta, Canada, which is scheduled for commercial operation in Q2 2021. The Skookumchuck Wind Project remains under construction and TransAlta's right to invest occurs at the commercial operations date ("COD"). The project owner has notified TransAlta that construction has been delayed due to weather and other factors and, as a result, the project is expected to be completed and reach full COD in the second half of 2020. Our WindCharger battery project construction started in late March 2020 after TransAlta put in place the necessary safety procedures to protect the construction team during the COVID-19 pandemic. The project is on track and is expected to achieve commercial operations in Q3 2020.

This is a direct operations opportunity for TransAlta and also a customer opportunity for Microsoft, the AESO and our other counterparties.

Time horizon

Long-term

Likelihood

Virtually certain

Magnitude of impact

Medium-high

Are you able to provide a potential financial impact figure?

Yes, a single figure estimate

Potential financial impact figure (currency)

45,000,000

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

We expect this growth to create approximately \$45 million of new EBITDA for TransAlta and support GHG reduction goals for customers.

Cost to realize opportunity

777,500,000

Strategy to realize opportunity and explanation of cost calculation

Renewable energy projects are subject to a number of closing conditions. For example, customary regulatory approvals and, in the case of the New Hampshire project, the receipt of a favourable regulatory determination in relation to the permitting of the project. We were able to begin commercial operation of the Antrim and Big Level projects at the end of December in 2019. Our Skookumchuck and WindCharger projects have an expected commercial operation date in Q3-Q4 2020 and our Windrise project has an expected commercial operation date in Q2 2021.

Total capital costs of the wind projects listed above are estimated at \$777.5 million (mid-range of costs below).

Skookumchuck - \$150-\$160 million

Windrise - \$270-\$285 million

WindCharger - \$7-8 million

Antrim - \$100-\$110 million

Big Level - \$225-\$240 million

Comment

These projects will avoid approximately 500,000 tonnes of CO₂e for our customers.

Identifier

Opp2

Where in the value chain does the opportunity occur?

Direct operations

Opportunity type

Resource efficiency

Primary climate-related opportunity driver

Use of more efficient production and distribution processes

Primary potential financial impact

Reduced indirect (operating) costs

Company-specific description

This opportunity is conversion of coal plants to natural gas. Our conversion of our coal plants to natural gas in Alberta is a more efficient use of the plants from both an economic and environmental standpoint. We are currently on track to convert three units to natural gas through boiler conversions and to repower one unit as a natural gas combined cycle plant. Two units are still under evaluation. These are being evaluated on

their potential for boiler conversions and repowering. Specific to our JV investment in the Sheerness coal facility in Alberta (GHG emissions are captured in our scope 3 emissions in 6.5) this facility will be converted to gas by 2021. We remain committed to our external sustainability goal to be completely off coal by the end of 2025.

Time horizon

Medium-term

Likelihood

Very likely

Magnitude of impact

Medium-high

Are you able to provide a potential financial impact figure?

Yes, an estimated range

Potential financial impact figure (currency)

Potential financial impact figure – minimum (currency)

171,000,000

Potential financial impact figure – maximum (currency)

286,000,000

Explanation of financial impact figure

Carbon costs in Alberta are \$30/tonne CO₂e and are expected to rise to \$40 in 2021 and \$50 in 2022 as per Federal rules. At a \$30 per tonne carbon price with a performance standard of 0.37 tonnes CO₂e per MWh our coal related annual GHG emission costs would be approximately \$171 million (takes the difference between the facility emission intensity and the performance standard, multiplied by the carbon price), rising to \$229 million with a \$40 per tonne carbon price and \$286 million with a \$50 per tonne carbon price. This assumes the plants continue to operate as they were operating in 2019 - comparable MWh's and on coal, not natural gas.

Cost to realize opportunity

900,000,000

Strategy to realize opportunity and explanation of cost calculation

One of our major strategic objectives tied to our Clean Energy Investment Plan is to "successfully execute our coal-to-gas conversions". We plan to invest between \$800 million to \$1.0 billion to convert or repower our Alberta thermal fleet to natural gas. This will repurpose and reposition our fleet to a cleaner gas-fired fleet and advance our leadership position in onsite generation while generating attractive returns by leveraging TransAlta's existing infrastructure.

Our Clean Energy Investment Plan includes converting three of our existing Alberta thermal units to gas in 2020 and 2021 by replacing existing coal burners with natural

gas burners and two JV thermal units at the Sheerness coal facility.

The Clean Energy Investment Plan also includes permitting to repower the steam turbines at Sundance Unit 5 and Keephills Unit 1 by installing one or more combustion turbines and heat recovery steam generators, thereby creating highly efficient combined-cycle units. Repowered units are expected to have a 40 per cent lower capital investment when compared to a new combined-cycle facility while achieving a similar heat rate. The Clean Energy Investment Plan assumes there are no delays in securing the natural gas supply requirements, which may result from regulatory or other constraints.

The capital cost of boiler conversions is a range \$120-\$200 million. This assumes a conversion range of 1,260 to 2,340 MW. The current cost estimates on our repowering is \$750 - \$770 million and assumes 730 MW. We have several coal units still under evaluation. These are being evaluated on their potential for boiler conversions and repowering. We remain committed to our external sustainability goal to be completely off coal by the end of 2025.

The highlights of these gas conversion investments include:

- Positioning TransAlta's fleet as a low-cost generator in the Alberta energy-only market;
- Generating attractive returns by leveraging TransAlta's existing infrastructure;
- Significantly extending the life and cash flows of our Alberta thermal assets; and
- Significantly reducing air emissions and costs.

Comment

We continue to advance our coal-to-gas conversion projects. We are on-track to complete the conversion of Sundance Unit 6 in the second half of 2020. We continue to advance conversion of its Keephills Unit 2 and Unit 3 in 2021 and expect that these projects could be delayed by two to three months due to delays in procuring certain equipment as a result of COVID-19 supply chain disruptions. During the first quarter of 2020, we received regulatory approval from the Alberta Utilities Commission for the repowering of Sundance Unit 5 and Keephills Unit 1 into combined cycle units. We are still waiting for approval from Alberta Environment and Parks. We are still on track to issue full notice to proceed in 2021 for Sundance Unit 5, with an expected commercial operation date in 2023.

Identifier

Opp3

Where in the value chain does the opportunity occur?

Downstream

Opportunity type

Products and services

Primary climate-related opportunity driver

Development and/or expansion of low emission goods and services

Primary potential financial impact

Increased revenues through access to new and emerging markets

Company-specific description

This opportunity is the development, marketing and sale of environmental attributes. Carbon related environmental attributes that we have the ability to generate, trade, purchase and sell, include: Alberta Emission Performance Credits (EPCs), Alberta carbon offsets, Renewable Energy Credits (RECs) and emission offsets. Alberta carbon offsets can be voluntarily generated by Alberta projects, which meet Alberta carbon offset system qualification protocols. Our Alberta wind facilities generate Alberta carbon offset credits. RECs are produced from our renewable energy assets (wind, hydro and solar) and can be traded in voluntary carbon markets or sold to customers. RECs can be used to meet regulatory requirements when a target for renewable energy generation is set by a jurisdiction or can be used to voluntarily 'green' electricity procurement. Emissions offsets are produced from voluntary projects that reduce emissions in sectors of the economy not covered by carbon reduction regulations. The optimization of environmental attributes can be used as a cost-effective way, for TransAlta or primarily for our customers, to lower compliance costs attributed to carbon policies or renewable portfolio standards or utilized to achieve voluntary corporate sustainability or carbon reduction goals. In addition, our Emissions Trading team actively looks to buy and sell carbon offsets with the goal to generate revenue from carbon offsets or support our customers carbon offset goals.

Time horizon

Long-term

Likelihood

Virtually certain

Magnitude of impact

Medium

Are you able to provide a potential financial impact figure?

Yes, a single figure estimate

Potential financial impact figure (currency)

27,600,000

Potential financial impact figure – minimum (currency)

Potential financial impact figure – maximum (currency)

Explanation of financial impact figure

This figure is revenue in 2019 from environmental attribute sales. This includes the sale of Alberta carbon offsets, renewable energy credits (RECS) and solar renewable energy credits (SRECS) in the US.

Cost to realize opportunity

300,000

Strategy to realize opportunity and explanation of cost calculation

We have people and expertise in place to serialize and register carbon offset credits, within different markets. We have an Emission Trading team in place, who actively markets our credits, buy and sell carbon offset credits and seek investment opportunities in carbon offset projects.

Comment

Our Emissions Trading team is comprised of two people. Support from the business unit is also required to serialize Alberta carbon offsets credits, EPCs or RECs. Hence the value above accounts for employee time and is an estimate.

C3. Business Strategy

C3.1

(C3.1) Have climate-related risks and opportunities influenced your organization’s strategy and/or financial planning?

Yes, and we have developed a low-carbon transition plan

C3.1a

(C3.1a) Does your organization use climate-related scenario analysis to inform its strategy?

Yes, qualitative and quantitative

C3.1b

(C3.1b) Provide details of your organization’s use of climate-related scenario analysis.

Climate-related scenarios and models applied	Details
2DS IEA B2DS IEA Sustainable development scenario	The sectoral decarbonization approach methodology of science-based target setting has informed the climate resiliency of our goal to reduce emissions by 2030 (in respect to prevention of 2 degrees of global warming, now well beyond 2 degrees). Our goal is to reduce 19.7 million tonnes of CO2e by 2030, over a 2015 baseline (in line with Paris Agreement). The year 2030 is aligned with the ambition of Climate Action as per UN SDG goal 13. This scenario and associated target encompass TransAlta-wide scope 1 and scope 2 emissions, as per an operational control boundary as per the GHG Protocol Corporate

	<p>Accounting and Reporting Standard. Our 2015 baseline is 32,227,815 tonnes CO2e (TransAlta-wide operational control scope 1 and 2 emissions).</p> <p>We anticipate in 2030 annual CO2e scope 1 and scope 2 emissions to be approximately 12,527,815 tonnes CO2e (19.7 million tonne reduction), a 61 per cent reduction over 2015. This scenario, supported by our target, holds our business accountable to reduce GHG emissions across our existing fleet, while advancing low-carbon growth opportunities. Essentially it provides us a carbon budget. The phase-out and conversion of the majority of our coal fleet to gas supports achieving this target.</p> <p>Our actions also support others achieving their carbon reduction goals. As we reduce our scope 1, grid emission intensities improve and our customers scope 2 emissions. Our continued growth in renewable energy also supports our customers decarbonization goals, especially when projects are additional, such as our recently completed wind development projects in the US (for Microsoft and other partners).</p> <p>We continue to model this target under different scenarios to ensure its relevance.</p>
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C3.1d

(C3.1d) Describe where and how climate-related risks and opportunities have influenced your strategy.

	Have climate-related risks and opportunities influenced your strategy in this area?	Description of influence
Products and services	Yes	We are shifting our product from a GHG-intensive product to a low-carbon product to meet the need to decarbonize and mitigate associated societal risks, but also to meet changing goals from our customers. As noted above we continue to build renewable projects for customers seeking to meet their own sustainability goals, such as carbon neutrality on scope 2 or meeting RE100 goals. We continue to support customers with on-site power generation goals, where collectively there is an opportunity to reduce GHG impacts through on-site cogeneration, where power and steam production replace existing higher GHG intensive boilers. Our conversion of coal plants to gas will significantly reduce the GHG intensity of the Alberta grid, supporting scope 2 emission reductions for our customers and Alberta commercial and industrial loads.

		<p>Another way we can contribute to our customers' sustainability goals is through the product use of environmental attributes. Environmental attributes that we have the ability to generate, trade, purchase and sell, include: Alberta environmental performance credits, Alberta carbon offsets, Renewable Energy Credits (RECs) and emission offsets. Alberta carbon offsets can be voluntarily generated by Alberta projects, which meet Alberta carbon offset system qualification protocols. Our Alberta wind facilities generate Alberta carbon offset credits. RECs are produced from our renewable energy assets (wind, hydro and solar) and can be traded in voluntary carbon markets or sold to customers. RECs can be used to meet regulatory requirements when a target for renewable energy generation is set by a jurisdiction or can be used to voluntarily 'green' electricity procurement. Emissions offsets are produced from voluntary projects that reduce emissions in sectors of the economy not covered by carbon reduction regulations. The optimization of environmental attributes can be used as a cost-effective way, for TransAlta or our customers, to lower compliance costs attributed to carbon policies or renewable portfolio standards or utilized to achieve voluntary corporate sustainability or carbon reduction goals.</p>
Supply chain and/or value chain	Yes	<p>As noted above, our customer base is increasingly integrating ESG risk into their business decisions and as such we see an advantage to continued growth in clean power technologies to support our customer sustainability goals, such as RE100 or net-zero ambitions. Additional projects, such as renewable facilities, and absolute reductions of GHG by TransAlta support both our customer goals and societal objectives to reduce GHG to levels well beyond 2 degrees.</p> <p>In 2019 our Board of Directors approved a Supplier Code of Conduct that applies to all vendors and suppliers of TransAlta. Under this 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. Climate change management cuts across all three of these values for suppliers.</p>
Investment in R&D	Yes	<p>We recognize the need to decarbonize the power sector and as has been noted we are taking strategic steps to</p>

		<p>support this with increased renewable energy development and conversion of coal to gas. We also recognize the associated problems of renewable energy intermittency. For the last several years we have been working on development of a 'first of its kind' battery storage project in Alberta. In 2019 we received approval from the Alberta Utilities Commission for our Windcharger battery storage project, an innovative 10 MW/20 MWh energy storage project using Tesla lithium-ion batteries. The project will store energy produced by our nearby Summerview II wind farm and discharge electricity onto the Alberta grid at times of high-peak demand. This project is receiving co-funding support from Emissions Reduction Alberta. The total expected cost of the project to TransAlta is \$7 million to \$8 million.</p>
Operations	Yes	<p>The impact of climate-related policy intervention (mandatory timelines on coal plant shutdowns) and carbon pricing (currently \$30 per tonne CO₂e) has led to our strategy to convert a significant amount of our Alberta coal fleet to natural gas. Our goal is to be completely coal free by the end of 2025. Our Clean Energy Investment Plan, announced September 16, 2019, supports capital allocation and expenditures towards conversion of coal facilities to gas from now to 2025.</p>

C3.1e

(C3.1e) Describe where and how climate-related risks and opportunities have influenced your financial planning.

	Financial planning elements that have been influenced	Description of influence
Row 1	Capital expenditures Capital allocation	<p>Capital allocation and expenditure: Recognizing both risk (need to shift away from GHG intensive coal, associated carbon pricing impacts, societal shifts and expectations) and opportunity (conversion of coal to gas significantly reduces GHG, while supporting a broader lower carbon transition, and continued growth in renewable energy supports a low carbon future and supports our customers sustainability goals) we announced our Clean Energy Investment Plan on September 16, 2019. This includes converting existing Alberta coal assets to natural gas and advancing our leadership position in renewable energy with a goal to be coal free by the end of 2025. The total cost of the plan is expected to be approximately \$2 billion which includes approximately \$800 million of renewable energy projects already under construction. The investment</p>

		time frame associated with this plan will reach to 2024-2025, but it should be noted some projects will be completed sooner.
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C3.1f

(C3.1f) Provide any additional information on how climate-related risks and opportunities have influenced your strategy and financial planning (optional).

Discussed in detail above.

C4. Targets and performance

C4.1

(C4.1) Did you have an emissions target that was active in the reporting year?

Absolute target

C4.1a

(C4.1a) Provide details of your absolute emissions target(s) and progress made against those targets.

Target reference number

Abs 1

Year target was set

2015

Target coverage

Company-wide

Scope(s) (or Scope 3 category)

Scope 1+2 (location-based)

Base year

2015

Covered emissions in base year (metric tons CO₂e)

32,227,815

Covered emissions in base year as % of total base year emissions in selected Scope(s) (or Scope 3 category)

100

Target year

2021

Targeted reduction from base year (%)

22

Covered emissions in target year (metric tons CO₂e) [auto-calculated]

25,137,695.7

Covered emissions in reporting year (metric tons CO₂e)

20,574,461

% of target achieved [auto-calculated]

164.3604783914

Target status in reporting year

Achieved

Is this a science-based target?

No, but we are reporting another target that is science-based

Please explain (including target coverage)

Target was achieved ahead of schedule at YE 2018

Target reference number

Abs 2

Year target was set

2015

Target coverage

Company-wide

Scope(s) (or Scope 3 category)

Scope 1+2 (location-based)

Base year

2015

Covered emissions in base year (metric tons CO₂e)

32,227,815

**Covered emissions in base year as % of total base year emissions in selected
Scope(s) (or Scope 3 category)**

100

Target year

2030

Targeted reduction from base year (%)

61.11

Covered emissions in target year (metric tons CO₂e) [auto-calculated]

12,533,397.2535

Covered emissions in reporting year (metric tons CO₂e)

20,574,461

% of target achieved [auto-calculated]

59.1708480545

Target status in reporting year

Underway

Is this a science-based target?

Yes, we consider this a science-based target, but this target has not been approved as science-based by the Science-Based Targets initiative

Please explain (including target coverage)

Abs2 is aligned with Goal 13, Climate Action: UN Sustainable Development Goals. Abs2 is also aligned with science-based target setting, specifically using the sectoral decarbonization approach - we completed unofficial validation of this target with SBTi.

C4.2

(C4.2) Did you have any other climate-related targets that were active in the reporting year?

Other climate-related target(s)

C4.2b

(C4.2b) Provide details of any other climate-related targets, including methane reduction targets.

Target reference number

Oth 1

Year target was set

2017

Target coverage

Company-wide

Target type: absolute or intensity

Absolute

Target type: category & Metric (target numerator if reporting an intensity target)

Fossil fuel reduction target

Other, please specify

Installed Coal Capacity (MW)

Target denominator (intensity targets only)

Base year

2017

Figure or percentage in base year

4,653

Target year

2026

Figure or percentage in target year

0

Figure or percentage in reporting year

4,372

% of target achieved [auto-calculated]

6.0391145498

Target status in reporting year

Underway

Is this target part of an emissions target?

This target also builds in to our 2030 GHG emission reduction target due to the nature of coal power generation being GHG intensive.

Is this target part of an overarching initiative?

Science Based Targets initiative

Please explain (including target coverage)

As noted previously, our GHG target is not aligned officially with SBTi, but we continue to model against SBTi and the sectoral decarbonization approach to ensure its relevance. This target is also one of our strategic sustainable development targets, which we announce annually in our integrated report. The specific goal can be found on our target's website: <https://www.transalta.com/sustainability/sustainable-development-targets/>

C4.3

(C4.3) Did you have emissions reduction initiatives that were active within the reporting year? Note that this can include those in the planning and/or implementation phases.

Yes

C4.3a

(C4.3a) Identify the total number of initiatives at each stage of development, and for those in the implementation stages, the estimated CO2e savings.

	Number of initiatives	Total estimated annual CO2e savings in metric tonnes CO2e (only for rows marked *)
Under investigation	6	3,057,374
To be implemented*	2	5,563,286
Implementation commenced*	3	372,825
Implemented*	3	614,735
Not to be implemented	1	206,035

C4.3b

(C4.3b) Provide details on the initiatives implemented in the reporting year in the table below.

Initiative category & Initiative type

Low-carbon energy generation
Wind

Estimated annual CO2e savings (metric tonnes CO2e)

13,046

Scope(s)

Scope 2 (market-based)

Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in C0.4)

0

Investment required (unit currency – as specified in C0.4)

105,000,000

Payback period

4-10 years

Estimated lifetime of the initiative

21-30 years

Comment

This is our Antrim wind project, a 29 MW project located in New Hampshire, which is contracted with two 20-year PPAs with Partners Healthcare and New Hampshire Electric Co-op. Antrim began commercial operations on Dec. 24, 2019.

Initiative category & Initiative type

Low-carbon energy generation
Wind

Estimated annual CO₂e savings (metric tonnes CO₂e)

95,638

Scope(s)

Scope 2 (market-based)

Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in C0.4)

0

Investment required (unit currency – as specified in C0.4)

232,500,000

Payback period

4-10 years

Estimated lifetime of the initiative

21-30 years

Comment

This is our Big Level wind project, a 90 MW project located in Pennsylvania, which is contracted with a 15-year PPA with Microsoft Corp. Big Level began operation on Dec. 19, 2019.

Initiative category & Initiative type

Energy efficiency in production processes
Fuel switch

Estimated annual CO₂e savings (metric tonnes CO₂e)

506,052

Scope(s)

Scope 1

Voluntary/Mandatory

Voluntary

Annual monetary savings (unit currency – as specified in C0.4)

0

Investment required (unit currency – as specified in C0.4)

100,000,000

Payback period

1-3 years

Estimated lifetime of the initiative

11-15 years

Comment

Our Sundance thermal facility had GHG emissions reductions of 1,149,173 tonnes in 2019. Approximately 56 per cent of this is attributed to a planned outage and the remainder (approximately 44 per cent 506,056 tonnes CO₂e) was attributed to co-firing with natural gas. Fuel, carbon compliance and purchased power costs per MWh were lower in 2019 compared to 2018. Cost per MWh of production across our thermal fleet fell to approximately \$35 per MWh in 2019 from \$37 per MWh in 2018, but this a blend of factors, including fewer units operating, lower capacity factor operation on merchant units, co-firing with gas, and operations and maintenance work optimization. Our investment was a 50 per cent interest in the Pioneer Pipeline to transport gas to our Alberta thermal fleet, which we have subsequently entered into a sale agreement with a natural gas pipeline company for \$255 million.

C4.3c

(C4.3c) What methods do you use to drive investment in emissions reduction activities?

Method	Comment
Internal price on carbon	We assess internal projects on a case by case basis and at a carbon price of \$30 to \$50 tonne CO ₂ e.
Dedicated budget for other emissions reduction activities	We are a leader in renewable energy development, with over 2,500 MW of installed renewable capacity in North America. We continue to seek opportunities to grow renewable energy. As part of our \$1.8 to \$2 billion Clean Energy Investment Plan, announced Sept 16, 2019, we have allocated approximately \$800 million of capital to renewable energy projects, which have either recently been completed or are already under construction.
Dedicated budget for other emissions reduction activities	As part of our \$1.8 to \$2 billion Clean Energy Investment Plan, announced Sept 16, 2019, we have allocated approximately \$800 million to \$1 billion to convert or repower our Alberta thermal fleet to natural gas. This will repurpose and reposition our fleet to a cleaner gas-fired fleet and advance our leadership position in onsite generation while generating attractive returns by leveraging TransAlta's existing infrastructure.

C4.5

(C4.5) Do you classify any of your existing goods and/or services as low-carbon products or do they enable a third party to avoid GHG emissions?

Yes

C4.5a

(C4.5a) Provide details of your products and/or services that you classify as low-carbon products or that enable a third party to avoid GHG emissions.

Level of aggregation

Group of products

Description of product/Group of products

We can contribute to our customers' sustainability goals through the use of environmental attributes. Environmental attributes that we have the ability to generate, trade, purchase and sell, include: Emission Performance Credits (EPCs), Alberta carbon offsets, Renewable Energy Credits (RECs) and emission offsets. Alberta carbon offsets can be voluntarily generated by Alberta projects, which meet Alberta carbon offset system qualification protocols. Our Alberta wind facilities generate Alberta carbon offset credits. RECs are produced from our renewable energy assets (wind, hydro and solar) and can be traded in voluntary carbon markets or sold to customers. RECs can be used to meet regulatory requirements when a target for renewable energy generation is set by a jurisdiction or can be used to voluntarily 'green' electricity procurement. Emissions offsets are produced from voluntary projects that reduce emissions in sectors of the economy not covered by carbon reduction regulations. The optimization of environmental attributes can be used as a cost-effective way, for TransAlta or our customers, to lower compliance costs attributed to carbon policies or renewable portfolio standards or utilized to achieve voluntary corporate sustainability or carbon reduction goals.

Are these low-carbon product(s) or do they enable avoided emissions?

Low-carbon product and avoided emissions

Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions

Other, please specify

EcoLogo, TIER, Alberta Carbon Offset Protocol, Massachusetts SRECs

% revenue from low carbon product(s) in the reporting year

1

Comment

There is a strict qualification process and retirement / audit process to ensure EcoLogo RECs, SRECs, EPCs and carbon offsets are not double sold.

Level of aggregation

Product

Description of product/Group of products

Renewable electricity (hydro, wind and solar)

Are these low-carbon product(s) or do they enable avoided emissions?

Low-carbon product

Taxonomy, project or methodology used to classify product(s) as low-carbon or to calculate avoided emissions

Other, please specify

Our renewable generation qualifies as carbon offsets or RECs under different offset frameworks, hence these are low-carbon facilities / products. They are very close to 0 emission facilities from a scope 1 and 2 GHG accounting perspective.

% revenue from low carbon product(s) in the reporting year

25

Comment

In 2019 we earned \$589 million in revenue from renewable energy generation.

C-EU4.6

(C-EU4.6) Describe your organization's efforts to reduce methane emissions from your activities.

Our clean energy investment plan and sustainability goals to reduce GHG, be coal free by the end of 2025 and grow renewable energy will support GHG reductions, offsetting, and as a result methane or CH₄ emission reduction. Operation of renewable energy facilities has close to zero GHG emissions. Our Alberta coal-to-gas conversion will reduce GHG emissions from these facilities by close to 60 per cent. Although methane or CH₄ specific emissions may increase or hold steady at these facilities, the benefit of the reduced CO₂ is substantial. Conversion of our Windsor and Ottawa plants in Ontario to peaking power plant facilities is a good example of TransAlta reducing methane emissions. Our overall methane emissions were 52,898 tonnes CO₂e in 2019, which is less than 1 per cent of our total CO₂e emissions. The gas supplied to our Alberta coal to gas facilities will be some of the lowest carbon natural gas in the world as Alberta and Canada moves forward to meet the federal government's objective of a 45 per cent reduction in vented methane emissions from the oil and gas sector by 2025.

Within our value chain, where methane emissions can be more of a problem, we recently invested in an oil and gas methane reduction program in exchange for carbon offsets. The project is being carried out by Blue Source. The purpose of the project is to assist oil and gas companies efficiently and quickly meet more stringent methane venting requirements established by both Environment and Climate Change Canada (ECCC) and the Alberta Energy Regulator (AER) by replacing existing high-bleed equipment. In doing so the program will play an important role in helping Alberta and Canada meet the federal government's objective of a

45 per cent reduction in vented methane emissions from the oil and gas sector by 2025. The program's objective is to retrofit approximately 7,000 high bleed pneumatic controllers with newer low bleed equivalents over the next two years. The program is composed of at least four projects that cover the installation of transducers, pressure and level controllers during a discreet installation period. The project is an aggregation of installations that are performed during the first quarter of the calendar year.

The number of Alberta carbon offsets credits we received in 2018 was 73,353.

C5. Emissions methodology

C5.1

(C5.1) Provide your base year and base year emissions (Scopes 1 and 2).

Scope 1

Base year start

January 1, 2015

Base year end

December 31, 2015

Base year emissions (metric tons CO₂e)

32,041,425

Comment

Our base year is aligned with the Paris Climate Agreement

Scope 2 (location-based)

Base year start

January 1, 2015

Base year end

December 31, 2015

Base year emissions (metric tons CO₂e)

186,390

Comment

Our base year is aligned with the Paris Climate Agreement

Scope 2 (market-based)

Base year start

January 1, 2015

Base year end

December 31, 2015

Base year emissions (metric tons CO₂e)

0

Comment

Our base year is aligned with the Paris Climate Agreement

C5.2

(C5.2) Select the name of the standard, protocol, or methodology you have used to collect activity data and calculate emissions.

Australia - National Greenhouse and Energy Reporting Act

Environment Canada, Sulphur hexafluoride (SF₆) Emission Estimation and Reporting Protocol for Electric Utilities

The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)

US EPA Center for Corporate Climate Leadership: Direct Emissions from Stationary Combustion Sources

Other, please specify

Government of Alberta (CCIR) and Ontario (390/18)

C5.2a

(C5.2a) Provide details of the standard, protocol, or methodology you have used to collect activity data and calculate emissions.

Our corporate-wide GHG inventory and calculation of scope 1 and 2 emissions is guided by the Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard. Calculations and reporting are carried out using an Operational Control boundary. As per the Kyoto Protocol, GHGs include carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, nitrogen trifluoride, hydrofluorocarbons and perfluorocarbons. Our exposure is limited to carbon dioxide, methane, nitrous oxide and a small amount of sulphur hexafluoride. The majority of our estimated GHG emissions are comprised of carbon dioxide emissions from stationary combustion from coal and natural gas power generation. At our business unit or operations level calculation of emissions defaults to carbon regulations (and associated methodologies) if these are in place and are aligned with an operational control boundary. All protocols or regulations have historically aligned with operational control boundaries, but in 2017 Ontario changed reporting boundaries for our Sarnia, Ontario gas facility. For this facility, in 2019, we calculate emissions as per O. Reg 390/18 for regulatory purposes but continue to calculate corporate emissions on an Operational Control boundary guided by the Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard. Other gas facilities in Ontario are guided by O. Reg. 390/18, which also aligns with an operational control boundary. In Alberta, in 2019, emission calculations for our coal facilities and one gas facility were guided the Carbon Competitiveness Incentive Regulation (CCIR). Our gas facilities emissions in Australia are calculated in accordance with National Greenhouse gas Emission Reporting (NGER). Our coal facility emissions in Washington State are calculated in line with the EPA Greenhouse Gas Reporting Program (GHGRP) or eGGRT. Emissions, in 2019, in Alberta and Ontario, under both CCIR

and O. Reg 390/18 were verified to reasonable assurance as per regulation. In addition, our entire corporate inventory is verified to a level of limited assurance. In Canada we also report facility GHG emissions through the Greenhouse Gas Reporting Program and SF6 emissions in line with Environment Canada's SF6 Emission Estimation and Reporting Protocol for Electric Utilities.

C6. Emissions data

C6.1

(C6.1) What were your organization's gross global Scope 1 emissions in metric tons CO₂e?

Reporting year

Gross global Scope 1 emissions (metric tons CO₂e)

20,434,944

Start date

January 1, 2019

End date

December 31, 2019

Comment

Past year 1

Gross global Scope 1 emissions (metric tons CO₂e)

20,605,250

Start date

January 1, 2018

End date

December 31, 2018

Comment

Minor adjustments were made to historical 2017 and 2018 GHG emissions data from our natural gas business units as a result of adjusted historical energy use volumes

Past year 2

Gross global Scope 1 emissions (metric tons CO₂e)

29,731,321

Start date

January 1, 2017

End date

December 31, 2017

Comment

Minor adjustments were made to historical 2017 and 2018 GHG emissions data from our natural gas business units as a result of adjusted historical energy use volumes

C6.2

(C6.2) Describe your organization's approach to reporting Scope 2 emissions.

Row 1

Scope 2, location-based

We are reporting a Scope 2, location-based figure

Scope 2, market-based

We have operations where we are able to access electricity supplier emission factors or residual emissions factors, but are unable to report a Scope 2, market-based figure

Comment

C6.3

(C6.3) What were your organization's gross global Scope 2 emissions in metric tons CO₂e?

Reporting year

Scope 2, location-based

139,498

Start date

January 1, 2019

End date

December 31, 2019

Comment

Past year 1

Scope 2, location-based

169,316

Start date

January 1, 2018

End date

December 31, 2018

Comment

Past year 2

Scope 2, location-based

185,379

Start date

January 1, 2017

End date

December 31, 2017

Comment

C6.4

(C6.4) Are there any sources (e.g. facilities, specific GHGs, activities, geographies, etc.) of Scope 1 and Scope 2 emissions that are within your selected reporting boundary which are not included in your disclosure?

No

C6.5

(C6.5) Account for your organization's gross global Scope 3 emissions, disclosing and explaining any exclusions.

Purchased goods and services

Evaluation status

Relevant, calculated

Metric tonnes CO₂e

471,935

Emissions calculation methodology

GHG Protocol Quantis Scope 3 Evaluator

Percentage of emissions calculated using data obtained from suppliers or value chain partners

100

Please explain

Our accounting and supply chain group provides our annual supply chain spend analysis annually for sustainability to further categorize and add to the Quantis Scope 3

Evaluator. All data comes from the supplier or service provider, but not the specific GHG information.

Capital goods

Evaluation status

Relevant, calculated

Metric tonnes CO₂e

47,617

Emissions calculation methodology

GHG Protocol Quantis Scope 3 Evaluator

Percentage of emissions calculated using data obtained from suppliers or value chain partners

100

Please explain

Our accounting and supply chain group provides our annual supply chain spend analysis annually for sustainability to further categorize and add to the Quantis Scope 3 Evaluator. All data comes from the supplier, but not the specific GHG information.

Fuel-and-energy-related activities (not included in Scope 1 or 2)

Evaluation status

Relevant, calculated

Metric tonnes CO₂e

439,672

Emissions calculation methodology

Alberta Environment emissions factors for extraction and production of gasoline, diesel, natural gas, propane and kerosene. Applied emission intensity (mining emissions/coal combustion) from our own coal mine in Alberta to derive coal extraction emissions for our US coal operations.

Percentage of emissions calculated using data obtained from suppliers or value chain partners

100

Please explain

TransAlta purchases natural gas for its gas power generation facilities. Gas extraction and production is included in this calculation. Emissions from coal extraction in AB are accounted for in scope 1, as we operate the mine adjacent to our coal facilities. The extraction of coal combustion at our Centralia plant is also included in this calculation as we rely on coal deliveries at this plant. This calculation also includes diesel extraction and production. Diesel is occasionally used for combustion in our plants. We also use diesel and gasoline for transportation requirements and propane and kerosene for heating. These have also been included.

Upstream transportation and distribution

Evaluation status

Relevant, calculated

Metric tonnes CO₂e

155,292

Emissions calculation methodology

Diesel usage from locomotives (delivering coal) multiplied by mobile combustion source diesel rail emission factors (taken from Environment Canada National Inventory Report – EPA emission factors not clear)

Percentage of emissions calculated using data obtained from suppliers or value chain partners

100

Please explain

Coal is transported in diesel locomotive freight trains from Montana and Wyoming to our Centralia coal power plant in Washington. CO₂e is calculated using a guidance from Rail Canada. We track the distance, number of train cars and weight in order to help determine CO₂e. Different weights are applied for the return journey, empty cars, hence the weight of the car only. Natural gas is distributed in pipelines. We have tie-in points at all of our operations. Some fugitive emissions are associated with natural gas transportation. We consider these to be negligible. Emissions from extraction and production of natural gas are calculated in 'Fuel and energy related activities'

Waste generated in operations

Evaluation status

Relevant, calculated

Metric tonnes CO₂e

45,435

Emissions calculation methodology

GHG Protocol Quantis Scope 3 Evaluator

Percentage of emissions calculated using data obtained from suppliers or value chain partners

100

Please explain

As part of our annual sustainability reporting we track all environmental expenditures, including waste management expenditures. The total was applied in the Scope 3 evaluator to derive an estimate of our waste emissions.

Business travel

Evaluation status

Relevant, calculated

Metric tonnes CO₂e

771

Emissions calculation methodology

Travel provider methodology. Sourced from GRASP Reporting. 17. GREEN PORTFOLIO FRAMEWORK ADDITIONAL RESOURCES - GHG FACTORS Common GHG conversion factors for determining GHG emissions performance based on energy use and travel. Air travel - Short haul (under 281 miles): 0.2897 kg CO₂/passenger mile / Medium haul (281-994 miles): 0.2028 kg CO₂/passenger mile / Long haul (over 994 miles): 0.1770 kg CO₂/passenger mile

Percentage of emissions calculated using data obtained from suppliers or value chain partners

50

Please explain

Travel provider provided this data and in addition we conservatively double this figure to account for internally booked flights (outside of our travel provider).

Employee commuting

Evaluation status

Relevant, calculated

Metric tonnes CO₂e

2,975

Emissions calculation methodology

GHG Protocol Quantis Scope 3 Evaluator

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

GHG Protocol Quantis Scope 3 tool takes total employee numbers and applies a methodology. TransAlta company size 1000-2500 employees.

Upstream leased assets

Evaluation status

Relevant, calculated

Metric tonnes CO₂e

0

Emissions calculation methodology

TransAlta accounts for emissions from leased assets in its scope 2 emissions, hence this calculation is 0.

Percentage of emissions calculated using data obtained from suppliers or value chain partners

0

Please explain

See comment above.

Downstream transportation and distribution

Evaluation status

Relevant, calculated

Metric tonnes CO₂e

396

Emissions calculation methodology

Downstream electricity use, after generation, is transmission and distribution (T&D) of electricity. There are typical losses from T&D. Given our small share of overall power generation these emissions are relatively small. As an example, line losses in Alberta for 2019 were anticipated to be 2.75% (as per guidance from the Alberta Electricity System Operator). Hence, applying this across our fleet (the majority of our infrastructure and generation is in Alberta) and multiplying line losses by our overall generation (conservative as we also provide at the source power for customers) is 27,287,582 MWh x 0.000275 = 750 MWh of electricity lost. Emissions, using a weighted grid emission factor across our fleet is approximately 0.53, would be 614 tonnes. Again, this is a conservative estimate as a significant amount of our electricity is used close to its source.

Percentage of emissions calculated using data obtained from suppliers or value chain partners

56

Please explain

As we use Alberta (AESO) line loss public data, we have applied a factor of 56 per cent as this is the amount of generation (MWh) we produced in Alberta in 2019.

Processing of sold products

Evaluation status

Not relevant, explanation provided

Please explain

Electricity is not processed, hence this is not relevant.

Use of sold products

Evaluation status

Not relevant, explanation provided

Please explain

TransAlta generates electricity. GHG emissions are calculated in our Scope 1 response.

End of life treatment of sold products

Evaluation status

Not relevant, explanation provided

Please explain

There is no end of life treatment required for our primary product, which is electricity. As per the laws of thermodynamics, energy changes form or is transferred, i.e. electricity powers a light bulb and the energy changes form to radiant energy (light).

Downstream leased assets

Evaluation status

Not relevant, explanation provided

Please explain

TransAlta does not lease any assets downstream of its business, hence this is not relevant.

Franchises

Evaluation status

Not relevant, explanation provided

Please explain

TransAlta has no franchises, hence this is not relevant.

Investments

Evaluation status

Relevant, calculated

Metric tonnes CO₂e

4,500,346

Emissions calculation methodology

Carbon Competitiveness Incentive Regulation (CCIR) - Alberta GHG regulations

Percentage of emissions calculated using data obtained from suppliers or value chain partners

71

Please explain

GHG emissions from sites that we have a financial or equity ownership percentage but are not the operator.

Other (upstream)

Evaluation status

Please explain

Other (downstream)

Evaluation status

Please explain

C6.7

(C6.7) Are carbon dioxide emissions from biogenic carbon relevant to your organization?

No

C6.10

(C6.10) Describe your gross global combined Scope 1 and 2 emissions for the reporting year in metric tons CO₂e per unit currency total revenue and provide any additional intensity metrics that are appropriate to your business operations.

Intensity figure

0.0088

Metric numerator (Gross global combined Scope 1 and 2 emissions, metric tons CO₂e)

20,574,442

Metric denominator

unit total revenue

Metric denominator: Unit total

2,347,000,000

Scope 2 figure used

Location-based

% change from previous year

5

Direction of change

Decreased

Reason for change

GHG emissions reduced in 2019, primarily as a result of significant GHG reductions from increased co-firing of gas in our Alberta Sundance coal facility. Revenues in 2019 were \$2,347 million, up \$98 million compared to 2018, mainly as a result of strong revenue generated from our Energy Marketing segment as well as higher production, resulting in higher revenue, within our US Coal segment due to strong merchant pricing in the Pacific Northwest.

Intensity figure

0.75

Metric numerator (Gross global combined Scope 1 and 2 emissions, metric tons CO₂e)

20,574,442

Metric denominator

megawatt hour generated (MWh)

Metric denominator: Unit total

27,287,582

Scope 2 figure used

Location-based

% change from previous year

4

Direction of change

Decreased

Reason for change

GHG emissions reduced in 2019, primarily as a result of significant GHG reductions from increased co-firing of gas in our Alberta Sundance coal facility. Overall production across our fleet was higher in 2019 as a result of higher production within from our US Coal facility due to the strong merchant demand in the Pacific Northwest.

C7. Emissions breakdowns

C7.1

(C7.1) Does your organization break down its Scope 1 emissions by greenhouse gas type?

Yes

C7.1a

(C7.1a) Break down your total gross global Scope 1 emissions by greenhouse gas type and provide the source of each used greenhouse warming potential (GWP).

Greenhouse gas	Scope 1 emissions (metric tons of CO2e)	GWP Reference
CO2	20,271,379	IPCC Fourth Assessment Report (AR4 - 100 year)
CH4	52,883	IPCC Fourth Assessment Report (AR4 - 100 year)
N2O	110,608	IPCC Fourth Assessment Report (AR4 - 100 year)
SF6	74	IPCC Fourth Assessment Report (AR4 - 100 year)

C-EU7.1b

(C-EU7.1b) Break down your total gross global Scope 1 emissions from electric utilities value chain activities by greenhouse gas type.

	Gross Scope 1 CO2 emissions (metric tons CO2)	Gross Scope 1 methane emissions (metric tons CH4)	Gross Scope 1 SF6 emissions (metric tons SF6)	Total gross Scope 1 emissions (metric tons CO2e)	Comment
Fugitives	722.22	21,340.61	74.36	22,137.2	This is associated with fugitive emissions from mining related activities and SF6. N2O emission were 0.
Combustion (Electric utilities)	20,210,310.52	31,414.99	0	20,351,957.08	This is associated with coal and gas combustion. N2O emissions were 110,231.56
Combustion (Gas utilities)	0	0	0	0	0
Combustion (Other)	60,346.09	127.81	0	60,850.15	This is associated with vehicle GHG emissions. N2O

					emissions were 376.25 tonnes.
Emissions not elsewhere classified	0	0	0	0	0

C7.2

(C7.2) Break down your total gross global Scope 1 emissions by country/region.

Country/Region	Scope 1 emissions (metric tons CO2e)
Australia	997,898
Canada	11,432,645
United States of America	8,004,401

C7.3

(C7.3) Indicate which gross global Scope 1 emissions breakdowns you are able to provide.

By business division

By activity

C7.3a

(C7.3a) Break down your total gross global Scope 1 emissions by business division.

Business division	Scope 1 emissions (metric ton CO2e)
Coal power generation and mining	17,954,533
Natural Gas power generation	2,479,264
Hydro power generation	575
Wind and solar power generation	572
Corporate	0

C7.3c

(C7.3c) Break down your total gross global Scope 1 emissions by business activity.

Activity	Scope 1 emissions (metric tons CO2e)
Coal-fired Power plants	17,872,947
Natural gas fired power plants	2,479,010
Coal mining - operations, surface and handling, mining vehicles	72,705

Fleet vehicles	10,208
Breakers - fugitive emissions (SF6)	74

C-CE7.4/C-CH7.4/C-CO7.4/C-EU7.4/C-MM7.4/C-OG7.4/C-ST7.4/C-TO7.4/C-TS7.4

(C-CE7.4/C-CH7.4/C-CO7.4/C-EU7.4/C-MM7.4/C-OG7.4/C-ST7.4/C-TO7.4/C-TS7.4) Break down your organization's total gross global Scope 1 emissions by sector production activity in metric tons CO2e.

	Gross Scope 1 emissions, metric tons CO2e	Comment
Electric utility activities	20,362,240	The remaining scope 1 emissions or 72,705 tonnes CO2e come from our coal mine, which sits adjacent to our Sundance and Keephills coal facilities. The mine is used to produce coal for our electric utilities business, hence we could include this in our 20,434,944 tonnes CO2e total. The difference between the reported number, 20,362,240 tonnes CO2e and mine GHG emissions, 72,705 tonnes CO2e, versus total scope 1 GHG emissions reported (20,434,944) is due to rounding.

C7.9

(C7.9) How do your gross global emissions (Scope 1 and 2 combined) for the reporting year compare to those of the previous reporting year?

Decreased

C7.9a

(C7.9a) Identify the reasons for any change in your gross global emissions (Scope 1 and 2 combined), and for each of them specify how your emissions compare to the previous year.

	Change in emissions (metric tons CO2e)	Direction of change	Emissions value (percentage)	Please explain calculation
Change in renewable energy consumption				
Other emissions	200,123	Decreased	1	GHG reductions were down primarily due to reduced GHG emissions at our

reduction activities				Alberta coal fleet (-2.1 million tonnes CO2e). We did experience higher GHG emissions at our US coal facility, which offset this (+1.9 million tonnes CO2e). On a TransAlta-wide basis GHG was reduced through Alberta coal reductions. We have transition plans in place for all of our coal facilities and will be off coal by the end of 2025.
Divestment				
Acquisitions				
Mergers				
Change in output				
Change in methodology				
Change in boundary				
Change in physical operating conditions				
Unidentified				
Other				

C7.9b

(C7.9b) Are your emissions performance calculations in C7.9 and C7.9a based on a location-based Scope 2 emissions figure or a market-based Scope 2 emissions figure?

Location-based

C8. Energy

C8.1

(C8.1) What percentage of your total operational spend in the reporting year was on energy?

More than 40% but less than or equal to 45%

C8.2

(C8.2) Select which energy-related activities your organization has undertaken.

	Indicate whether your organization undertook this energy-related activity in the reporting year
Consumption of fuel (excluding feedstocks)	Yes
Consumption of purchased or acquired electricity	Yes
Consumption of purchased or acquired heat	Yes
Consumption of purchased or acquired steam	No
Consumption of purchased or acquired cooling	No
Generation of electricity, heat, steam, or cooling	Yes

C8.2a

(C8.2a) Report your organization's energy consumption totals (excluding feedstocks) in MWh.

	Heating value	MWh from renewable sources	MWh from non-renewable sources	Total (renewable and non-renewable) MWh
Consumption of fuel (excluding feedstock)	HHV (higher heating value)	0	95,677,571	95,677,571
Consumption of purchased or acquired electricity		788	210,314	211,102
Consumption of purchased or acquired heat		0	0	0
Consumption of self-generated non-fuel renewable energy		0		0
Total energy consumption		788	95,887,885	95,888,673

C8.2b

(C8.2b) Select the applications of your organization’s consumption of fuel.

	Indicate whether your organization undertakes this fuel application
Consumption of fuel for the generation of electricity	Yes
Consumption of fuel for the generation of heat	No
Consumption of fuel for the generation of steam	No
Consumption of fuel for the generation of cooling	No
Consumption of fuel for co-generation or tri-generation	Yes

C8.2c

(C8.2c) State how much fuel in MWh your organization has consumed (excluding feedstocks) by fuel type.

Fuels (excluding feedstocks)

Subbituminous Coal

Heating value

HHV (higher heating value)

Total fuel MWh consumed by the organization

74,015,399.23

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-cogeneration or self-trigeneration

0

Emission factor

1.97

Unit

metric tons CO2e per metric ton

Emissions factor source

Calculated based on GHG emissions from scope 1 coal combustion (not factoring in vehicle fuel GHG) divided by coal use (on a ton basis). Calculation follows: 17,881,828 metric tons CO_{2e} / 9,091,676 metric tons coal = 1.97. Coal emission factors vary from location to location. For CO₂ at our Alberta coal facilities we use laboratory tested results of the carbon content in our coal and ash, from three different labs, to average an emission factor for CO₂. In this case to calculate CO₂ we use the assumed CO₂ to C ratio of 3.66417 multiplied by the total carbon in coal minus any carbon in the ash. For CH₄ and N₂O we use USEPA guidance: USEPA AP 42, Chapter 1.1 (Table 1.1-19. EMISSION FACTORS FOR CH₄, TNMOC, AND N₂O FROM BITUMINOUS AND SUBBITUMINOUS COAL COMBUSTION). USEPA emission factors are used for coal combustion at our Washington State coal facility.

Comment

Fuels (excluding feedstocks)

Natural Gas

Heating value

HHV (higher heating value)

Total fuel MWh consumed by the organization

21,305,852

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-cogeneration or self-trigeneration

0

Emission factor

0.05178

Unit

metric tons CO₂ per GJ

Emissions factor source

Emission factor source: Canada's GHG Inventory 1990-2017 (Part 2) Table A6-1 CO₂ Emission Factors for Natural Gas --> assumes 99.5 combustion efficiency -- released 2019

Comment

We use a number of emission factors for natural gas. Emission factor use is dependent on geographic location, operations or regulations in place. For example, at Alberta coal,

where we co-fire coal and natural gas, for stationary combustion of natural gas in boilers we use the following emission factor for CO₂ tonnes/GJ: 0.050576750. Source: USEPA AP-42 Chapter 1.4 (TABLE 1.4-2. EMISSION FACTORS FOR CRITERIA POLLUTANTS AND GREENHOUSE GASES FROM NATURAL GAS COMBUSTION). In Canada, at our natural gas power generation facilities for stationary combustion of natural gas in boilers we use the following emission factors, source noted above: Electric Utility Natural Gas Combustion - CO₂: 0.05178619 tonnes CO₂/GJ; Electric Utility Natural Gas Combustion - CH₄: 0.00001316 tonnes CH₄/GJ; Electric Utility Natural Gas Combustion - N₂O: 0.00000132 tonnes N₂O/GJ. In Australia, as per NGER regulations, the emission factor for natural gas combustion in boilers is 51.53 kgCO₂-e/GJ. For use in buildings for heating purposes we apply the Canadian electric utility natural gas combustion factors noted above.

Fuels (excluding feedstocks)

Diesel

Heating value

HHV (higher heating value)

Total fuel MWh consumed by the organization

342,788

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-cogeneration or self-trigeneration

0

Emission factor

0.00268

Unit

metric tons CO₂ per liter

Emissions factor source

Canada's GHG Inventory 1990-2017 (Part 2) Table A6-13: Emission Factors for Energy Mobile Combustion Sources) -- released 2019

Comment

Actual emission factor: 0.00268100 tonnes / L (does not fit in box above) The emission factor above is used for mobile diesel combustion across our Canadian operations. Diesel use at Highvale mine represents the majority of our diesel use, totalling 41,637,571 litres or 74 per cent of our diesel combustion and Canadian mobile diesel use represents 75 per cent of diesel combustion. In 2018 our diesel combustion totalled 47,905,686 litres.

Fuels (excluding feedstocks)

Motor Gasoline

Heating value

HHV (higher heating value)

Total fuel MWh consumed by the organization

10,815

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-cogeneration or self-trigeneration

0

Emission factor

0.0023

Unit

metric tons CO2 per liter

Emissions factor source

Canada's GHG Inventory 1990-2017 (Part 2) Table A6-13: Emission Factors for Energy Mobile Combustion Sources --> applicable to heavy duty vehicles and light duty trucks -- released 2019

Comment

Actual emission factor: 0.000230700 tonnes / L. This will not fit in the emission factor box above. CH4 and N2O are 0.00000020 and 0.00000049 tonnes / L respectively

Fuels (excluding feedstocks)

Propane Gas

Heating value

HHV (higher heating value)

Total fuel MWh consumed by the organization

1,864

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-cogeneration or self-trigeneration

0

Emission factor

0.00151

Unit

metric tons CO2e per liter

Emissions factor source

Canada's GHG Inventory 1990-2017 (Part 2) Table A6-13: Emission Factors for Energy Mobile Combustion Sources--> Propane vehicles (i.e. - forklifts) -- released 2019

Comment

Across our operations propane is used for both space heating at remote locations and for operational vehicle use. Emission factors are similar for both uses for CO2, but there is some variance for CH4 and N2O. Stationary Combustion Source - Space Heater Propane - CO2: 0.00151500 tonnes/L Mobile Combustion Source - Propane (light & heavy duty) - CO2: 0.00151500 tonnes/L Stationary Combustion Source - Space Heater Propane - CH4: 0.00000024 tonnes L Mobile Combustion Source - Propane (light & heavy duty) - CH4: 0.00000024 tonnes/L Stationary Combustion Source - Space Heater Propane - N2O: 0.000000108 tonnes/L Mobile Combustion Source - Propane (light & heavy duty) - N2O: 0.00000003 tonnes/L

Fuels (excluding feedstocks)

Kerosene

Heating value

HHV (higher heating value)

Total fuel MWh consumed by the organization

852

MWh fuel consumed for self-generation of electricity

0

MWh fuel consumed for self-generation of heat

0

MWh fuel consumed for self-cogeneration or self-trigeneration

0

Emission factor

0.00256

Unit

metric tons CO2 per liter

Emissions factor source

Canada's GHG Inventory 1990-2017 (Part 2) Table A6-4 Emission Factors for Refined Petroleum Products --> applicable to kerosene -- released 2019

Comment

Actual emission factor: 0.002560 tonnes / L (does not fit in box above) / CH4 and N2O are 0.000000006 and 0.000000031 tonnes / L respectively

C-EU8.2d

(C-EU8.2d) For your electric utility activities, provide a breakdown of your total power plant capacity, generation, and related emissions during the reporting year by source.

Coal – hard

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO2e)

0

Scope 1 emissions intensity (metric tons CO2e per GWh)

0

Comment

Lignite

Nameplate capacity (MW)

4,174

Gross electricity generation (GWh)

17,599

Net electricity generation (GWh)

17,599

Absolute scope 1 emissions (metric tons CO2e)

17,954,533

Scope 1 emissions intensity (metric tons CO2e per GWh)

1,020.2

Comment

This is subbituminous coal, as noted above in 8.2c

Oil

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Gas

Nameplate capacity (MW)

1,268

Gross electricity generation (GWh)

4,112

Net electricity generation (GWh)

4,112

Absolute scope 1 emissions (metric tons CO₂e)

2,479,264

Scope 1 emissions intensity (metric tons CO₂e per GWh)

602.91

Comment

Biomass

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Waste (non-biomass)

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Nuclear

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Fossil-fuel plants fitted with CCS

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO2e)

0

Scope 1 emissions intensity (metric tons CO2e per GWh)

0

Comment

Geothermal

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO2e)

0

Scope 1 emissions intensity (metric tons CO2e per GWh)

0

Comment

Hydropower

Nameplate capacity (MW)

948

Gross electricity generation (GWh)

2,126

Net electricity generation (GWh)

2,126

Absolute scope 1 emissions (metric tons CO2e)

575

Scope 1 emissions intensity (metric tons CO2e per GWh)

0.27

Comment

Wind

Nameplate capacity (MW)

1,553

Gross electricity generation (GWh)

3,424

Net electricity generation (GWh)

3,424

Absolute scope 1 emissions (metric tons CO₂e)

572

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0.17

Comment

Solar

Nameplate capacity (MW)

21

Gross electricity generation (GWh)

26

Net electricity generation (GWh)

26

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Marine

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Other renewable

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Other non-renewable

Nameplate capacity (MW)

0

Gross electricity generation (GWh)

0

Net electricity generation (GWh)

0

Absolute scope 1 emissions (metric tons CO₂e)

0

Scope 1 emissions intensity (metric tons CO₂e per GWh)

0

Comment

Total

Nameplate capacity (MW)

7,964

Gross electricity generation (GWh)

27,288

Net electricity generation (GWh)

27,288

Absolute scope 1 emissions (metric tons CO2e)

20,434,944

Scope 1 emissions intensity (metric tons CO2e per GWh)

748.87

Comment

As per an operational control boundary

C-EU8.4

(C-EU8.4) Does your electric utility organization have a transmission and distribution business?

No

C9. Additional metrics

C9.1

(C9.1) Provide any additional climate-related metrics relevant to your business.

Description

Energy usage

Metric value

345,198,947

Metric numerator

GJ

Metric denominator (intensity metric only)

% change from previous year

4

Direction of change

Decreased

Please explain

The decrease is attributable to continued reduction of coal use. Since 2015 we have reduced coal use by 38 per cent

C-EU9.5a

(C-EU9.5a) Break down, by source, your total planned CAPEX in your current CAPEX plan for power generation.

Primary power generation source	CAPEX planned for power generation from this source	Percentage of total CAPEX planned for power generation	End year of CAPEX plan	Comment
Coal – hard	108,000,000	5	2020	This total includes routine capital, planned major maintenance capital, mine capital and productivity capital (collectively sustaining and productivity capital expenditures). Outside of ongoing sustaining and productivity capital expenditures we have no growth-related expenditures for coal, rather we have plans to convert coal facilities to gas or retire units. Growth capital expenditures for coal to gas are captured in gas.
Gas	1,127,625,000	54	2023	Approximately 90 per cent of this cost is associated with our coal to gas conversions. It also includes one on-site cogeneration or combined heat and power development project for a customer in northern Alberta and sustaining and productivity capital expenditures.
Wind	816,875,000	39	2021	This includes four new wind development projects, a small-scale battery storage project and sustaining and productivity capital expenditures. Development CAPEX accounts for approximately 95 per cent of this total.
Hydropower	39,375,000	0	2020	Costs are associated with sustaining and productivity capital expenditures.

C-EU9.5b

(C-EU9.5b) Break down your total planned CAPEX in your current CAPEX plan for products and services (e.g. smart grids, digitalization, etc.).

Products and services	Description of product/service	CAPEX planned for product/service	Percentage of total CAPEX planned products and services	End of year CAPEX plan
Distributed generation	On-site cogeneration or combined heat and power	110	6	2021

C-CE9.6/C-CG9.6/C-CH9.6/C-CN9.6/C-CO9.6/C-EU9.6/C-MM9.6/C-OG9.6/C-RE9.6/C-ST9.6/C-TO9.6/C-TS9.6

(C-CE9.6/C-CG9.6/C-CH9.6/C-CN9.6/C-CO9.6/C-EU9.6/C-MM9.6/C-OG9.6/C-RE9.6/C-ST9.6/C-TO9.6/C-TS9.6) Does your organization invest in research and development (R&D) of low-carbon products or services related to your sector activities?

	Investment in low-carbon R&D	Comment
Row 1	Yes	This activity has fluctuated over time due to cash flow availability, market demands, capacity of innovation potential. Currently we are investing in a small-scale 10 MW/20 MWh utility-scale storage project in southern Alberta at our Summerview wind farm. This will be the first of its kind in Alberta

C-CO9.6a/C-EU9.6a/C-OG9.6a

(C-CO9.6a/C-EU9.6a/C-OG9.6a) Provide details of your organization's investments in low-carbon R&D for your sector activities over the last three years.

Technology area	Stage of development in the reporting year	Average % of total R&D investment over the last 3 years	R&D investment figure in the reporting year (optional)	Comment
Energy storage	Applied research and development	81-100%	1	This is our 10 MW/20 MWh utility-scale storage project in southern Alberta at our Summerview wind farm

C10. Verification

C10.1

(C10.1) Indicate the verification/assurance status that applies to your reported emissions.

	Verification/assurance status
Scope 1	Third-party verification or assurance process in place
Scope 2 (location-based or market-based)	Third-party verification or assurance process in place
Scope 3	No third-party verification or assurance

C10.1a

(C10.1a) Provide further details of the verification/assurance undertaken for your Scope 1 emissions, and attach the relevant statements.

Verification or assurance cycle in place

Annual process


Status in the current reporting year


Complete

Type of verification or assurance

Limited assurance

Attach the statement

 Sustainability Assurance Statement.pdf

 TAC2019_AnnualReport.pdf

Page/ section reference

Page 225 of our Annual Integrated Report. We have also posted the Assurance Statement for ease of access.

Relevant standard

ASAE3000

Proportion of reported emissions verified (%)

100

C10.1b

(C10.1b) Provide further details of the verification/assurance undertaken for your Scope 2 emissions and attach the relevant statements.

Scope 2 approach

Scope 2 location-based

Verification or assurance cycle in place

Annual process


Status in the current reporting year

Complete

Type of verification or assurance

Limited assurance

Attach the statement

 Sustainability Assurance Statement.pdf

 TAC2019_AnnualReport.pdf

Page/ section reference

Page 225 of our Annual Integrated Report. We have also posted the Assurance Statement for ease of access.

Relevant standard

ASAE3000

Proportion of reported emissions verified (%)

100


C10.2

(C10.2) Do you verify any climate-related information reported in your CDP disclosure other than the emissions figures reported in C6.1, C6.3, and C6.5?

Yes

C10.2a

(C10.2a) Which data points within your CDP disclosure have been verified, and which verification standards were used?

Disclosure module verification relates to	Data verified	Verification standard	Please explain
C6. Emissions data	Year on year change in emissions (Scope 1)	International Standard on Assurance Engagements 3000 "Assurance Engagements other than Audits or	Included in our annual sustainability assurance with E&Y  1

		Reviews of Historical Financial Information”	
C6. Emissions data	Year on year change in emissions (Scope 2)	International Standard on Assurance Engagements 3000 “Assurance Engagements other than Audits or Reviews of Historical Financial Information”	Included in our annual sustainability assurance with E&Y 📎 1
C6. Emissions data	Year on year change in emissions (Scope 1 and 2)	International Standard on Assurance Engagements 3000 “Assurance Engagements other than Audits or Reviews of Historical Financial Information”	Included in our annual sustainability assurance with E&Y 📎 1
C6. Emissions data	Year on year emissions intensity figure	International Standard on Assurance Engagements 3000 “Assurance Engagements other than Audits or Reviews of Historical Financial Information”	Included in our annual sustainability assurance with E&Y 📎 1

📎 1 Sustainability Assurance Statement.pdf

C11. Carbon pricing

C11.1

(C11.1) Are any of your operations or activities regulated by a carbon pricing system (i.e. ETS, Cap & Trade or Carbon Tax)?

Yes

C11.1a

(C11.1a) Select the carbon pricing regulation(s) which impacts your operations.

Alberta Carbon Competitive Incentive Regulation (CCIR) – ETS

Canada federal fuel charge

Canada federal Output Based Pricing System (OBPS) - ETS

Washington CAR

C11.1b

(C11.1b) Complete the following table for each of the emissions trading schemes you are regulated by.

Alberta Carbon Competitive Incentive Regulation (CCIR) – ETS

% of Scope 1 emissions covered by the ETS

51

% of Scope 2 emissions covered by the ETS

0

Period start date

January 1, 2019

Period end date

December 31, 2019

Allowances allocated

0

Allowances purchased

0

Verified Scope 1 emissions in metric tons CO₂e

10,377,979

Verified Scope 2 emissions in metric tons CO₂e

0

Details of ownership

Facilities we own and operate

Comment

Canada federal OBPS - ETS

% of Scope 1 emissions covered by the ETS

5

% of Scope 2 emissions covered by the ETS

0

Period start date

January 1, 2019

Period end date

December 31, 2019

Allowances allocated

0

Allowances purchased

0

Verified Scope 1 emissions in metric tons CO₂e

1,012,465

Verified Scope 2 emissions in metric tons CO₂e

0

Details of ownership

Facilities we own and operate

Comment

Ontario large emitters were subject to the federal backstop OBPS regulation in 2019

Washington CAR

% of Scope 1 emissions covered by the ETS

39

% of Scope 2 emissions covered by the ETS

0

Period start date

January 1, 2019

Period end date

December 31, 2019

Allowances allocated

0

Allowances purchased

0

Verified Scope 1 emissions in metric tons CO₂e

8,004,298

Verified Scope 2 emissions in metric tons CO₂e

0

Details of ownership

Facilities we own and operate

Comment

Although the Clean Air Rule is currently suspended, facilities covered by the Clean Air Rule still are required to report their emissions for the Greenhouse Gas Reporting program. This reporting program is required by Washington law. We verify all Centralia scope 1 emissions (and scope 2) annually through our Corporate sustainability function, utilizing E&Y to conduct the third-party assurance.

C11.1c

(C11.1c) Complete the following table for each of the tax systems you are regulated by.

Canada federal fuel charge

Period start date

January 4, 2019

Period end date

December 31, 2019

% of total Scope 1 emissions covered by tax

0

Total cost of tax paid

0

Comment

Negligible. This fuel charge applied only to users of fossil fuels in New Brunswick, Ontario, Manitoba, and Saskatchewan in 2019. We have several wind farms in Ontario and New Brunswick and a very small amount of diesel combustion in trucks.

C11.1d

(C11.1d) What is your strategy for complying with the systems you are regulated by or anticipate being regulated by?

Our strategy is to participate in carbon pricing markets from both a design/process/continuous improvement standpoint and also strategically, for the purpose of either lowering compliance costs (i.e. optimize facilities) or to generate revenue (i.e. offsets, trading).

TransAlta has employment positions dedicated to managing and complying with all the carbon programs in our operating jurisdictions. The individuals that compose that team work to make sure that we respect the prerequisite and compliance rules of each market and comment and participate in the implementation of new markets and/or new instruments. From the trader to the compliance analyst, to the emission engineer we make sure that TransAlta has the knowledge to understand these different carbon programs. Our recent contributions to policy design of the Carbon Competitiveness Incentive Regulation (CCIR) and the Technology Innovation and Emission Reduction (TIER) in Alberta helped secure opt in for origination of carbon offset credits from our hydro and a number of wind facilities in the province. Carbon offsets are valued at \$30/tonne in Alberta we expect to generate additional revenue from new offsets, significantly adding value to these renewable facilities and to shareholders.

C11.2

(C11.2) Has your organization originated or purchased any project-based carbon credits within the reporting period?

Yes

C11.2a

(C11.2a) Provide details of the project-based carbon credits originated or purchased by your organization in the reporting period.

Credit origination or credit purchase

Credit purchase

Project type

Other, please specify

Anaerobic treatment of wastewater projects, enhanced oil recovery, emission performance credits, instrument gas conversion to instrument air conversion in process control systems and waste heat recovery projects

Project identification

Numerous

Verified to which standard

Other, please specify

Alberta Carbon Competitiveness Incentive Regulation (CCIR)

Number of credits (metric tonnes CO₂e)

150,591

Number of credits (metric tonnes CO₂e): Risk adjusted volume

150,591

Credits cancelled

Yes

Purpose, e.g. compliance

Compliance

Credit origination or credit purchase

Credit purchase

Project type

CO₂ usage

Project identification

Numerous

Verified to which standard

Other, please specify

Alberta Carbon Competitiveness Incentive Regulation (CCIR)

Number of credits (metric tonnes CO₂e)

4,381

Number of credits (metric tonnes CO₂e): Risk adjusted volume

4,381

Credits cancelled

Yes

Purpose, e.g. compliance

Compliance

Credit origination or credit purchase

Credit purchase

Project type

Agriculture

Project identification

Numerous

Verified to which standard

Other, please specify

Alberta Carbon Competitiveness Incentive Regulation (CCIR)

Number of credits (metric tonnes CO₂e)

550,762

Number of credits (metric tonnes CO₂e): Risk adjusted volume

550,762

Credits cancelled

Yes

Purpose, e.g. compliance

Compliance

Credit origination or credit purchase

Credit purchase

Project type

Biomass energy

Project identification

Numerous

Verified to which standard

Other, please specify

Alberta Carbon Competitiveness Incentive Regulation (CCIR)

Number of credits (metric tonnes CO₂e)

50,605

Number of credits (metric tonnes CO₂e): Risk adjusted volume

50,605

Credits cancelled

Yes

Purpose, e.g. compliance

Compliance

Credit origination or credit purchase

Credit purchase

Project type

Energy efficiency: industry

Project identification

Numerous

Verified to which standard

Other, please specify

Alberta Carbon Competitiveness Incentive Regulation (CCIR)

Number of credits (metric tonnes CO₂e)

142,646

Number of credits (metric tonnes CO₂e): Risk adjusted volume

142,646

Credits cancelled

Yes

Purpose, e.g. compliance

Compliance

Credit origination or credit purchase

Credit purchase

Project type

Hydro

Project identification

Numerous

Verified to which standard

Other, please specify

Alberta Carbon Competitiveness Incentive Regulation (CCIR)

Number of credits (metric tonnes CO₂e)

8,553

Number of credits (metric tonnes CO₂e): Risk adjusted volume

8,553

Credits cancelled

Yes

Purpose, e.g. compliance

Compliance

Credit origination or credit purchase

Credit purchase

Project type

Landfill gas

Project identification

Numerous

Verified to which standard

Other, please specify

Alberta Carbon Competitiveness Incentive Regulation (CCIR)

Number of credits (metric tonnes CO₂e)

40,896

Number of credits (metric tonnes CO₂e): Risk adjusted volume

40,896

Credits cancelled

Yes

Purpose, e.g. compliance

Compliance

Credit origination or credit purchase

Credit purchase

Project type

Methane avoidance

Project identification

Numerous

Verified to which standard

Other, please specify

Alberta Carbon Competitiveness Incentive Regulation (CCIR)

Number of credits (metric tonnes CO2e)

139,610

Number of credits (metric tonnes CO2e): Risk adjusted volume

139,610

Credits cancelled

Yes

Purpose, e.g. compliance

Compliance

Credit origination or credit purchase

Credit purchase

Project type

Wind

Project identification

Numerous

Verified to which standard

Other, please specify

Alberta Carbon Competitiveness Incentive Regulation (CCIR)

Number of credits (metric tonnes CO2e)

586,104

Number of credits (metric tonnes CO2e): Risk adjusted volume

586,104

Credits cancelled

Yes

Purpose, e.g. compliance

Compliance

Credit origination or credit purchase

Credit purchase

Project type

Solar

Project identification

Numerous

Verified to which standard

Other, please specify

Alberta Carbon Competitiveness Incentive Regulation (CCIR)

Number of credits (metric tonnes CO2e)

1,767

Number of credits (metric tonnes CO2e): Risk adjusted volume

1,767

Credits cancelled

Yes

Purpose, e.g. compliance

Compliance

Credit origination or credit purchase

Credit purchase

Project type

Forests

Project identification

Numerous

Verified to which standard

CAR (The Climate Action Reserve)

Number of credits (metric tonnes CO2e)

12,861

Number of credits (metric tonnes CO2e): Risk adjusted volume

12,861

Credits cancelled

Yes

Purpose, e.g. compliance

Compliance

Credit origination or credit purchase

Credit origination

Project type

Forests

Project identification

Numerous

Verified to which standard

CAR (The Climate Action Reserve)

Number of credits (metric tonnes CO2e)

108,132

Number of credits (metric tonnes CO2e): Risk adjusted volume

108,132

Credits cancelled

No

Purpose, e.g. compliance

Other, please specify
Speculation and Resale

Credit origination or credit purchase

Credit origination

Project type

Agriculture

Project identification

Numerous

Verified to which standard

CAR (The Climate Action Reserve)

Number of credits (metric tonnes CO2e)

19,007

Number of credits (metric tonnes CO2e): Risk adjusted volume

19,007

Credits cancelled

No

Purpose, e.g. compliance

Other, please specify
Speculation and Resale

Credit origination or credit purchase

Credit purchase

Project type

PFCs and SF6

Project identification

Numerous

Verified to which standard

CAR (The Climate Action Reserve)

Number of credits (metric tonnes CO2e)

30,000

Number of credits (metric tonnes CO2e): Risk adjusted volume

30,000

Credits cancelled

No

Purpose, e.g. compliance

Other, please specify
Speculation and Resale

C11.3

(C11.3) Does your organization use an internal price on carbon?

Yes

C11.3a

(C11.3a) Provide details of how your organization uses an internal price on carbon.

Objective for implementing an internal carbon price

Navigate GHG regulations
Stakeholder expectations
Drive low-carbon investment
Stress test investments
Identify and seize low-carbon opportunities

GHG Scope

Scope 1
Scope 2

Application

- Where a jurisdiction has a clear carbon regulatory framework or policy plan, we use that as the planning tool; i.e. CCIR (now TIER) in Alberta where we paid \$30 / tonne in 2019
- In Canada, we model carbon price estimates at approximately \$30 / tonne for facilities where we have obligations potentially rising to \$50 by 2022 as per federal guidance
- In jurisdictions without carbon pricing we apply scenario analysis to an effective carbon price to guide decisions; In many cases we have built in contract protection

through flow of carbon pricing to the customer

- We do not always include offset generating potential modelling in budget calculations, the primary driver for wind development is electrical generation; Jurisdictions where attractive offset potential exists, such as we do produce offset credits at \$30/tonne from many of our Alberta renewable facilities, are taken in to consideration along with a number of other factors (i.e. stability of the offset market)

Actual price(s) used (Currency /metric ton)

30

Variance of price(s) used

Approximately 70 per cent

Type of internal carbon price

Shadow price
Offsets

Impact & implication

Our coal-to-gas transition in Alberta has been influenced by carbon pricing. Among other factors, which include electricity prices, industry trends towards cleaner power solutions, customer preference towards green and external market forces. Carbon costs to run coal in an Alberta \$40/tonne carbon price environment are approximately \$30/MWh. This would increase in 2022 as carbon pricing rises could rise to \$50/tonne in 2022, in line with Canadian federal guidance. Conversion of coal units to gas significantly reduces carbon costs/MWh. In a modelled \$40 carbon price environment carbon costs are approximately \$10/MWh for coal facilities converted to gas through boiler conversions. For coal facilities repowered to gas, emission costs are close to zero.

Analysis is based on a sub-critical unit, \$40 per tonne carbon price, and 0.37 tonne CO₂e /MWh performance standard. Emission costs include carbon and, in the case of coal, mercury, NO_x and SO_x. Analysis will vary depending on heat rate and capacity factors.

C12. Engagement

C12.1

(C12.1) Do you engage with your value chain on climate-related issues?

- Yes, our suppliers
- Yes, our customers
- Yes, other partners in the value chain

C12.1a

(C12.1a) Provide details of your climate-related supplier engagement strategy.

Type of engagement

Other, please specify

Code of Conduct in place for all suppliers, which communicates TA sustainability values: commitment to health & safety, labour issues and human rights, environmental leadership, stakeholders and society and ethical business conduct

Details of engagement

% of suppliers by number

100

% total procurement spend (direct and indirect)

75

% of supplier-related Scope 3 emissions as reported in C6.5

100

Rationale for the coverage of your engagement

Our scope includes direct procurement of goods and services, which we have the ability to engage with and ensure sign off on the conduct. We could not confirm the percentage of total procurement spend, but we do know that the majority of our supply spend is direct. As such, 75 per cent is a conservative estimate.

Impact of engagement, including measures of success

We have sent this to all suppliers and are also now beginning to include this information within our PO Terms & Conditions.

Comment

Suppliers are to provide acknowledgement of this Code as a condition of engagement. It is also expected that Suppliers will comply with all laws, rules and regulations applicable to TransAlta's business in the countries in which it operates.

C12.1b

(C12.1b) Give details of your climate-related engagement strategy with your customers.

Type of engagement

Collaboration & innovation

Details of engagement

Other, please specify

On-site cogeneration

% of customers by number

3

% of customer - related Scope 3 emissions as reported in C6.5

15

Please explain the rationale for selecting this group of customers and scope of engagement

TransAlta has expertise in on-site cogeneration development for customers and, if required, operations of on-site cogeneration. A number of industrial processes can benefit from the use of high efficiency steam to replace existing natural gas boilers. Examples of industrial processes that utilize cogeneration include gas processing, steam-assisted gravity drainage oil sands extraction, chemical manufacturing, and pulp and paper production. When constructed on-site, the construction of additional transmission lines is not required, which avoids disruption to the environment. It also reduces the natural gas required for some industrial processes by using high efficiency steam production rather than boilers. Cogeneration is recognized by regulatory bodies for its efficiency in generating power versus traditional methods, and thus can potentially produce Emission Performance Credits (in Alberta) that can be used to satisfy our customers' regulatory obligations or sold as additional revenue.

Impact of engagement, including measures of success

Each project is specific, but a good example of the GHG reduction potential is our new Kaybob #3 cogeneration project with our partner SemCams. The existing plants boiler configuration produces approximately 400,000 tonnes CO₂e per year. Introduction of two gas turbines with excess steam going to operations reduces the CO₂e from the plant configuration to approximately 260,000 tonnes CO₂e.

C12.1d

(C12.1d) Give details of your climate-related engagement strategy with other partners in the value chain.

In 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, closing the Centralia facility's two units, one in 2020 and the other in 2025.

The US \$55 million community investment was directly sent to the Weatherization Board (\$10M), the Economic & Community Development Board (\$20M) and the Energy Technology Board (\$25M). To date, the Weatherization Board has invested \$5.9M, the Economic & Community Development Board \$12M and the Energy Technology Board \$3.9M. This funding continues to be distributed to the community on an annual basis and we participate in project grant approvals.

C12.3

(C12.3) Do you engage in activities that could either directly or indirectly influence public policy on climate-related issues through any of the following?

Direct engagement with policy makers

Trade associations

C12.3a

(C12.3a) On what issues have you been engaging directly with policy makers?

Focus of legislation	Corporate position	Details of engagement	Proposed legislative solution
Carbon tax	Support	Directly engaged with government, policymakers, industry and NGOs on new carbon market design for Alberta, which became effective Jan 1, 2020 as the Technology Innovation and Emissions Reduction (TIER) regulation	We supported consultation on the redesign and advocated for design that would ensure competitiveness, growth and job creation in Alberta, while succeeding at reducing emissions. A large majority of our Alberta hydro facilities and wind farms were qualified to generate carbon offset credits under the previous Carbon Competitiveness Incentive Regulation (CCIR), which results in additional revenue for TransAlta at the CCIR per tonne CO ₂ e price (currently \$20/tonne in 2019). We advocated that these facilities, which are renewable facilities, continue to be included within the carbon offset component of TIER.
Clean energy generation	Support with minor exceptions	Engaged with government, policymakers, industry and NGOs on future of clean energy mix	We believe natural gas plays an important role in the electricity sector, providing low-emission baseload and peaking generation to support system demands and intermittent renewable generation. TransAlta operates simple and combined cycle units as well as cogeneration facilities in Canada and Australia.

C12.3b

(C12.3b) Are you on the board of any trade associations or do you provide funding beyond membership?

Yes

C12.3c

(C12.3c) Enter the details of those trade associations that are likely to take a position on climate change legislation.

Trade association

Independent Power Producers Society of Alberta

Is your position on climate change consistent with theirs?

Consistent

Please explain the trade association's position

IPPSA offers a forum for Alberta's power producers to generate policy positions representing the interests of membership with government and stakeholders. IPPSA is a strong proponent of competitive market principles, allowing the market to determine the most appropriate types of energy generation. As Alberta shifts from coal to natural gas and renewable energy, IPPSA advises government on policy changes while representing the interests of its members.

How have you influenced, or are you attempting to influence their position?

We are aligned with IPPSA on the need for a transition to a lower carbon grid in Alberta. At TransAlta we support smart carbon pricing policies that support competitiveness, while reducing carbon emissions.

Trade association

Canadian Electricity Association

Is your position on climate change consistent with theirs?

Consistent

Please explain the trade association's position

The CEA advocates for rational climate change policy with the Canadian federal government as it relates to the electricity sector.

How have you influenced, or are you attempting to influence their position?

We support this position.

C12.3f

(C12.3f) What processes do you have in place to ensure that all of your direct and indirect activities that influence policy are consistent with your overall climate change strategy?

Our corporate strategy integrates our climate change strategy, the two go very much hand in hand. Our corporate strategy includes six pillars: conversion of coal fleet to gas or retire units; deliver on announced renewables growth; increase our presence in the US renewables market;

advance and expand our on-site generation business; maintain a strong financial position; and in 2020 we have added a new pillar, which is to keep our people protected and resilient under COVID. As such our corporate strategy is tied to significant decarbonization and supporting our customers goals to decarbonize. Hence, our strategy ensures that our activities support low carbon policy. Employees are expected to represent these corporate positions when engaging with policy makers or trade associations. As previously noted, we support smart carbon pricing that ensures competitiveness for the electricity sector, while reducing carbon emissions. Specific processes and policy in place include our:

- "Transition to Renewable Energy" metric within executive long-term incentive compensation
- GHG reduction target to 2030, which essentially provides a cap on fossil fuel and GHG intensive growth

C12.4

(C12.4) Have you published information about your organization's response to climate change and GHG emissions performance for this reporting year in places other than in your CDP response? If so, please attach the publication(s).

Publication

In mainstream reports, incorporating the TCFD recommendations

Status

Complete

Attach the document

 TAC2019_AnnualReport.pdf

Page/Section reference

Please refer to pages M80 to M86

Content elements

Governance
Strategy
Risks & opportunities
Emissions figures
Emission targets

Comment

C15. Signoff

C-FI

(C-FI) Use this field to provide any additional information or context that you feel is relevant to your organization's response. Please note that this field is optional and is not scored.

Nothing further.

C15.1

(C15.1) Provide details for the person that has signed off (approved) your CDP climate change response.

	Job title	Corresponding job category
Row 1	John Kousinioris, Chief Operating Officer	Chief Operating Officer (COO)

Submit your response

In which language are you submitting your response?

English

Please confirm how your response should be handled by CDP

	I am submitting to	Public or Non-Public Submission
I am submitting my response	Investors	Public

Please confirm below

I have read and accept the applicable Terms