Management's Discussion and Analysis

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This Management's Discussion and Analysis ("MD&A") should be read in conjunction with our 2022 audited annual consolidated financial statements (the "consolidated financial statements") and our 2022 annual information form ("AIF"), each for the fiscal year ended Dec. 31, 2022. The consolidated financial statements have been prepared in accordance with International Financial Reporting Standards ("IFRS") for Canadian publicly accountable enterprises as issued by the International Accounting Standards Board ("IASB") and in effect at Dec. 31, 2022. All dollar amounts in the tables are in millions of Canadian dollars unless otherwise noted and except amounts per share, which are in whole dollars to the nearest two decimals. All other dollar amounts in this MD&A are in Canadian dollars, unless otherwise noted. This MD&A is dated February 22, 2023. Additional information respecting TransAlta Corporation ("TransAlta", "we", "our", "us" or the "Company"), including our AIF, is available on SEDAR at www.sedar.com, on EDGAR at www.sec.gov and on our website at www.transalta.com. Information on or connected to our website is not incorporated by reference herein.

Forward-Looking Statements

This MD&A includes "forward-looking information" within the meaning of applicable Canadian securities laws and "forward-looking statements" within the meaning of applicable United States ("US") securities laws, including the United States Private Securities Litigation Reform Act of 1995 (collectively referred to herein as "forward-looking statements"). All forward-looking statements are based on our beliefs as well as assumptions based on information available at the time the assumptions were made and on management's experience and perception of historical trends, current conditions and expected future developments, as well as other factors deemed appropriate in the circumstances. Forward-looking statements are not facts, but only predictions and generally can be identified by the use of statements that include phrases such as "may," "will," "can," "could," "would," "shall," "believe," "expect," "estimate," "anticipate," "intend," "plan," "forecast," "foresee," "potential," "enable," "continue" or other comparable terminology. These statements are not guarantees of our future performance, events or results and are subject to risks, uncertainties and other important factors that could cause our actual performance, events or results to be materially different from that set out in or implied by the forward-looking statements.

In particular, this MD&A contains forward-looking statements including, but not limited to, statements relating to: our Clean Electricity Growth Plan and ability to achieve the target of 2 gigawatts ("GW") of incremental renewables capacity with an estimated capital investment of $3.6 billion that is expected to deliver incremental average annual EBITDA of $315 million; the Company's projects under construction, including the timing of commercial operations, expected annual EBITDA and associated costs, including the Horizon Hill wind project, the White Rock wind projects, Northern Goldfields solar project, Garden Plain wind project and the Mount Keith 132kV transmission expansion; the Montem pumped hydro development project and related renewable projects; the execution of the Company's early, and advanced-stage development pipeline, including the size, cost and expected EBITDA from such projects; the expansion of the Company's early stage development pipeline to 5 GW; the proportion of EBITDA to be generated from renewable sources by the end of 2025; the 2023 Financial Outlook (defined below), including adjusted EBITDA, free cash flow and annualized dividend per share; the Company's ability to enhance shareholder value through its NCIB (as defined below); the reduction of carbon emissions by 75 per cent from 2015 emissions levels by 2026; the remediation of the Kent Hills 1 and 2 wind facilities, including, the timing and cost of such remediation, the resulting impact of such rehabilitation on the Company's revenues and the potential battery storage project at and repowering of, the Kent Hills facilities; the expected impact and quantum of carbon compliance costs; regulatory developments and their expected impact on the Company, including the Canadian federal climate plan and the implementation of the major aspects thereof (including increased carbon pricing and increased funding for clean technology), the proposed new Clean Electricity Regulations, the Clean Fuel Regulations and Canadian Greenhouse Gas Offset Credit System Regulations and the ability of the Company to realize benefits from Canadian, United States and Australian regulatory developments, including receiving funding or favourable tax treatment for clean electricity projects; the potential value of emission reduction credits; modelling and scenario analysis associated with climate change management and the resiliency of the Company's strategy under various climate scenarios; sustaining and productivity capital in 2023; expected power prices in Alberta, Ontario and the Pacific Northwest; AECO gas prices; the cyclicality of the business, including as it relates to maintenance costs, production and loads; expectations regarding refinancing debt maturing from 2023 and 2025; and the Company continuing to maintain a strong financial position and significant liquidity without any significant impact from the current economic environment.

The forward-looking statements contained in this MD&A are based on many assumptions including, but not limited to, the following: no significant changes to applicable laws and regulations beyond those that have already been announced; no significant changes to fuel and purchased power costs; no material adverse impacts to long-term investment and credit markets; no significant changes to power price and hedging assumptions, including Alberta spot prices of $105/MWh to $135/MWh in 2023, Mid-Columbia spot prices of US$75/MWh to US$85/MWh in 2023, and AECO gas prices of $4.60/GJ in 2023; hedged volumes and prices in 2023; sustaining capital of $140 million to $170 million in 2023; Energy Marketing gross margin of $90 million to $110 million in 2023; no significant changes to gas commodity prices and transport costs; no significant changes to the decommissioning and restoration costs of the retired Alberta assets; no significant changes to interest rates; no significant changes to the demand and growth of renewables generation; no significant changes to the Company's debt and credit ratings; the Company's proportionate ownership of TransAlta Renewables Inc. ("TransAlta Renewables") not changing materially; and no decline in the dividends to be received from TransAlta Renewables.

Forward-looking statements are subject to a number of significant risks and uncertainties that could cause actual plans, performance, results or outcomes to differ materially from current expectations. Factors that may adversely impact what is expressed or implied by forward-looking statements contained in this MD&A include risks relating to: force majeure claims; reduced labour availability and ability to continue to staff our operations and facilities; disruptions to our supply chains, including our ability to secure necessary equipment; our ability to obtain regulatory and any other third-party approvals on the expected timelines or at all in respect of our growth projects; risks associated with development and construction projects, including as it pertains to increased capital costs, permitting, labour and engineering risks, disputes with contractors and potential delays in the construction or commissioning of such projects; restricted access to capital and increased borrowing costs; significant fluctuations in the Canadian dollar against the US dollar and Australian dollar; changes in short-term and long-term electricity supply and demand; fluctuations in market prices, including lower merchant pricing in Alberta, Ontario and Mid-Columbia; reductions in production; a higher rate of losses on our accounts receivable; inability to achieve our targets relating to ESG (as defined below); impairments and/or write-downs of assets; adverse impacts on our information technology systems and our internal control systems, including increased cybersecurity threats; commodity risk management and energy trading risks, including the effectiveness of the Company's risk management tools associated with hedging and trading procedures to protect against significant losses; changes in demand for electricity and capacity and our ability to contract our generation for prices that will provide expected returns and replace contracts as they expire; changes to the legislative, regulatory and political environments in the jurisdictions in which we operate; environmental requirements and changes in, or liabilities under, these requirements; disruptions in the transmission and distribution of electricity; the effects of weather, including man-made or natural disasters and other climate-change related risks; increases in costs; inability to satisfy the conditions to closing of the acquisition of an interest in the Tent Mountain pumped hydro development project; reductions to our generating units' relative efficiency or capacity factors; disruptions in the source of fuels, including natural gas, coal, water, solar or wind resources required to operate our facilities; operational risks, unplanned outages and equipment failure and our ability to carry out or have completed any repairs in a cost-effective or timely manner or at all, including as it applies to the remediation and replacement of turbine foundations of the Kent Hills 1 and 2 wind facilities; general economic risks, including deterioration of equity markets, increasing interest rates or rising inflation; failure to meet financial expectations; general domestic and international economic and political developments; armed hostilities, including the war in Ukraine and associated impacts; the threat of terrorism; adverse diplomatic developments or other similar events that could adversely affect our business; industry risk and competition; fluctuations in the value of foreign currencies; structural subordination of securities; counterparty credit risk; public health crisis risks, including any further impacts of COVID-19; changes to our relationship with, or ownership of, TransAlta Renewables; changes in the payment or receipt of future dividends, including from TransAlta Renewables; inadequacy or unavailability of insurance coverage; our provision for income taxes and any risk of reassessment; legal, regulatory and contractual disputes and proceedings involving the Company; reliance on key personnel; and labour relations matters. The foregoing risk factors, among others, are described in further detail in the Governance and Risk Management section of our 2022 Annual MD&A and the Risk Factors section in our AIF for the year ended Dec. 31, 2022.

Readers are urged to consider these factors carefully in evaluating the forward-looking statements, which reflect the Company's expectations only as of the date hereof and are cautioned not to place undue reliance on them. The forward-looking statements included in this document are made only as of the date hereof and we do not undertake to publicly update these forward-looking statements to reflect new information, future events or otherwise, except as required by applicable laws. The purpose of the financial outlooks contained herein is to give the reader information about management's current expectations and plans and readers are cautioned that such information may not be appropriate for other purposes. In light of these risks, uncertainties and assumptions, the forward-looking statements might occur to a different extent or at a different time than we have described, or might not occur at all. We cannot assure that projected results or events will be achieved.

Description of the Business

Portfolio of Assets

TransAlta is a Canadian corporation and one of Canada's largest publicly traded power generators with over 111 years of operating experience. We own, operate and manage a geographically diversified portfolio of assets utilizing a broad range of input resources that includes water, wind, solar, natural gas and thermal coal. We are one of the largest producers of wind power in Canada and the largest producer of hydro power in Alberta.

Our Clean Electricity Growth Plan, announced in 2021, will continue to advance our leadership position in renewable electricity. In 2022, our renewable energy gross installed capacity is 2,828 MW and we have over 600 MW of renewable energy under construction.

TransAlta is actively transitioning our business to manage climate change risks and opportunities and has demonstrated leadership through action on climate-change related issues. The Company no longer generates electricity in Canada using coal. We have retired 4,464 MW of coal-fired generation capacity and converted 1,659 MW of coal-fired facilities to natural gas since 2018. Our remaining coal-fired unit in Washington State is scheduled to retire at the end of 2025.

We are on track to achieve our target of reducing our greenhouse gas ("GHG") emissions by 75 per cent from 2015 levels by 2026. Since 2015, we have reduced GHG emissions by 22 million tonnes of CO_2e or 68 per cent.

The following table provides our consolidated ownership of our facilities across the regions in which we operate as of Dec. 31, 2022:

As at Dec. 31, 2022		Hydro	Wind and Solar	Gas	Energy Transition	Total
Alberta	Gross installed capacity (MW)[1]	**834**	**636**	**1,960**	**—**	**3,430**
	Number of facilities	**17**	**13**	**7**	**—**	**37**
	Weighted average contract life (years)[2][3][4]	**—**	**6**	**1**	**—**	**2**
Canada, Excluding Alberta	Gross installed capacity (MW)[1]	**88**	**751**	**645**	**—**	**1,484**
	Number of facilities	**7**	**9**	**3**	**—**	**19**
	Weighted average contract life (years)[3]	**6**	**11**	**9**	**—**	**10**
US	Gross installed capacity (MW)[1]	**—**	**519**	**29**	**671**	**1,219**
	Number of facilities	**—**	**7**	**1**	**2**	**10**
	Weighted average contract life (years)[3]	**—**	**11**	**3**	**3**	**7**
Australia	Gross installed capacity (MW)[1]	**—**	**—**	**450**	**—**	**450**
	Number of facilities	**—**	**—**	**6**	**—**	**6**
	Weighted average contract life (years)[3]	**—**	**—**	**16**	**—**	**16**
Total	**Gross installed capacity (MW)[1]**	**922**	**1,906**	**3,084**	**671**	**6,583**
	Number of facilities	**24**	**29**	**17**	**2**	**72**
	Weighted average contract life (years)[3]	**1**	**10**	**5**	**3**	**6**

(1) Gross installed capacity for consolidated reporting represents 100 per cent output of a facility. Capacity figures for the Wind and Solar segment includes 100 per cent of the Kent Hills wind facilities; Gas includes 50 per cent of the Ottawa and Windsor facilities, 100 per cent of the Poplar Creek facility, 50 per cent of the Sheerness facility and 60 per cent of the Fort Saskatchewan facility.

(2) The weighted average contract life for Hydro and certain gas and wind assets in Alberta are nil as they are operating primarily on a merchant basis in the Alberta market. Refer to the Alberta Electricity Portfolio section of this MD&A for more information.

(3) For power generated under long-term power purchase agreements ("PPA"), power hedge contracts and short-term and long-term industrial contracts, the PPAs have a weighted average remaining contract life based on long-term average gross installed capacity.

(4) The weighted average remaining contract life is related to the contract period for McBride Lake (38 MW), Windrise Wind (206 MW), Poplar Creek (115 MW) and Fort Saskatchewan (71 MW), with the remaining wind and gas facilities operated on a merchant basis in the Alberta market.

Highlights

Consolidated Financial Highlights

Year ended Dec. 31	2022	2021	2020
Adjusted availability (%)	**90.0**	86.6	90.7
Production (GWh)	**21,258**	22,105	24,980
Revenues	**2,976**	2,721	2,101
Fuel and purchased power	**1,263**	1,054	805
Carbon compliance	**78**	178	163
Operations, maintenance and administration	**521**	511	472
Adjusted EBITDA[(1)(2)]	**1,634**	1,286	917
Earnings (loss) before income taxes	**353**	(380)	(303)
Net earnings (loss) attributable to common shareholders	**4**	(576)	(336)
Cash flow from operating activities	**877**	1,001	702
Funds from operations[(1)(2)]	**1,346**	994	675
Free cash flow[(1)(2)]	**961**	585	348
Net earnings (loss) per share attributable to common shareholders, basic and diluted	**0.01**	(2.13)	(1.22)
Dividends declared per common share[(3)]	**0.21**	0.19	0.22
Dividends declared per preferred share[(3)]	**1.20**	1.02	1.27
Funds from operations per share[(1)(4)]	**4.97**	3.67	2.45
Free cash flow per share[(1)(4)]	**3.55**	2.16	1.27

As at Dec. 31	2022	2021	2020
Total assets	**10,741**	9,226	9,747
Total consolidated net debt[(1)(5)]	**2,854**	2,636	2,974
Total long-term liabilities	**5,864**	4,702	5,376
Total liabilities	**8,752**	6,633	6,311

(1) These items are not defined and have no standardized meaning under IFRS. Presenting these items from period to period provides management and investors with the ability to evaluate earnings (loss) trends more readily in comparison with prior periods' results. Refer to the Segmented Financial Performance and Operating Results section of this MD&A for further discussion of these items, including, where applicable, reconciliations to measures calculated in accordance with IFRS. Also refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.

(2) During 2022, our adjusted EBITDA composition was amended to include the impact of closed exchange positions that are effectively settled by offsetting positions with the same counterparty to reflect the performance of the assets and the Energy Marketing segment in the period in which the transactions occur. Therefore, the Company has applied this composition to all previously reported periods.

(3) Weighted average of the Series A, B, C, D, E and G preferred share dividends declared. Dividends declared vary period over period due to the timing of dividend declarations and quarterly floating rates.

(4) Funds from operations ("FFO") per share and free cash flow ("FCF") per share are calculated using the weighted average number of common shares outstanding during the period. The weighted average number of common shares outstanding for the year ended Dec. 31, 2022, was 271 million shares (2021 – 271 million, 2020 – 275 million). Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A for the purpose of these non-IFRS ratios.

(5) Total consolidated net debt includes long-term debt, including the current portion, amounts due under credit facilities, exchangeable securities, US tax equity financing and lease liabilities, net of available cash and cash equivalents, the principal portion of restricted cash on our subsidiary TransAlta OCP LP ("TransAlta OCP") and the fair value of economic hedging instruments on debt. Refer to the table in the Financial Capital section of this MD&A for more details on the composition of total consolidated net debt.

The Company exceeded the top end of its adjusted EBITDA and FCF guidance during the year with exceptional performance in all of our generation segments as well as our Energy Marketing segment. The Hydro and Gas facilities in the Alberta Electricity Portfolio were well positioned to capture opportunities from the strong spot market conditions. Wind and Solar benefited from a full year of operations from the Windrise wind and North Carolina Solar facilities. The Energy Transition segment had strong performance from Centralia Unit 2, which was offset by the reductions related to the retirement of Keephills Unit 1 and Sundance Unit 4.

Adjusted availability for 2022 was 90.0 per cent compared to 86.6 per cent in 2021. The increase was primarily due to lower planned outages within the Gas segment with the completion of the coal-to-gas conversions in 2021, higher reliability of the coal-to-gas converted units compared to coal units and lower planned and unplanned outages at our Alberta Hydro Assets and Centralia Unit 2, partially offset by the extended outage at the Kent Hills 1 and 2 wind facilities.

Production for 2022 was 21,258 gigawatt hours ("GWh") compared to 22,105 GWh in 2021. Overall, the decrease in production was primarily due to the retirement of Keephills Unit 1 and Sundance Unit 4 and the extended outage at the Kent Hills 1 and 2 wind facilities. This was partially offset by an increase in production from the Gas segment due to higher availability and dispatch optimization of the Alberta assets; higher production at the Ada cogeneration facility; the addition of the Windrise wind facility commissioned in the fourth quarter of 2021, the North Carolina Solar facility acquired in the fourth quarter of 2021 and higher wind resources in Eastern Canada, all in our Wind and Solar segment; and an increase in production from Centralia Unit 2 in 2022 in our Energy Transition segment.

Revenues for 2022 increased by $255 million compared to 2021, mainly as a result of capturing higher realized energy prices within the Alberta electricity market through our optimization and operating activities, and higher realized ancillary services prices and volumes in the Hydro segment. Revenues net of realized and unrealized losses from hedging and derivative positions also increased due to higher merchant prices and volumes at Centralia. The Wind and Solar segment benefited from increased production and an increase in emission credit sales over the prior year.

Fuel and purchased power costs in 2022 increased by $209 million compared to 2021. The Gas and Energy Transition segments experienced higher natural gas pricing and there was increased natural gas consumption from our recently converted units. This was partially offset by our hedged positions on gas, lower coal costs and no mine depreciation due to the termination of all coal-mining activities in Canada as of Dec. 31, 2021.

Carbon compliance costs in 2022 decreased by $100 million compared to 2021, primarily due to reductions in GHG emissions and utilization of our compliance credits to settle a portion of the GHG obligation, partially offset by an increase in the carbon price per tonne and higher production in the Gas segment. Lower GHG emissions were a direct result of operating exclusively on natural gas in Alberta rather than coal, resulting in changes in the Company's fuel mix ratio.

Operations, maintenance and administration ("OM&A") expenses for 2022 increased by $10 million compared to 2021. Excluding the impact of the Canada Emergency Wage Subsidy ("CEWS") funding received in 2021, OM&A expenses were higher mainly due to the Company's performance-related incentive accruals, OM&A related to the addition of the Windrise wind and North Carolina Solar facilities and higher general operating expenses. In 2021, OM&A included $28 million related to a write-down on parts and material inventory related to the Highvale mine and coal operations.

Adjusted EBITDA increased by $348 million compared to 2021, largely due to strong performance from our Alberta Electricity Portfolio, driven primarily by the hydro, gas and wind facilities as a result of higher merchant prices and dispatch optimization. Adjusted EBITDA was further improved by incremental production from new facilities, higher ancillary service revenues, liquidated damages recoverable due to turbine availability being below the contractual target at the Windrise wind facility, higher environmental attribute revenues in the Wind and Solar segment and lower carbon compliance costs in both the Gas and Energy Transition segments. This was partially offset by lower adjusted EBITDA from the retirement of Alberta coal units in the Energy Transition segment, higher natural gas fuel costs, lower production from the extended outage at the Kent Hills wind facilities, higher OM&A expenses related to the Company's performance-related incentive accruals and increased general operating expenses. Changes in segmented adjusted EBITDA are discussed in the Segmented Financial Performance and Operating Results section of this MD&A.

Earnings before income taxes for 2022 increased by $733 million compared to 2021. **Net earnings attributable to common shareholders** for 2022 were $4 million compared to a loss of $576 million in 2021. In 2022, the Company benefited from higher revenues net of realized and unrealized losses from hedging and derivative positions and lower carbon compliance costs, partially offset by higher fuel and purchased power, higher depreciation due to the acceleration of useful lives on certain facilities, higher interest expense due to increased costs to support trading and hedging activities and higher accretion of provisions, partially offset by higher interest income and higher income tax expense due to higher earnings before tax and current and prior period tax adjustments in the US to mitigate cash tax. In addition, during 2022, the Company recognized liquidated damages recoverable due to turbine availability being below the contractual target at the Windrise wind facility. Net earnings attributable to common shareholders in 2021 were significantly impacted by higher asset impairment charges resulting from the Company's decisions to shut down the Highvale mine, suspend the Sundance Unit 5 repowering project and retire Sundance Unit 4 and Keephills Unit 1.

Cash flow from operating activities decreased by $124 million compared with 2021, primarily due to unfavourable changes in working capital and higher fuel and purchased power costs. This was partially offset by higher revenues from risk management activities, higher net other operating (income) loss and lower carbon compliance costs.

FCF, one of the Company's key financial metrics, totalled $961 million compared to $585 million in 2021. This represents an increase of $376 million, driven primarily by higher adjusted EBITDA, favourable changes in provisions from 2021 and a decrease in sustaining capital spending related to fewer planned maintenance turnarounds. This was partially offset by higher current income tax expense, higher distributions paid to subsidiaries' non-controlling interests and higher decommissioning and restoration costs settled.

Ability to Deliver Financial Results

The metrics we use to track our performance are adjusted EBITDA and FCF. The following table compares target to actual amounts for each of the three past years:

Year ended Dec. 31		2022	2021	2020
Adjusted EBITDA [1]	Original Target	**1,065-1,185**	960-1,080	925-1,000
	Revised Target[2]	**1,380-1,460**	1,200-1,300	n/a
	Actual[3]	**1,634**	1,286	917
FCF [1]	Original Target	**455-555**	340-440	325-375
	Revised Target[2]	**725-775**	500-560	n/a
	Actual[3]	**961**	585	348

(1) These items are not defined and have no standardized meaning under IFRS. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A for further discussion of these items, including, where applicable, reconciliations to measures calculated in accordance with IFRS.
(2) In November 2022, as a result of the strong performance in the third quarter, the Company revised the outlook targets for adjusted EBITDA and FCF from the previously announced target range. In 2021, the Company revised adjusted EBITDA and FCF as a result of strong performance in the second and third quarters of 2021.
(3) The 2021 and 2020 actual adjusted EBITDA and FCF were revised during the second quarter of 2022 to be consistent with the currently defined composition of adjusted EBITDA and FCF. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A for further information.

Sustaining Capital

We are in a long-cycle, capital-intensive business that requires significant capital expenditures. Our goal is to undertake sustaining capital expenditures that ensure our facilities operate reliably and safely.

Year ended Dec. 31	2022	2021	2020
Total sustaining capital expenditures	**142**	199	157

Total sustaining capital expenditures were $57 million lower compared to 2021, mainly due to lower planned major maintenance turnarounds for the gas fleet as a result of coal-to-gas conversions being completed in 2021, partially offset by higher planned maintenance expenditures across the wind and hydro facilities, and additional expenditures on leasehold improvements within the Corporate segment.

Significant and Subsequent Events

Early-Stage Pumped Hydro Development Project

On Feb. 16, 2023, the Company announced that it had entered into a definitive agreement to acquire a 50 per cent interest in the Tent Mountain Renewable Energy Complex (“Tent Mountain”), an early-stage 320 MW pumped hydro energy storage development project, located in southwest Alberta, currently owned by Montem Resources Limited (“Montem”). The acquisition includes the land rights, fixed assets and intellectual property associated with the pumped hydro development project. The Company will pay Montem approximately $8 million upon closing the transaction with additional contingent payments of up to $17 million (approximately $25 million total) based on the achievement of specific development and commercial milestones. The Company and Montem will form a partnership and jointly manage the project, with the Company acting as project developer. The partnership will actively seek an offtake agreement over the development period for the energy and environmental attributes generated by the facility. The acquisition also includes the intellectual property associated with a 100 MW offsite green hydrogen electrolyser and a 100 MW offsite wind development project. The closing of the transaction remains subject to customary closing conditions, including receipt of shareholder approval by Montem which is expected to occur in March 2023.

TransAlta and Lafarge Canada Advance Low-Carbon Fly Ash Repurposing Project

During the fourth quarter of 2022, the Company entered into an agreement with Lafarge Canada that will advance low-carbon concrete projects in Alberta. The project will repurpose landfilled fly ash, a waste product from the Company's Canadian coal-fired electricity facilities, which ceased operating on coal at the end of 2021. The ash will be used to replace cement in concrete manufacturing.

Changes to the Board of Directors

On Dec. 15, 2022, the Company announced the appointment of Ms. Manjit Sharma to the Board of Directors (the “Board” or the “Board of Directors”) effective Jan. 1, 2023. Ms. Sharma brings over 30 years of experience that spans a variety of industries, most recently serving as Chief Financial Officer of WSP Canada Inc.

On Sept. 30, 2022, Ms. Beverlee Park retired from the Board of Directors. Ms. Park served on the Board of Directors since 2015 and as Chair of the Audit, Finance and Risk Committee from April 2018 to May 2022. The Company recognizes the many contributions made by Ms. Park to TransAlta, and thanks her for the many years of service.

Public Offering of US$ Senior Green Bonds and Release of Inaugural Green Bond Framework

On Nov. 17, 2022, the Company issued US$400 million senior notes ("US$400 million Senior Green Bonds"), which have a coupon rate of 7.75 per cent per annum and mature on Nov. 15, 2029. Including the effects of settled interest rate swaps, the notes have an effective yield of approximately 5.98 per cent. The notes are an unsecured obligation, rank equally in right of payment with all of our existing and future senior indebtedness, and are senior in right of payment to all of our future subordinated indebtedness. The interest payments on the bonds are made semi-annually, on November 15 and May 15, with the first payment commencing May 15, 2023.

The Company used the net proceeds from the issuance of the notes to repay $100 million drawn on its credit facility and replaced the balance sheet cash used to fund the repayment in full of the Company’s US$400 million 4.50 per cent unsecured senior notes.

The Company will allocate an amount equal to the net proceeds from this offering to finance or refinance new and/or existing eligible green projects in accordance with its Green Bond Framework (the “Framework”). The Framework received a second-party opinion from Sustainalytics, which verified that it aligned with the Green Bond Principles from the International Capital Market Association.

Announced a 10 per cent Common Share Dividend Increase

On Nov. 7, 2022, the Company announced that the Board of Directors approved a 10 per cent increase in its common share dividend and declared a dividend of $0.055 per common share that was paid on Jan. 1, 2023. The quarterly dividend of $0.055 per common share represents an annualized dividend of $0.22 per common share.

New Term Facility

During the third quarter of 2022, the Company closed a two-year $400 million floating-rate term facility ("Term Facility") with its banking syndicate with a maturity date of Sept. 7, 2024. As at Dec. 31, 2022, the full amount was drawn on the Term Facility.

Conversion Results for Series E and F Preferred Shares

On Sept. 21, 2022, there were 89,945 Cumulative Redeemable Rate Reset First Preferred Shares, Series E (“Series E Shares”) tendered for conversion, which was less than the one million shares required to give effect to conversions into Cumulative Redeemable Rate Reset First Preferred Shares, Series F (“Series F Shares”). As a result, no Series E Shares were converted into Series F Shares.

Executed Contract Renewals with the IESO at Sarnia Cogeneration and Melancthon 1 Wind Facilities

During the third quarter of 2022, TransAlta Renewables Inc., a subsidiary of the Company, announced that it was awarded capacity contracts for the Sarnia cogeneration facility and the Melancthon 1 wind facility from the Ontario Independent Electricity System Operator (“IESO”) as part of the IESO’s Medium-Term Capacity Procurement Request for Proposals. The new capacity contracts for the Sarnia cogeneration facility and the Melancthon 1 wind facility run from May 1, 2026, to April 30, 2031. It is intended that the existing contracts for the Sarnia cogeneration facility and the Melancthon 1 wind facility will be extended from Dec. 31, 2025 and March 3, 2026, respectively, to April 30, 2026. The Company expects the gross margin from the Sarnia cogeneration facility to be reduced by approximately 30 per cent as a result of the IESO price cap under the new contract.

Executed Industrial Contract Extensions at Sarnia Cogeneration

During the second and fourth quarters of 2022, the Company executed contracts for the supply of electricity and steam from the Sarnia cogeneration facility with three of its legacy industrial customers, and with three of its new customers, who had previously been re-sold utilities as part of a legacy customer's contract. Following the contracting efforts in 2021 and 2022, the Sarnia cogeneration facility has been fully re-contracted without interruption to the customers' delivery terms. The contracts extend to April 30, 2031, for four customers and to Dec. 31, 2032 for the other three customers.

TransAlta Debuts New Brand Reiterating Commitment to a Clean Energy Future

On June 20, 2022, the Company announced and launched a new brand, including company logo and tagline, "Energizing the Future". The new visual identity encapsulates the TransAlta of today while reinforcing the Company’s focus as a leader in creating a net-zero future.

Conversion Results for Series C and D Preferred Shares

On June 30, 2022, the Company converted 1,044,299 of its 11,000,000 Cumulative Redeemable Rate Reset First Preferred Shares, Series C (“Series C Shares”), on a one-for-one basis, into Cumulative Redeemable Floating Rate First Preferred Shares, Series D (“Series D Shares”).

Court of Appeal Upholds TransAlta’s Favourable Force Majeure Arbitration Decision

On June 9, 2022, the Alberta Court of Appeal released a unanimous decision dismissing ENMAX Energy Corporation ("ENMAX") and the Balancing Pool's applications to set aside an arbitration decision in favour of the Company. The Court of Appeal upheld the Company’s claim of force majeure that arose when its Keephills Unit 1 generating unit was forced offline in 2013. As a result of the decision, the Company’s claim of force majeure remains valid, and the associated costs of the force majeure event will not be reassessed against TransAlta.

Keephills Unit 2 Stator Force Majeure Dispute Settled

After the Keephills Unit 1 stator force majeure outage in 2013, it was determined that Keephills Unit 2 could face a similar stator failure before the next planned outage. In response, the Company took Keephills Unit 2 offline between January 31, 2014, and March 15, 2014 to perform a full rewind of the generator stator and claimed force majeure. The Balancing Pool disputed this force majeure event but the dispute was held in abeyance pending the outcome of the Keephills Unit 1 stator force majeure dispute, which was recently concluded. The Company and the Balancing Pool recently settled this dispute, resulting in the resolution of both stator force majeure claims.

Kent Hills Wind Facilities Update

On June 2, 2022, TransAlta Renewables announced the rehabilitation plan for the Kent Hills 1 and 2 wind facilities. In addition to the announcement, TransAlta Renewables amended and extended PPAs with New Brunswick Power Corporation ("NB Power") in respect of each of the Kent Hills 1, 2 and 3 wind facilities, providing for an additional 10-year contract term to December 2045 and an effective 10 per cent reduction to the original contract prices from January 2023 through December 2033. In addition, both parties have agreed to work in good faith to evaluate the installation of a battery energy storage system at Kent Hills and to consider a potential repowering of Kent Hills at the end of life in 2045. A waiver for the Kent Hills wind non-recourse bonds ("KH Bonds") was also obtained from the project bondholders and a supplemental indenture was entered into with the bondholders that facilitates the rehabilitation of the Kent Hills 1 and 2 wind facilities. Refer to the Wind and Solar segment discussion in the Segmented Financial Performance and Operating Results section and Financial Capital section of this MD&A for further details.

TSX Acceptance of Normal Course Issuer Bid

On May 24, 2022, the Toronto Stock Exchange (“TSX”) accepted the notice filed by the Company to renew its normal course issuer bid (“NCIB”) for a portion of its common shares. Pursuant to the NCIB, TransAlta may repurchase up to a maximum of 14,000,000 common shares, representing approximately 7.16 per cent of its public float of common shares as at May 17, 2022. Purchases under the NCIB may be made through open market transactions on the TSX and any alternative Canadian trading platforms on which the common shares are traded, based on the prevailing market price. Any common shares purchased under the NCIB will be cancelled. The period during which TransAlta is authorized to make purchases under the NCIB commenced on May 31, 2022, and ends on May 30, 2023, or such earlier date on which the maximum number of common shares are purchased under the NCIB or the NCIB is terminated at the Company’s election.

The NCIB provides the Company with a capital allocation alternative with a view to ensuring long-term shareholder value. TransAlta’s Board of Directors and management believe that, from time to time, the market price of the common shares does not reflect their underlying value and purchases of common shares for cancellation under the NCIB may provide an opportunity to enhance shareholder value.

During the year ended Dec. 31, 2022, the Company purchased and cancelled a total of 4,342,300 common shares at an average price of $12.48 per common share, for a total cost of $54 million.

Mount Keith 132kV Transmission Expansion

On May 3, 2022, TransAlta Renewables exercised its option to acquire an economic interest in the expansion of the Mount Keith 132kV transmission system in Western Australia that will support the Northern Goldfields-based operations of BHP Nickel West ("BHP"). The project is being developed under the existing PPA with BHP, which has a term of 15 years. It is expected to be completed in the second half of 2023. The project will facilitate the connection of additional generating capacity to our network to support BHP's operations and increase its competitiveness as a supplier of low-carbon nickel.

Executed Long-term PPA for the Remaining 30 MW at Garden Plain

During the second quarter of 2022, the Company entered into a long-term PPA for the remaining 30 MW of renewable electricity and environmental attributes for the Garden Plain wind project in Alberta with a new investment-grade globally recognized customer. The 130 MW Garden Plain wind project, which was announced in May 2021 with a 100 MW PPA contracted to Pembina Pipeline Corporation ("Pembina"), is now fully contracted with a weighted average contract life of approximately 17 years. Construction is underway with commercial operation expected in the first half of 2023.

Energy Impact Partners Investment

On May 5, 2022, the Company entered into a commitment to invest US$25 million over the next four years in Energy Impact Partners ("EIP") Deep Decarbonization Frontier Fund 1 (the “Frontier Fund”). During 2022, the Company invested $10 million (US$8 million). The investment in the Frontier Fund provides the Company with a portfolio approach to investing in emerging technologies and the opportunity to identify, pilot, commercialize and bring to market emerging technologies that will facilitate the transition to net-zero emissions.

Customer Update at White Rock Wind Projects

During the second quarter of 2022, TransAlta identified Amazon Energy LLC (“Amazon”) as the customer for the 300 MW White Rock wind projects, to be located in Caddo County, Oklahoma. On Dec. 22, 2021, Amazon and TransAlta entered into two long-term PPAs for the supply of 100 per cent of the renewable electricity and environmental attributes from the projects. Construction activities started in the fall of 2022 with a target commercial operation date in the second half of 2023. TransAlta will construct, operate and own the facilities.

MSCI Environmental, Social and Governance Rating Upgrade

During the second quarter of 2022, TransAlta's MSCI Environmental, Social and Governance ("ESG") Rating was upgraded to 'A' from 'BBB'. The upgrade reflects the Company's strong renewable energy growth compared to peers. In 2021, the Company grew its installed renewable energy capacity by 15 per cent through the acquisition and construction of solar and wind facilities and secured 600 MW in additional renewable energy projects. In line with its goal to reduce carbon emissions by 75 per cent from 2015 emissions levels by 2026, TransAlta also completed coal-to-gas conversions of its Canadian coal-fired facilities in 2021, nine years ahead of Alberta’s coal phase-out plan.

Horizon Hill Wind Project and Fully Executed Corporate PPA with Meta

On April 5, 2022, TransAlta announced a long-term renewable energy PPA with a subsidiary of Meta Platforms Inc. ("Meta"), formerly known as Facebook, Inc., for 100 per cent of the generation from its 200 MW Horizon Hill wind project to be located in Logan County, Oklahoma. Under this agreement, Meta will receive both renewable electricity and environmental attributes from the Horizon Hill facility. The facility will consist of a total of 34 Vestas turbines. Construction commenced in the fall of 2022 with a target commercial operation date in the second half of 2023. TransAlta will construct, operate and own the facility.

Segmented Financial Performance and Operating Results

Segmented information is prepared on the same basis that the Company manages its business, evaluates financial results and makes key operating decisions.

Consolidated Results

The following table reflects the generation and summary financial information on a consolidated basis for the year ended Dec. 31:

	LTA generation (GWh)[1]			Actual production (GWh)[2]			Adjusted EBITDA[3]		
Year ended Dec. 31	2022	2021	2020	2022	2021	2020	2022	2021[4]	2020[4]
Hydro	**2,015**	2,030	2,030	**1,988**	1,936	2,132	**527**	322	105
Wind and Solar	**4,950**	4,345	3,916	**4,248**	3,898	4,069	**311**	262	248
Renewables	**6,965**	6,375	5,946	**6,236**	5,834	6,201	**838**	584	353
Gas				**11,448**	10,565	10,780	**629**	488	367
Energy Transition				**3,574**	5,706	7,999	**86**	133	175
Energy Marketing							**183**	166	103
Corporate							**(102)**	(85)	(81)
Total				**21,258**	22,105	24,980	**1,634**	1,286	917
Earnings (loss) before income taxes							**353**	(380)	(303)

(1) Long-term average production ("LTA Generation (GWh)") is calculated based on our portfolio as at Dec. 31, 2022, on an annualized basis from the average annual energy yield predicted from our simulation model based on historical resource data performed over a period of typically 30-35 years for the Wind and Solar segments and 36 years for Hydro segment. LTA Generation (GWh) for Energy Transition is not considered as we are currently transitioning these units completely by the end of 2025 and the LTA Generation (GWh) for Gas is not considered as it is largely dependent on market conditions and merchant demand. LTA Generation (GWh) for the year ended Dec. 31, 2022, excluding the Kent Hills 1 and 2 wind facilities which are currently not in operation, is approximately 4,563 GWh.

(2) Actual production levels are compared against the long-term average to highlight the impact of an important factor that affects the variability in our business results. In the short-term, for each of the Hydro and Wind and Solar segments, the conditions will vary from one period to the next and over time facilities will continue to produce in line with their long-term averages, which have proven to be reliable indicators of performance.

(3) This item is not defined and has no standardized meaning under IFRS. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.

(4) Adjustments to the Gas and Energy Marketing segment were made for the impact of realized gains and losses on closed exchange positions. Refer to the Additional IFRS Measures and Non-IFRS Measures section under the Reconciliation of Non-IFRS Measures section of this MD&A.

Hydro

Year ended Dec. 31	2022	2021	2020
Gross installed capacity (MW)[1]	**922**	925	925
LTA (GWh)	**2,015**	2,030	2,030
Availability (%)	**96.7**	92.4	93.2
Production			
Contract production (GWh)	**323**	434	2,056
Merchant production (GWh)	**1,665**	1,502	76
Total energy production (GWh)	**1,988**	1,936	2,132
Ancillary service volumes (GWh)[2]	**3,124**	2,897	2,857
Alberta Hydro Assets revenues[3]	**328**	185	87
Other Hydro Assets and other revenues[3][4]	**42**	41	45
Alberta Hydro ancillary services revenues[2]	**236**	160	66
Capacity payments[5]	**—**	—	60
Environmental attribute revenues	**1**	1	—
Total gross revenues	**607**	387	258
Net payment relating to Alberta Hydro PPA[6]	**—**	(4)	(106)
Revenues[7]	**607**	383	152
Fuel and purchased power	**22**	16	8
Gross margin[7]	**585**	367	144
OM&A	**55**	42	37
Taxes, other than income taxes	**3**	3	2
Adjusted EBITDA[7]	**527**	322	105
Supplemental Information:			
Gross revenues per MWh			
Alberta Hydro Assets energy ($/MWh)	**197**	123	51
Alberta Hydro Assets ancillary ($/MWh)	**76**	55	23
Sustaining capital	**35**	26	20

(1) In the fourth quarter of 2022, the Company closed the sale of two Hydro assets resulting in a reduction in capacity of 3 MW.
(2) Ancillary services as described in the AESO Consolidated Authoritative Document Glossary.
(3) Alberta Hydro Assets include 13 hydro facilities on the Bow and North Saskatchewan river systems. Other Hydro assets includes our hydro facilities in BC and Ontario, hydro facilities in Alberta (other than the Alberta Hydro Assets) and transmission revenues.
(4) Other revenue includes revenues from our transmission business and other contractual arrangements, including the flood mitigation agreement with the Government of Alberta and black start services.
(5) Capacity payments include the annual capacity charge as described in the Power Purchase Arrangements Determination Regulation AR 175/2000, available from Alberta King's Printer. The PPA expired on Dec. 31, 2020.
(6) The net payment relating to the Alberta Hydro PPA represents the Company's financial obligations for notional amounts of energy and ancillary services in accordance with the Alberta Hydro PPA that expired on Dec. 31, 2020. The amount in 2021 related to adjustments for the final payment under the Alberta PPA.
(7) This item is not defined and has no standardized meaning under IFRS. For details of the adjustments to revenues and net other operating income included in adjusted EBITDA refer to the Additional IFRS and Non-IFRS Measures section of this MD&A.

2022

Availability for 2022 increased compared to 2021, primarily due to lower planned and unplanned outages at our Alberta Hydro Assets.

Production for 2022 increased by 52 GWh compared to 2021, mainly due to higher availability.

Ancillary services volumes for 2022 increased by 227 GWh compared to 2021, due to higher availability and demand.

Adjusted EBITDA for 2022 increased by $205 million compared to 2021, primarily due to higher merchant prices, higher production and higher ancillary service prices and volumes in the Alberta market. This was partially offset by higher OM&A costs for the year related to increased insurance premiums for updated replacement value coverage and the Company's performance-related incentive accruals. For further discussion on the Alberta market conditions and pricing, refer to the Alberta Electricity Portfolio section of this MD&A.

Sustaining capital expenditures for 2022 were $9 million higher compared to 2021, due to higher planned maintenance in 2022.

2021

Availability for 2021 decreased compared to 2020, primarily due to higher planned and unplanned outages.

Production for 2021 decreased by 196 GWh compared to 2020, mainly due to lower availability and lower precipitation.

Ancillary service volumes for 2021 increased by 40 GWh compared to 2020, in line with our expectations.

Adjusted EBITDA for 2021 increased by $217 million compared to 2020. Effective Jan. 1, 2021, with the expiration of the Alberta PPA for our Alberta Hydro Assets, these facilities began operating on a merchant basis in the Alberta power market. This eliminated the net payment obligations under the Alberta PPA. With strong availability during periods of market volatility, the Company captured higher energy and ancillary service revenue, partially offset by increased costs related to portfolio management services, dam safety staffing, dredging and station services.

Sustaining capital expenditures for 2021 were $6 million higher than in 2020, due to higher planned outages in 2021.

Wind and Solar

Year ended Dec. 31	2022	2021	2020
Gross installed capacity (MW)[1]	**1,906**	1,906	1,572
LTA (GWh)	**4,950**	4,345	3,916
Availability (%)	**83.8**	91.9	95.1
Contract production (GWh)	**3,182**	2,850	2,871
Merchant production (GWh)	**1,066**	1,048	1,198
Total production (GWh)	**4,248**	3,898	4,069
Wind and Solar revenues	**357**	320	311
Environmental attribute revenues	**50**	28	23
Revenues[2]	**407**	348	334
Fuel and purchased power	**31**	17	25
Carbon compliance	**1**	—	—
Gross margin[2]	**375**	331	309
OM&A	**68**	59	53
Taxes, other than income taxes	**12**	10	8
Net other operating income[2]	**(16)**	—	—
Adjusted EBITDA[2]	**311**	262	248
Supplemental information:			
Sustaining capital	**18**	13	13
Kent Hills wind rehabilitation expenditures[3]	**77**	—	—
Insurance proceeds - Kent Hills	**(7)**	—	—

(1) The gross installed capacity in 2022 and 2021 includes incremental capacity related to new facilities: Windrise wind facility (206 MW), North Carolina Solar facility (122 MW) and Oldman wind facility (4 MW).
(2) For details of the adjustments to revenues and net other operating income included in adjusted EBITDA refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.
(3) The Kent Hills wind facilities rehabilitation capital expenditures are segregated from the sustaining capital expenditures due to the extraordinary nature of the expenditures and have been reflected separately.

2022

Availability for the year ended Dec. 31, 2022, decreased compared to 2021, primarily as a result of the extended outage at the Kent Hills 1 and 2 wind facilities.

Production for the year ended 2022 increased 350 GWh compared to 2021, primarily due to higher production from the addition of the Windrise wind facility and the acquisition of the North Carolina Solar facility in the fourth quarter of 2021 and higher wind resources in Eastern Canada, partially offset by lower production from the extended outage at the Kent Hills 1 and 2 wind facilities.

Adjusted EBITDA for 2022 increased by $49 million compared to 2021, primarily due to higher production, higher realized merchant pricing in Alberta, higher environmental attribute revenues and the recognition of liquidated damages recoverable from turbine availability being below the contractual target at the Windrise wind facility. This was partially offset by lower production from the extended outage at Kent Hills, an increase in transmission rates and OM&A related to the addition of the Windrise wind and North Carolina Solar facilities. A one-time favourable adjustment as a result of the AESO transmission line loss ruling was included in 2021.

Sustaining capital expenditures for 2022 were $5 million higher compared to 2021, due to a higher level of major component replacements in 2022.

2021

Availability for the year ended Dec. 31, 2021, decreased compared to 2020, primarily as a result of the unplanned outage at the Kent Hills 1 and 2 wind facilities.

Production for the year ended 2021 decreased 171 GWh compared to 2020 and was impacted by lower wind resources in Eastern Canada and in the US, and the unplanned outage at the Kent Hills 1 and 2 wind facilities, which was partially offset by a full year of production from the Skookumchuck wind facility, the commissioning of the Windrise wind facility and the acquisition of the North Carolina Solar facility.

Adjusted EBITDA for 2021 increased by $14 million compared to 2020, primarily due to higher merchant pricing in Alberta, a full year of operations from the Skookumchuck wind facility and the WindCharger battery storage facility as well as incremental earnings from the newly commissioned or acquired assets in 2021, consisting of the Windrise wind facility and the North Carolina Solar facility. Also, fuel and purchased power costs were lower in 2021 due to the AESO transmission line loss provision recorded in 2020. Adjusted EBITDA was negatively impacted by lower wind resources in Eastern Canada and the US, the unplanned outage at the Kent Hills 1 and 2 wind facilities and the weakening US dollar relative to the Canadian dollar.

Sustaining capital expenditures for 2021 were consistent with 2020.

Kent Hills Rehabilitation

The Kent Hills 1 and 2 wind facilities are not currently in operation following the tower failure event that occurred in September 2021. This event has taken approximately 150 MW of gross production offline temporarily as the Company replaces all 50 turbine foundations at the Kent Hills 1 and 2 wind facilities. The extended outage is expected to result in foregone revenue of approximately $3 million per month on an annualized basis (to the extent all 50 turbines at the Kent Hills 1 and 2 wind facilities are offline), based on average historical wind production, with revenue expected to be earned as the wind turbines are returned to service. Each turbine at Kent Hills 1 and 2 wind facilities will return to service as soon as its foundation is replaced and the turbine is reassembled and tested.

Rehabilitation for the Kent Hills 1 and 2 wind facilities is well underway. The majority of the towers have been fully disassembled including foundation removal. Construction of new foundations is progressing well and the team has now started to re-erect the first turbine tower segments on the new foundations. In addition, the new wind turbine components to replace the damaged unit have been delivered to site. Rehabilitation is targeted to be completed in the second half of 2023. The current estimate of the capital expenditures is approximately $120 million, inclusive of insurance proceeds.

The Company is actively evaluating all options that may be available to recover the rehabilitation costs.

Gas

Year ended Dec. 31	2022	2021	2020
Gross installed capacity (MW)	**3,084**	3,084	3,084
Availability (%)	**94.6**	85.7	87.7
Contract production (GWh)	**3,609**	3,622	7,280
Merchant production (GWh)	**7,927**	7,084	3,698
Purchased power (GWh)	**(88)**	(141)	(198)
Total production (GWh)	**11,448**	10,565	10,780
Revenues[1]	**1,521**	1,126	848
Fuel and purchased power[1]	**637**	374	221
Carbon compliance	**83**	118	120
Gross margin[1]	**801**	634	507
OM&A[1]	**195**	173	166
Taxes, other than income taxes	**15**	13	13
Net other operating income	**(38)**	(40)	(39)
Adjusted EBITDA[1]	**629**	488	367
Supplemental information:			
Sustaining capital:	**41**	128	87

(1) For details of the adjustments to revenues, fuel and purchased power and OM&A included in adjusted EBITDA, refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.

2022

Availability for the year ended Dec. 31, 2022, increased compared to 2021, primarily due to lower planned outages with the completion of the coal-to-gas conversions in 2021 and higher reliability of the coal-to-gas converted units compared to coal units.

Production for the year ended Dec. 31, 2022, increased by 883 GWh compared to 2021, mainly due to higher availability and dispatch optimization of the Alberta assets and higher production at the Ada cogeneration facility.

Adjusted EBITDA for the year ended Dec. 31, 2022, increased by $141 million compared to 2021, mainly due to capturing higher realized energy prices through dispatch optimization of our Alberta assets, net of hedging, higher Ontario merchant pricing, steam generation and lower carbon compliance costs. This was partially offset by increased natural gas consumption on recently converted units, higher natural gas prices and higher OM&A due to the Company's performance-related incentive accruals and increased general operating expenses. Carbon compliance costs were lower due to reductions in GHG emissions and utilization of compliance credits to settle a portion of the GHG obligation, partially offset by an increase in the carbon price per tonne and higher production. Lower GHG emissions were a direct result of operating exclusively on natural gas in Alberta rather than coal. Adjusted EBITDA for 2021 was also impacted by the unplanned short-term steam supply outages at the Sarnia cogeneration facility in 2021.

Sustaining capital expenditures for the year ended Dec. 31, 2022, decreased by $87 million compared to 2021, due to the coal-to-gas conversions being completed in 2021.

2021

Availability for the year ended Dec. 31, 2021, decreased compared to 2020, primarily as a result of an increase in unplanned outages and planned boiler conversions of Keephills Unit 2, Keephills Unit 3 and Sheerness Unit 1 in Alberta, partially offset by higher availability of Sundance Unit 6 with its gas conversion having been completed in 2020.

Production for the year ended Dec. 31, 2021, decreased by 215 GWh compared to 2020, mainly due to higher portfolio optimization activities in Alberta and lower customer loads in Australia, partially offset by higher demand at other facilities and incremental production from a full year of operations at the Ada cogeneration facility.

Adjusted EBITDA for the year ended Dec. 31, 2021, increased by $121 million compared to 2020, primarily due to higher merchant pricing in the Alberta market, the South Hedland PPA contract settlement and incremental production from a full year of operations at our Ada cogeneration facility, partially offset by an increase in fuel costs, unplanned short-term steam supply outages at our Sarnia cogeneration facility, higher OM&A costs related to the new projects being constructed under the PPA with BHP and legal fees related to the South Hedland PPA contract settlement.

Sustaining capital expenditures for the year ended Dec. 31, 2021, increased by $41 million mainly due to major maintenance costs associated with conversion to natural gas outages of Keephills Unit 2 and Unit 3 and Sheerness Unit 1, planned major maintenance at the Australian gas facilities and the purchase of an additional engine at the South Hedland facility.

Energy Transition

Year ended Dec. 31	2022	2021	2020
Gross installed capacity (MW)[1]	**671**	1,472	2,548
Availability (%)	**77.2**	75.3	82.6
Adjusted availability (%)[2]	**79.0**	78.8	91.3
Contract sales volume (GWh)	**3,329**	3,329	5,526
Merchant sales volume (GWh)	**3,951**	6,052	6,248
Purchased power (GWh)	**(3,706)**	(3,675)	(3,775)
Total production (GWh)	**3,574**	5,706	7,999
Revenues[3]	**724**	728	690
Fuel and purchased power[3]	**566**	432	352
Carbon compliance	**(1)**	60	48
Gross margin[3]	**159**	236	290
OM&A[3]	**69**	97	106
Taxes, other than income taxes	**4**	6	9
Adjusted EBITDA[3]	**86**	133	175
Supplemental information:			
Highvale mine reclamation spend	**12**	6	7
Centralia mine reclamation spend	**16**	9	7
Sustaining capital	**19**	19	22

(1) The gross installed capacity for 2022, excludes Keephills Unit 1 (395 MW retired on Dec. 31, 2021) and Sundance Unit 4 (406 MW retired on March 31, 2022). The gross installed capacity for 2021 excludes Centralia Unit 1 (670 MW retired on Dec. 31, 2020) and Sundance Unit 5 (406 MW).
(2) Adjusted for dispatch optimization.
(3) For details of the adjustments to revenues, fuel and purchased power and OM&A included in adjusted EBITDA refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.

2022

Adjusted availability for the year ended Dec. 31, 2022, was consistent with 2021 as higher availability from lower planned and unplanned outages at Centralia Unit 2 was partially offset by the retirements of Sundance Unit 4 in 2022 and Keephills Unit 1 in 2021.

Production decreased by 2,132 GWh for the year ended Dec. 31, 2022, compared to 2021, primarily due to the retirements of Keephills Unit 1 and Sundance Unit 4, partially offset by increased production from higher availability at Centralia Unit 2.

Adjusted EBITDA decreased by $47 million for the year ended Dec. 31, 2022, as compared to 2021, primarily due to the retirement of the Alberta coal assets and higher purchased power costs during outages at Centralia in 2022, partially offset by higher merchant and contract prices and higher production at Centralia, lower carbon costs in Alberta related to utilization of our compliance credits to settle the 2021 GHG obligation and lower OM&A as a result of the retirements on the coal fleet in 2021.

Mine reclamation spend for the Highvale and Centralia mines increased due to the advancement of reclamation activities compared to 2021.

Sustaining capital expenditures for the year ended Dec. 31, 2022, was consistent compared to 2021.

2021

Adjusted availability for the year ended Dec. 31, 2021, decreased compared to 2020 due to higher planned and unplanned outages at Centralia Unit 2 and Sundance Unit 4 related to derates.

Production decreased by 2,293 GWh for the year ended Dec. 31, 2021, compared to 2020, primarily due to the planned retirement of Centralia Unit 1 and dispatch optimization of the Alberta assets.

Adjusted EBITDA decreased by $42 million for the year ended Dec. 31, 2021, compared to 2020, primarily due to the planned retirement of Centralia Unit 1, higher fuel and purchased power costs due to unplanned outages at Centralia Unit 2, higher carbon compliance costs for the Alberta assets primarily due to an increase in carbon prices, and the weakening of the US dollar relative to the Canadian dollar throughout the year, partially offset by dispatch optimization of the Alberta assets and lower OM&A as a result the planned retirement of Centralia Unit 1.

Mine reclamation spend for the Highvale and Centralia mines was consistent compared to 2020.

Sustaining capital expenditures for the year ended Dec. 31, 2021, were $3 million lower than 2020 mainly due to a reduction in planned outage work performed.

Energy Marketing

Year ended Dec. 31	2022	2021	2020
Revenues[1]	**218**	202	133
OM&A	**35**	36	30
Adjusted EBITDA[1]	**183**	166	103

(1) For details of the adjustments to revenues included in adjusted EBITDA, refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.

2022

Adjusted EBITDA for 2022 increased by $17 million compared to 2021. Results exceeded segment expectations due to short-term trading of both physical and financial power and gas products across all North American deregulated markets. The Company was able to capitalize on short-term volatility in the trading markets without materially changing the risk profile of the business unit.

2021

Adjusted EBITDA for 2021 increased by $63 million compared to 2020. Results were stronger primarily due to favourable short-term trading of both physical and financial power, and natural gas products across all North American markets. This was partially offset by OM&A increases due to higher incentives related to stronger performance. The Energy Marketing team was able to capitalize on short-term volatility in the markets in which we trade without materially changing the risk profile of the business unit.

Corporate

Year ended Dec. 31	2022	2021	2020
OM&A	**101**	84	80
Taxes, other than income taxes	**1**	1	1
Adjusted EBITDA	**(102)**	(85)	(81)
Adjusted EBITDA	**(102)**	(85)	(81)
Total return swap (gains) losses	**1**	(4)	3
CEWS funding received	**—**	(8)	—
CEWS funding applied to incremental employment	**5**	3	—
Adjusted EBITDA excluding impact of total return swap and CEWS	**(96)**	(94)	(78)
Supplemental information:			
Sustaining capital:	**29**	13	14

2022

Adjusted EBITDA for the year ended Dec. 31, 2022, decreased by $17 million compared to 2021, primarily due to higher incentive accruals reflecting the Company's performance. The 2021 adjusted EBITDA was positively impacted by the receipt of CEWS proceeds and gains on the total return swap.

For the year ended Dec. 31, 2022, sustaining capital expenditures increased by $16 million, compared to 2021, mainly due to higher spend on leasehold improvements associated with the relocation of the Company's head office.

2021

Adjusted EBITDA for the year ended Dec. 31, 2021, decreased by $4 million compared to 2020, primarily due to higher incentive payments, higher employee costs, higher insurance costs and higher legal fees for settlement of outstanding legal issues, partially offset by the receipt of CEWS funding and realized gains from the total return swap. A portion of the settlement costs of our employee share-based payment plans is hedged by entering into total return swaps, which are cash settled every quarter. Excluding the impact of the total return swap, staffing costs increased due to additional headcount to support growth initiatives. As previously committed, the CEWS funding is being used to support incremental employment within the Company.

For the year ended Dec. 31, 2021, sustaining capital expenditures were consistent with 2020.

Performance by Segment with Supplemental Geographical Information

The following table provides adjusted EBITDA performance of our facilities across the regions we operate in:

Year ended Dec. 31, 2022	Hydro	Wind and Solar	Gas	Energy Transition[1]	Energy Marketing[2]	Corporate	Total
Alberta	515	114	404	(18)	183	(102)	1,096
Canada, excluding Alberta	12	106	87	—	—	—	205
US	—	91	8	104	—	—	203
Australia	—	—	130	—	—	—	130
Adjusted EBITDA[3]	**527**	**311**	**629**	**86**	**183**	**(102)**	**1,634**
Earnings before income taxes							**353**

Year ended Dec. 31, 2021	Hydro	Wind and Solar	Gas	Energy Transition[1]	Energy Marketing[2]	Corporate	Total
Alberta	308	63	263	59	166	(85)	774
Canada, excluding Alberta	14	120	75	—	—	—	209
US	—	79	10	74	—	—	163
Australia	—	—	140	—	—	—	140
Adjusted EBITDA[3][4]	322	262	488	133	166	(85)	1,286
Loss before income taxes							(380)

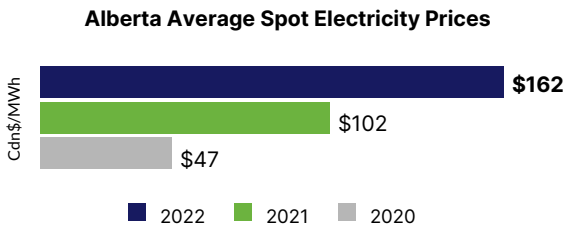
(1) Keephills Unit 1 was retired Dec. 31, 2021, and Sundance Unit 4 was retired March 31, 2022.
(2) The adjusted EBITDA for the Energy Marketing segment was reclassified to the Alberta region to reflect where the operations reside.
(3) Adjusted EBITDA is not defined and has no standardized meaning under IFRS. Presenting this from period to period provides management and investors with the ability to evaluate earnings (loss) trends more readily in comparison with prior periods' results. Refer to the Segmented Financial Performance and Operating Results section of this MD&A for further discussion of these items, including, where applicable, reconciliations to measures calculated in accordance with IFRS. Also, refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.
(4) In 2022, adjustments to the Gas and Energy Marketing segments were made for the impact of realized gains and losses on closed exchange positions for these segments in 2021. Also refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.

Alberta Electricity Portfolio

Generating capacity in Alberta is subject to market forces, rather than rate regulation. Power from commercial generation is cleared through a wholesale electricity market. Power is dispatched in accordance with an economic merit order administered by the Alberta Electric System Operator ("AESO"), based upon offers by generators to sell power in the real-time energy-only market. Our merchant Alberta fleet operates under this framework and we internally manage our offers to sell power.

Approximately 52 per cent of our gross installed capacity is located in Alberta. Our portfolio of merchant assets in Alberta consists of hydro facilities, wind facilities, a battery storage facility, cogeneration facilities and converted natural-gas-fired thermal facilities. Some of the wind and gas facilities within the Alberta Electricity Portfolio operate on long-term contracts. Optimization of portfolio performance is driven by the diversity of fuel types, which enables portfolio management and allows for maximization of operating margins. It also provides us with capacity that can be monetized as ancillary services or dispatched into the energy market during times of supply tightness. A portion of the installed generation capacity in the portfolio has been hedged to provide cash flow certainty.

Alberta's annual demand increased approximately 1.7 per cent from 2021 to 2022, due to the economic recovery from the COVID-19 pandemic, higher residential cooling demand in summer and stronger market conditions for energy commodities supporting power demand. The average pool price increased from $102/MWh in 2021 to $162/MWh in 2022. Pool prices were higher in the second through fourth quarters of 2022 compared to 2021, as a result of higher demand in the province, higher natural gas and carbon prices and stronger prices in an adjacent power market. August and December, specifically, were months with significant weather-driven demand in the province.



Year ended Dec. 31	2022 Hydro	2022 Wind & Solar	2022 Gas	2022 Energy Transition	2022 Total	2021 Hydro	2021 Wind & Solar	2021 Gas	2021 Energy Transition	2021 Total	2020 Hydro	2020 Wind & Solar	2020 Gas	2020 Energy Transition	2020 Total
Total production (GWh)[1]	**1,665**	**1,686**	**8,106**	**19**	**11,476**	1,586	1,319	7,281	2,591	12,777	1,779	1,320	7,732	2,865	13,696
Contract production (GWh)	**—**	**620**	**526**	**—**	**1,146**	—	271	509	—	780	1,703	122	4,223	2,187	8,235
Merchant production (GWh)	**1,665**	**1,066**	**7,580**	**19**	**10,330**	1,586	1,048	6,772	2,591	11,997	76	1,198	3,509	678	5,461
Revenues[2]	**583**	**155**	**989**	**6**	**1,733**	358	97	674	257	1,386	126	57	482	207	872
Fuel and purchased power[3]	**18**	**21**	**442**	**5**	**486**	13	9	258	92	372	6	15	151	73	245
Carbon compliance	**—**	**1**	**70**	**(1)**	**70**	—	—	96	60	156	—	—	120	48	168
Gross margin	**565**	**133**	**477**	**2**	**1,177**	345	88	320	105	858	120	42	211	86	459

(1) Units in the Gas and Energy Transition segments in the prior periods operated on coal. Keephills Unit 1 was retired on Dec. 31, 2021, and Sundance Unit 4 was retired on March 31, 2022.
(2) Revenue has been adjusted to exclude the impact of unrealized mark-to-market gains or losses and realized gains and losses on closed exchange positions in order to depict revenue realized in the year.
(3) Adjustments to fuel and purchased power include the impact of coal mine depreciation and coal inventory write-downs at the Highvale mine in 2021.

For the year ended Dec. 31, 2022, the Alberta Electricity Portfolio generated 11,476 GWh of energy, a decrease of 1,301 GWh compared to 2021. Production was impacted by the retirement of Keephills Unit 1 on Dec. 31, 2021, and Sundance Unit 4 on March 31, 2022. Lower production from the retirement of assets was partially offset by higher contract production mainly due to the Windrise wind facility, commissioned in the fourth quarter of 2021, and higher merchant production benefiting from higher availability in the Hydro segment. Higher merchant production related to the Gas segment was due to more market opportunities for our merchant gas fleet in the second half of 2022.

Gross margin for the year ended Dec. 31, 2022, was $1,177 million, an increase of $319 million compared to 2021. Higher merchant margins were realized through dispatch optimization and the increase in realized power prices, which more than offset higher fuel costs from increased natural gas prices in 2022 as compared to the prior year. Periods of strong weather-driven demand and unplanned outages resulted in opportunities for each of our fuel types in the Alberta Electricity Portfolio throughout the year.

The following table provides information for the Company's Alberta Electricity Portfolio:

Year ended Dec. 31	2022	2021	2020
Spot power price average per MWh	**$162**	$102	$47
Natural gas price (AECO) per GJ	**$5.08**	$3.39	$2.11
Carbon compliance price per tonne	**$50**	$40	$30
Realized merchant power price per MWh[1][2]	**$126**	$91	$64
Hydro energy spot power price per MWh	**$197**	$122	$—
Hydro ancillary spot price per MWh	**$76**	$55	$—
Wind energy spot power price per MWh	**$90**	$63	$—
Gas and Energy Transition spot power price per MWh	**$194**	$114	$—
Hedged volume (GWh)[2][3]	**7,228**	6,992	5,395
Hedged power price average per MWh[2]	**$86**	$72	$54
Fuel and purchased power per MWh[4]	**$60**	$38	$23
Carbon compliance cost per MWh[4]	**$9**	$16	$16

(1) Realized merchant power price for the Alberta Electricity Portfolio is the average price realized as a result of the Company's merchant power sales (excluding assets under long-term contract and ancillary revenues) and portfolio optimization activities divided by total merchant GWh produced. In 2020, the realized price was based on the average price realized as a result of the portfolio under PPAs.
(2) In 2020, the portfolio in Alberta was under PPAs and the PPA volumes are not included in the total hedged volumes listed above.
(3) Hedge volumes are for production volumes primarily from the Gas segment.
(4) Fuel and purchased power per MWh and carbon compliance cost per MWh are calculated on production from carbon-emitting generation in the Gas and Energy Transition segments, and carbon compliance cost per MWh includes compliance credits to settle a portion of our GHG carbon pricing obligations.

For the year ended Dec. 31, 2022, the realized merchant power price per MWh of production increased by $35 per MWh, compared with the same period in 2021. Higher realized merchant power pricing for energy across the fleet was due to higher market prices, increased price volatility and optimization of our available capacity across all fuel types. The segment spot prices exclude gains and losses from hedging positions that are entered into in order to mitigate the impact of unfavourable market pricing.

For the year ended Dec. 31, 2022, the fuel and purchased power cost per MWh of production increased by $22 per MWh compared to the same period in 2021, due to higher natural gas pricing and higher fixed gas transportation costs, partially offset by our hedge positions for gas prices and lower coal costs due to the cessation of mining operations in 2021.

For the year ended Dec. 31, 2022, carbon compliance costs per MWh of production decreased by $7 per MWh in the same period in 2021, due to lower carbon emissions from the retirement of our coal fleet and the utilization of compliance credits to settle a portion of our GHG carbon pricing obligation for 2021. Carbon compliance prices have increased to $50 per tonne from $40 per tonne; however, the shift to gas-fired generation effectively lowered our GHG compliance costs as natural gas combustion produces lower GHG emissions than coal combustion.

Fourth Quarter Highlights

Consolidated Financial Highlights

Three months ended Dec. 31	2022	2021
Adjusted availability (%)	**89.5**	83.8
Production (GWh)	**6,005**	5,823
Revenues	**854**	610
Fuel and purchased power[1]	**446**	266
Carbon compliance	**27**	39
Operations, maintenance and administration[1]	**157**	130
Adjusted EBITDA[2][3]	**541**	243
Earnings (loss) before income taxes	**7**	(32)
Net loss attributable to common shareholders	**(163)**	(78)
Cash flow from operating activities	**351**	54
FFO[2][3]	**459**	186
FCF[2][3]	**315**	79
Net loss per share attributable to common shareholders, basic and diluted	**(0.61)**	(0.29)
Dividends declared per common share[4]	**0.11**	0.10
Dividends declared per preferred share[4]	**0.34**	0.25
FFO per share[2][5]	**1.71**	0.69
FCF per share[2][5]	**1.17**	0.29

(1) In 2021, $6 million was reclassified from OM&A to fuel and purchased power for station service costs in the Hydro segment.
(2) These items are not defined and have no standardized meaning under IFRS. Refer to the Segmented Financial Performance and Operating Results section of this MD&A for further discussion of these items, including, where applicable, reconciliations to measures calculated in accordance with IFRS. Also, refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.
(3) During 2022, our adjusted EBITDA composition was amended to include the impact of closed exchange positions that are effectively settled by offsetting positions with the same counterparty to reflect the performance of the assets and Energy Marketing segment in the period in which the transactions occur. Therefore, the Company has applied this composition to all previously reported periods.
(4) Weighted average of the Series A, B, C, D, E and G preferred share dividends declared. Dividends declared vary year over year due to timing of dividend declarations.
(5) Funds from operations ("FFO") per share and free cash flow ("FCF") per share are calculated using the weighted average number of common shares outstanding during the period. The weighted average number of common shares outstanding for the three months ended Dec. 31, 2022, was 269 million shares (2021 – 271 million shares). Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A for the purpose of these non-IFRS ratios.

Financial Highlights

During the fourth quarter of 2022, the Company completed the year with exceptional performance in all of our generation segments as well as our Energy Marketing segment. The Hydro, Wind and Gas facilities in the Alberta Electricity Portfolio had high availability during periods of peak pricing, which resulted from extreme cold weather and periods of province-wide planned and unplanned outages. The Alberta Electricity Portfolio was positioned to capture opportunities from these strong spot market conditions through both energy and ancillary services revenues.

Adjusted availability for the three months ended Dec. 31, 2022, was 89.5 per cent compared to 83.8 per cent for the same period in 2021, mainly due to lower outages at our Alberta gas facilities and at Centralia Unit 2.

Production for the three months ended Dec. 31, 2022, was 6,005 GWh compared to 5,823 GWh for the same period in 2021. The increase in production for the three-month period in 2022 was due to higher availability of the Alberta gas facilities within the Gas segment and Centralia Unit 2 within the Energy Transition segment, partially offset by the retirement of Keephills Unit 1 and Sundance Unit 4.

Revenues for the three months ended Dec. 31, 2022, increased by $244 million compared to the same period in 2021, mainly as a result of capturing higher realized energy prices within the Alberta electricity market through our optimization and operating activities and higher realized ancillary services prices and volumes in the Hydro segment. Revenues further increased due to higher merchant prices and volumes at Centralia Unit 2. These increases were partially offset by the retirement of Keephills Unit 1 and Sundance Unit 4 within the Energy Transition segment.

Fuel and purchased power costs increased by $180 million in the three months ended Dec. 31, 2022, compared to the same period in 2021. The increase is due to higher natural gas prices and higher consumption of natural gas within our Gas segment, partially offset by our hedged positions on gas, lower coal costs and mine depreciation due to the termination of all coal-mining activities in Canada as of Dec. 31, 2021. In addition, fuel and purchased power costs at Centralia were higher from the acquisition of higher-priced power to fulfil our contractual obligations during periods of higher merchant pricing at Centralia Unit 2.

Carbon compliance costs decreased by $12 million in the three months ended Dec. 31, 2022, compared to the same period in 2021, primarily due to reductions in GHG emissions stemming from changes in the fuel mix ratio as we operated more on natural gas and fired less with coal, partially offset by increased production and an increase in the carbon price per tonne.

OM&A expenses for the three months ended Dec. 31, 2022, increased by $27 million, compared to the same period in 2021, primarily due to higher incentive accruals reflecting the Company's performance and increased staffing costs for growth and strategic initiatives.

Adjusted EBITDA for the three months ended Dec. 31, 2022, increased by $298 million compared to the same period in 2021, largely due to higher adjusted EBITDA in our Hydro and Gas segments, which was driven by higher realized prices in the Alberta market, higher adjusted EBITDA in the Wind and Solar segment from higher wind resources in Eastern Canada and higher gross margin from our Energy Marketing segment. This was partially offset by lower adjusted EBITDA in the Energy Transition segment from the retirement of Keephills Unit 1 and Sundance Unit 4, partially offset by higher realized merchant prices and production at Centralia Unit 2.

Net loss attributable to common shareholders in the fourth quarter of 2022 was $163 million compared to a net loss of $78 million in the same period of 2021, an increase of $85 million. The net loss in 2022 was impacted by higher depreciation and amortization expense due to the acceleration of useful lives on certain facilities in our Gas segment, higher OM&A expenses and higher income tax expense due to higher earnings before tax and current and prior period tax adjustments in the US to mitigate cash tax. These unfavourable impacts were partially offset by lower asset impairments, higher gains on sale of assets and other due to the timing of asset sales and higher adjusted EBITDA.

Cash flow from operating activities in the fourth quarter of 2022 increased by $297 million compared to the same period in 2021, mainly due to higher revenues net of unrealized gains and losses from risk management activities and favourable changes in working capital from movements in the collateral accounts related to high commodity prices and volatility in the markets, partially offset by higher fuel and purchased power costs and higher current income tax expense.

FCF in the fourth quarter of 2022 was $315 million compared to $79 million in the same period of 2021, as a result of higher adjusted EBITDA due to Alberta Electricity Portfolio performance and favourable changes in provisions from 2021, partially offset by higher current tax expense, higher distributions paid to subsidiaries' non-controlling interests, higher realized foreign exchange losses, and higher sustaining capital expenditures.

Segmented Financial Performance and Operating Results for the Fourth Quarter

A summary of our adjusted EBITDA by segment and earnings (loss) before income taxes for the three months ended Dec. 31, 2022, and 2021 is as follows:

	Adjusted EBITDA	
Three months ended Dec. 31	**2022**	**2021**
Hydro	**133**	67
Wind and Solar	**92**	76
Gas	**264**	103
Energy Transition	**19**	37
Energy Marketing	**63**	(11)
Corporate	**(30)**	(29)
Total adjusted EBITDA	**541**	243
Earnings (loss) before income taxes	**7**	(32)

Adjusted EBITDA increased by $298 million for the fourth quarter of 2022, compared to 2021, primarily as a result of:

- Hydro results were $66 million higher due to increased revenues from higher merchant and ancillary prices in the Alberta market.
- Wind and Solar results were $16 million higher due to higher merchant pricing in Alberta, higher wind resource in Eastern Canada, higher environmental attribute revenue, higher revenues related to the addition of the Windrise wind and North Carolina Solar facilities, and recognition of liquidated damages recoverable from turbine availability being below the contractual target at the Windrise wind facility.
- Gas results were $161 million higher mainly due to dispatch optimization and higher merchant prices, net of hedging in Alberta and a contract settlement. This was partially offset by the higher cost of natural gas and OM&A related to general operating expenses.
- Energy Transition results were $18 million lower as a result of the retirement of Alberta coal assets, partially offset by higher production and higher contract and merchant pricing at Centralia Unit 2.
- Energy Marketing results were higher by $74 million compared to the same period in 2021. Results exceeded expectations due to short-term trading of both physical and financial power and gas products across all North American deregulated markets.
- Corporate costs were comparable to 2021.

Selected Quarterly Information

Our results are seasonal due to the nature of the electricity market and related fuel costs. Higher maintenance costs are often incurred in the spring and fall when electricity prices are expected to be lower; electricity prices generally increase in the peak winter and summer months in our main markets due to increased heating and cooling loads. Margins are also typically impacted in the second quarter due to the volume of hydro production resulting from spring runoff and rainfall in the Pacific Northwest, which impacts production at Centralia. Typically, hydroelectric facilities generate most of their electricity and revenues during the spring months when melting snow starts feeding watersheds and rivers. Inversely, wind speeds are historically greater during the cold winter months and lower in the warm summer months.

	Q1 2022	Q2 2022	Q3 2022	Q4 2022
Revenues	735	458	929	**854**
Earnings (loss) before income taxes	242	(22)	126	**7**
Cash flow (used in) from operating activities[1]	451	(129)	204	**351**
Net earnings (loss) attributable to common shareholders	186	(80)	61	**(163)**
Net earnings (loss) per share attributable to common shareholders, basic and diluted[2]	0.69	(0.30)	0.23	**(0.61)**

	Q1 2021	Q2 2021	Q3 2021	Q4 2021
Revenues	642	619	850	610
Earnings (loss) before income taxes	21	72	(441)	(32)
Cash flow from operating activities	257	80	610	54
Net loss attributable to common shareholders	(30)	(12)	(456)	(78)
Net loss per share attributable to common shareholders, basic and diluted[2]	(0.11)	(0.04)	(1.68)	(0.29)

(1) The cash flow used in operating activities for the second quarter of 2022 was due to unfavourable changes in working capital mainly due to movements in our collateral accounts related to higher commodity prices and volatility in the markets.

(2) Basic and diluted earnings (loss) per share attributable to common shareholders is calculated in each period using the weighted average common shares outstanding during the period. As a result, the sum of the earnings (loss) per share for the four quarters making up the calendar year may sometimes differ from the annual earnings (loss) per share.

Net earnings (loss) attributable to common shareholders has also been impacted by the following variations and events:

- Higher revenues arising from higher overall availability during periods of peak pricing and higher power prices in Alberta in 2022;
- Higher natural gas pricing and increased natural gas consumption for the units that were converted to gas in 2021 and 2020;
- Lower carbon costs in 2022 related to our transition off coal and the utilization of renewable energy compliance credits to settle a portion of our GHG obligation in the second quarter of 2022;
- The continued extended outage of the Kent Hills 1 and 2 wind facilities from the fourth quarter of 2021 through the fourth quarter of 2022. The extended outage is expected to continue into 2023;
- The effects of asset impairment charges and reversals during all periods shown;
- The effects of changes in decommissioning provisions for retired assets from changes in estimated cash flows and discount rates in all periods shown;
- Accelerated timing of decommissioning cash flows and changes in useful lives recognized in the third quarter of 2022;
- Insurance proceeds for the single tower failure at Kent Hills wind facilities of $7 million recognized in the second quarter of 2022;
- Liquidated damages recoverable from turbine availability being below the contractual target at the Windrise wind facility were recorded in each of the quarters in 2022;
- Keephills Unit 1 being retired in the fourth quarter of 2021 and Sundance Unit 4 being retired in the first quarter of 2022;
- Acquisition of North Carolina Solar facility in the fourth quarter of 2021;
- Commissioning of the Windrise wind facility in the fourth quarter of 2021;
- The suspension of the Sundance Unit 5 repowering project in the third quarter of 2021;
- The retirement of the Sundance Unit 5 during 2021;
- Gains relating to the sales of assets being recognized in the fourth quarter of 2022, the sale of the Pioneer Pipeline in the second quarter of 2021 and gains on sale of Gas equipment in the third quarter of 2021;
- The unplanned steam supply outages at the Sarnia facility in the second quarter of 2021;
- Receipt of CEWS funding in 2021;
- Accelerated plans to shut down the Highvale mine resulting in remaining future royalty payments being recognized as an onerous contract in the third quarter of 2021;
- Accelerated shutdown of the Highvale mine increasing mine depreciation included in the cost of coal. Coal inventory write-down incurred in the first three quarters of 2021;
- Coal-related parts and materials inventory write-down incurred in the second and third quarters of 2021;
- The impact of the updated provision estimates for the AESO transmission line loss ruling during the first quarter of 2021;
- Fluctuations in the Canadian dollar relative to the US dollar resulting in foreign exchange gains and losses on our US denominated long-term debt balances not designated as hedges; and
- Current and future tax expense fluctuating with earnings before tax across the quarters. Future tax expense increased from 2021 mainly due to a deferred tax write-down taken against part of the Canadian operations and losses on mark-to-market hedging.

Financial Position

The following table highlights significant changes in the Consolidated Statements of Financial Position from Dec. 31, 2021, to Dec. 31, 2022:

Assets	Dec. 31, 2022	Dec. 31, 2021	Increase/ (decrease)
Current assets			
Cash and cash equivalents	**1,134**	947	187
Trade and other receivables	**1,589**	651	938
Risk management assets	**709**	308	401
Other current assets[1]	**282**	291	(9)
Total current assets	**3,714**	2,197	1,517
Non-current assets			
Risk management assets	**161**	399	(238)
Property, plant and equipment, net	**5,556**	5,320	236
Other non-current assets[2]	**1,310**	1,310	—
Total non-current assets	**7,027**	7,029	(2)
Total assets	**10,741**	9,226	1,515
Liabilities			
Current liabilities			
Accounts payable and accrued liabilities	**1,346**	689	657
Risk management liabilities	**1,129**	261	868
Long-term debt and lease liabilities (current)	**178**	844	(666)
Other current liabilities[3]	**235**	137	98
Total current liabilities	**2,888**	1,931	957
Non-current liabilities			
Credit facilities, long-term debt and lease liabilities	**3,475**	2,423	1,052
Decommissioning and other provisions (long-term)	**659**	779	(120)
Risk management liabilities (long-term)	**333**	145	188
Defined benefit obligation and other long-term liabilities	**294**	253	41
Other non-current liabilities[4]	**1,103**	1,102	1
Total non-current liabilities	**5,864**	4,702	1,162
Total liabilities	**8,752**	6,633	2,119
Equity			
Equity attributable to shareholders	**1,110**	1,582	(472)
Non-controlling interests	**879**	1,011	(132)
Total equity	**1,989**	2,593	(604)
Total liabilities and equity	**10,741**	9,226	1,515

(1) Includes restricted cash, prepaid expenses, inventory and assets held for sale.
(2) Includes investments, long-term portion of finance lease receivables, right-of-use assets, intangible assets, goodwill, deferred income tax assets and other assets.
(3) Includes bank overdraft, current portion of decommissioning and other provisions, current portion of contract liabilities, income taxes payable and dividends payable.
(4) Includes exchangeable securities, deferred income tax liabilities and contract liabilities.

Significant changes in TransAlta's Consolidated Statements of Financial Position were as follows:

Working Capital

Current assets increased by $1,517 million to $3,714 million as at Dec. 31, 2022, from $2,197 million as at Dec. 31, 2021, primarily due to strong Alberta pricing which has increased operating cash flow and higher trade and other receivables due to higher revenue, along with higher collateral posted and higher risk management assets resulting from volatility in market prices. As at Dec. 31, 2022, the Company had provided $304 million (2021 – $55 million) of cash collateral related to derivative instruments in a net liability position.

Current liabilities increased by $957 million from $1,931 million as at Dec. 31, 2021, to $2,888 million as at Dec. 31, 2022, mainly due to an increase in accounts payable and accrued liabilities due to higher payables for increased construction activities. Additionally, higher payables in the Energy Market segment, higher collateral received associated with counterparty obligations and an increase in risk management liabilities arose primarily due to volatility in market prices across multiple markets. These increases were partially offset by the repayment of the US$400 million of 4.50 per cent unsecured senior notes due in 2022 and the reclassification of the KH Bonds of $206 million to long-term liabilities as the Company obtained a waiver and entered into a supplemental indenture that facilitated the rehabilitation of the Kent Hills 1 and 2 wind facilities which supported the reclassification to long-term debt. As at Dec. 31, 2022, the Company held $260 million (2021 – $18 million) of cash collateral received related to derivative instruments in a net asset position.

The excess of current assets over current liabilities, including the current portion of long-term debt and lease liabilities, was $826 million as at Dec. 31, 2022 (2021 – $266 million). Our working capital increased year over year mainly due to the reclassification of the KH Bonds from current to long-term liabilities, as well as the repayment of the US$400 million of 4.50 per cent unsecured senior notes due in 2022. The year-over-year increase was also due to an increase in cash of $187 million and higher trade and other receivables of $938 million due to strong Alberta merchant pricing, including higher collateral provided, and higher risk management assets of $401 million primarily from volatility in market prices. The increase was partially offset by higher accounts payable, including collateral held, of $657 million and higher risk management liabilities of $868 million primarily from the volatility in market prices. Excluding the current portion of long-term debt and lease liabilities of $178 million (2021 – $844 million), the excess of current assets over liabilities was $1,004 million as at Dec. 31, 2022 (2021 – $1,110 million), slightly lower than the prior year.

Non-Current Assets

Non-current assets as at Dec. 31, 2022, were $7,027 million, a decrease of $2 million from $7,029 million as at Dec. 31, 2021. The decrease was mainly due to lower risk management assets due to volatility in market pricing across multiple markets and contract settlements, primarily offset by an increase in property, plant and equipment ("PP&E"). Additions to PP&E of $918 million were mainly for the construction of the White Rock wind projects, the Garden Plain wind project, the Horizon Hill wind project, the Northern Goldfields solar project and the Kent Hills rehabilitation costs, and other planned major maintenance. The increases to PP&E were partially offset by revisions and additions to decommissioning and restoration costs of $74 million, the impairment of assets of $62 million and depreciation of $538 million.

Non-Current Liabilities

Non-current liabilities as at Dec. 31, 2022, were $5,864 million, an increase of $1,162 million from $4,702 million as at Dec. 31, 2021, mainly due to a $1,052 million increase in long-term debt and lease liabilities related to the Company entering into a two-year $400 million floating rate Term Facility, which was fully drawn at Dec. 31, 2022, and the issuance of the US$400 Senior Green Bonds. The KH Bonds were also reclassified to long-term debt in 2022 as a result of the waiver obtained. This was offset by the non-recourse bonds of Pingston Power Inc. being reclassified to current liabilities during 2022. The increase in risk management liabilities of $188 million is due to the volatility across multiple markets and new contracts, and is offset by lower decommissioning and other provisions of $120 million, and lower defined benefit obligation and other long-term liabilities of $41 million.

Total Equity

As at Dec. 31, 2022, the decrease in total equity of $604 million was due to other comprehensive loss of $424 million, distributions to non-controlling interests of $187 million, share repurchases under the NCIB of $54 million and dividends declared on common and preferred shares of $103 million, partially offset by net earnings of $161 million.

Financial Capital

The Company is focused on maintaining a strong balance sheet and financial position to ensure access to sufficient financial capital. Credit ratings provide information relating to the Company's financing costs, liquidity and operations, and affect the Company's ability to obtain short-term and long-term financing and/or the cost of such financing. Maintaining a strong balance sheet also allows the Company to enter into contracts with a variety of counterparties on terms and prices that are favourable to the Company's financial results and provide TransAlta with better access to capital markets through commodity and credit cycles.

In 2022, Moody's reaffirmed the Company's Long Term Rating of Ba1 with a stable outlook. DBRS Morningstar reaffirmed the Company's issuer rating and Unsecured Debt/Medium-Term Notes rating of BBB (low) and the Company's Preferred Shares rating of Pfd-3 (low), all with stable outlook. In addition, S&P Global Ratings reaffirmed the Company's Senior Unsecured Debt rating and Issuer Credit Rating of BB+ with stable outlook. Risks associated with our credit ratings are discussed in the Governance and Risk Management section of this MD&A.

Capital Structure

A strong financial position provides the Company with better access to capital markets through commodity and credit cycles. We use total capital to help evaluate the strength of our financial position. Our capital structure consists of the following components as shown below:

As at Dec. 31	2022		2021		2020	
	$	%	$	%	$	%
TransAlta Corporation						
Net senior unsecured debt						
Recourse debt - CAD debentures	**251**	**5**	251	4	249	3
Recourse debt - US senior notes	**934**	**18**	888	16	886	13
Credit facilities	**—**	**—**	—	—	114	2
Term Facility	**396**	**8**	—	—	—	—
Other	**1**	**—**	4	—	7	—
Less: cash and cash equivalents[1]	**(884)**	**(17)**	(703)	(12)	(121)	(2)
Less: other cash and liquid assets[2]	**(20)**	**—**	(19)	—	(13)	—
Net senior unsecured debt	**678**	**14**	421	8	1,122	16
Other debt liabilities						
Exchangeable debentures	**339**	**6**	335	6	330	5
Non-recourse debt						
TAPC Holdings LP bond	**94**	**2**	102	2	111	2
OCP Bond	**241**	**4**	263	5	284	4
Lease liabilities	**112**	**2**	78	1	112	2
Total net debt[3] - TransAlta Corporation	**1,464**	**28**	1,199	22	1,959	29
TransAlta Renewables						
Net TransAlta Renewables reported debt						
Committed credit facility	**32**	**1**	—	—	—	—
Pingston bond	**45**	**1**	45	1	45	1
Melancthon Wolfe Wind bond	**202**	**4**	235	4	268	4
New Richmond Wind bond	**112**	**2**	120	2	127	2
Kent Hills Wind bond	**206**	**4**	221	4	230	3
Windrise Wind bond	**170**	**3**	171	3	—	—
Lease liabilities	**23**	**—**	22	—	22	—
Less: cash and cash equivalents[4]	**(234)**	**(4)**	(244)	(4)	(582)	(9)
Debt on TransAlta Renewables Economic Investments						
US tax equity financing[5]	**123**	**2**	135	2	134	2
South Hedland non-recourse debt[5]	**711**	**14**	732	13	772	11
Total net debt[3] - TransAlta Renewables	**1,390**	**27**	1,437	25	1,016	14
Total consolidated net debt[3][6][7]	**2,854**	**55**	2,636	47	2,975	43
Non-controlling interests	**879**	**17**	1,011	18	1,084	16
Exchangeable preferred securities[7]	**400**	**7**	400	7	400	6
Equity attributable to shareholders						
Common shares	**2,863**	**54**	2,901	51	2,896	43
Preferred shares	**942**	**18**	942	17	942	14
Contributed surplus, deficit and accumulated other comprehensive income	**(2,695)**	**(51)**	(2,261)	(40)	(1,486)	(22)
Total capital	**5,243**	**100**	5,629	100	6,811	100

(1) As at Dec. 31, 2022, cash and cash equivalents is net of bank overdraft.
(2) Includes principal portion of OCP restricted cash as this cash is restricted specifically to repay outstanding debt and also includes the fair value of economic and designated hedging instruments on debt, as the carrying value of the related debt is impacted by changes in foreign exchange rates.
(3) These items are not defined and have no standardized meaning under IFRS. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A for further discussion of these items, including, where applicable, reconciliations to measures calculated in accordance with IFRS.
(4) Includes $145 million (AU$158 million) cash held within TransAlta Energy (Australia) Pty Ltd. reserved for future funding of Australia growth projects by TransAlta Renewables.
(5) TransAlta Renewables has an economic interest in the US entities holding these debts and an economic interest in the Australian entities, which includes the AU$786 million (2021 – AU$800 million) senior secured notes.
(6) The tax equity financing for the Skookumchuck wind facility, an equity accounted joint venture, is not represented in these amounts.
(7) The total consolidated net debt excludes the exchangeable preferred securities as they are considered equity with dividend payments for credit purposes.

We continued to strengthen our financial position during 2022 and have sufficient liquidity to fund our growth strategy.

We have enhanced liquidity and shareholder value through the following:

2022

- Issued US$400 million Senior Green Bonds, with a fixed coupon rate of 7.75 per cent per annum, due on Nov. 15, 2029;
- Repaid the US$400 million 4.50 per cent unsecured senior notes due 2022;
- Extended the committed syndicated credit facilities by one year to June 30, 2026 and the committed bilateral credit facilities by one year to June 30, 2024;
- Closed a two-year floating rate Term Facility with our banking syndicate for $400 million with a maturity date of Sep. 7, 2024. The Term Facility has interest rates that vary depending on the option selected (e.g. Canadian prime and bankers' acceptances.); and
- Purchased and cancelled 4,342,300 common shares at an average price of $12.48 per share through our NCIB program, for a total cost of $54 million.

2021

- Obtained $173 million in project financing related to our Windrise wind facility.

2020

- Obtained AU$800 million in project financing related to our South Hedland facility;
- Received the second tranche of $400 million from Brookfield in consideration for redeemable, retractable first preferred shares;
- Redeemed our outstanding 5 per cent $400 million medium-term notes due on Nov. 25, 2020; and
- Purchased and cancelled 7,352,600 common shares at an average price of $8.33 per share through our NCIB program, for a total cost of $61 million.

Credit Facilities

The Company's credit facilities are summarized in the table below:

As at Dec. 31, 2022		Utilized			
Credit facilities	Facility size	Outstanding letters of credit[1]	Cash drawings	Available capacity	Maturity date
Committed					
TransAlta Corporation syndicated credit facility	1,250	738	—	512	Q2 2026
TransAlta Renewables syndicated credit facility	700	—	33	667	Q2 2026
TransAlta Corporation bilateral credit facilities	240	219	—	21	Q2 2024
TransAlta Corporation Term Facility	400	—	400	—	Q3 2024
Total Committed	**2,590**	**957**	**433**	**1,200**	
Non-Committed					
TransAlta Corporation demand facilities	250	120	—	130	n/a
TransAlta Renewables demand facility	150	98	—	52	n/a
Total Non-Committed	**400**	**218**	**—**	**182**	

(1) TransAlta has obligations to issue letters of credit and cash collateral to secure potential liabilities to certain parties, including those related to potential environmental obligations, commodity risk management and hedging activities, pension plan obligations, construction projects and purchase obligations. Letters of credit drawn against the non-committed facilities reduce available capacity under the committed syndicated credit facilities.

US Tax Equity Financing

The Company owns equity interests in some wind facilities that are eligible for tax incentives available for renewable energy facilities in the US. With its current portfolio of renewable energy facilities, TransAlta cannot fully monetize such tax incentives. To take full advantage of these incentives, the Company partners with Tax Equity Investors ("TEI") who invest in these facilities in exchange for a share of the tax credits.

Some TEI financing structures include a partial pay-as-you-go ("Pay-go") funding arrangement under which, when the actual annual electricity production (MWh) exceeds a certain production threshold, the TEI are obligated to make a cash contribution ("Pay-go contribution") to the Company. The Pay-go arrangement results in a lower initial investment by the TEI and provides them with some protection from potential underperformance of the asset.

TransAlta recognizes the TEI contributions as long-term debt, at an amount representing the proceeds received from the TEI in exchange for shares of subsidiaries of TransAlta, net of the following elements:

Production tax credit ("PTC")	Allocation of PTCs to the TEI derived from the power generated during the period is recognized in other revenues as earned and as a reduction in tax equity financing.
Tax shield	Allocation of tax benefits and attributes to the TEI, such as investment tax credits and tax depreciation, is recognized in net interest expense as claimed and as a reduction in tax equity financing.
Interest expense	Interest expense using the effective interest rate method is recognized in net interest expense as incurred and as an increase in tax equity financing.
Pay-go contributions	Additional cash contributions made by the TEI when the annual production exceeds the contractually determined threshold and is recognized as an increase in tax equity financing.
Cash distributions	Cash payments to the TEI, recognized as a reduction in tax equity financing.

Production Tax Credit Program

Current US tax law allows qualified wind energy projects to receive tax credits that are earned for each MWh of generation during the first 10 years of the projects' operation. The TEIs are allocated a portion of the renewable energy facility's taxable income (losses) and PTCs produced and a portion of the cash generated by the facility until they achieve an agreed-upon after-tax investment return ("Flip Point"). After the Flip Point, the TEI will retain a lesser portion of the cash and the taxable income (losses) generated by the facility.

The following table outlines information regarding the Company's tax equity financing arrangements with PTC eligibility:

Facility	Commercial operation date	Expected Flip Point	Initial TEI investment ($)	Expected annual PTC ($)	Expected annual Pay-go Contribution ($)	TEI allocation of taxable income and PTCs (pre-Flip Point)
Lakeswind	2014	2029	45	4	—	99 %
Big Level and Antrim	2019	2030	126	9	2	99 %
Skookumchuck[1]	2020	2029	121	10	—	99 %

(1) The Company has a 49 per cent interest in the Skookumchuck wind facility, which is treated as an equity investment under IFRS and our proportionate share of the net earnings is reflected as equity income on the statement of earnings under IFRS.

Non-Recourse Debt

The Melancthon Wolfe Wind LP, Pingston Power Inc., TAPC Holdings LP, New Richmond Wind LP, Kent Hills Wind LP, TEC Hedland Pty Ltd, Windrise Wind LP and TransAlta OCP LP non-recourse bonds, with an aggregate carrying value of $1.8 billion (Dec. 31, 2021 – $1.9 billion), are subject to customary financing conditions and covenants that may restrict the Company's ability to access funds generated by the facilities' operations. Upon meeting certain distribution tests, typically performed once per quarter, the funds are able to be distributed by the subsidiary entities to their respective parent entity. These conditions include meeting a debt service coverage ratio prior to distribution, which was met by these entities in the fourth quarter of 2022 with the exception of Kent Hills Wind LP, as discussed below and TAPC Holdings LP, which has been impacted by higher interest rates in 2022. The funds in these entities that have accumulated since the fourth quarter test will remain there until the next debt service coverage ratio can be calculated in the first quarter of 2023. At Dec. 31, 2022, $50 million (Dec. 31, 2021 – $67 million) of cash was subject to these financial restrictions. Additionally, certain non-recourse bonds require that certain reserve accounts be established and funded through cash held on deposit and/or by providing letters of credit.

Kent Hills Wind Facilities Rehabilitation

During the second quarter of 2022, the Company obtained a waiver and entered into a supplemental indenture that facilitated the rehabilitation of the Kent Hills 1 and 2 wind facilities. Upon receipt of the waiver, the Company reclassified a portion of the carrying value outstanding for the KH Bonds to non-current liabilities with the exception of the scheduled principal repayments due within the next 12 months. In accordance with the supplemental indenture, Kent Hills Wind LP cannot make any distributions to its partners until the foundation replacement work has been completed.

Scheduled Debt Maturities

Between 2023 and 2025, we have $839 million of debt maturing, including $400 million of recourse debt primarily relating to the Term Facility, with the balance mainly related to scheduled non-recourse debt repayments.

Returns to Providers of Capital

Net Interest Expense

The components of net interest expense are shown below:

Year ended Dec. 31	2022	2021	2020
Interest on debt	**164**	163	158
Interest on exchangeable debentures	**29**	29	29
Interest on exchangeable preferred shares	**28**	28	5
Interest income	**(24)**	(11)	(10)
Capitalized interest	**(16)**	(14)	(8)
Interest on lease liabilities	**7**	7	8
Credit facility fees, bank charges and other interest	**27**	20	25
Tax shield on tax equity financing[1]	**(2)**	(9)	1
Accretion of provisions	**49**	32	30
Net interest expense	**262**	245	238

(1) The credit balance in 2022 primarily relates to the tax benefit associated with tax depreciation (2021 – investment tax credits) on the North Carolina Solar facility that was assigned to the tax equity investor. The tax equity investment is treated as debt under IFRS and the monetization of the tax depreciation and investment tax credits (as applicable) is considered a non-cash reduction of the debt balance and is reflected as a reduction in interest expense.

Net interest expense was higher in 2022 primarily due to higher accretion of provisions, higher credit facility fees and other interest due to increased letters of credit issued to support trading and hedging activities, and higher interest paid on cash collateral held as security for counterparty obligations and lower tax shield on tax equity financing. This is partially offset by higher interest income due to favourable interest rates and higher capitalized interest.

Share Capital

The following tables outline the common and preferred shares issued and outstanding:

As at	Feb. 22, 2023	Dec. 31, 2022	Dec. 31, 2021
	Number of shares (millions)		
Common shares issued and outstanding, end of period	**268.2**	**268.1**	271.0
Preferred shares			
Series A[1]	9.6	9.6	9.6
Series B[1]	2.4	2.4	2.4
Series C[2]	10.0	10.0	11.0
Series D[2]	1.0	1.0	—
Series E	9.0	9.0	9.0
Series G	6.6	6.6	6.6
Preferred shares issued and outstanding in equity, end of period	**38.6**	**38.6**	38.6
Series I - Exchangeable Securities[3]	**0.4**	**0.4**	0.4
Preferred shares issued and outstanding, end of period	**39.0**	**39.0**	39.0

(1) During the first quarter of 2021, the Company converted 1,417,338 of its 10,200,000 Series A Shares and 871,871 of its 1,800,000 Series B Shares, on a one-for-one basis, into Series B Shares and Series A Shares, respectively.
(2) During the second quarter of 2022, the Company converted 1,044,299 of its 11,000,000 currently outstanding Series C Shares, on a one-for-one basis, into Series D Shares.
(3) Brookfield invested $400 million in consideration for redeemable, retractable, first preferred shares. For accounting purposes, these preferred shares are considered debt and disclosed as such in the consolidated financial statements.

Dividends to Shareholders

The declaration of dividends is at the discretion of the Board. The following are the common and preferred shares dividends declared in each quarter during 2022:

Declaration date	April 27, 2022	July 27, 2022	Nov. 8, 2022	Dec. 12, 2022
Common shares (Payable date)	July 1, 2022	Oct. 1, 2022	Jan. 1, 2023	April 1, 2023
	Common shares dividends per share			
Common shares	0.0500	0.0500	0.0550	0.0550

Preferred shares (Payable date)	June 30, 2022	Sept. 30, 2022	Dec. 31, 2022	March 31, 2023
	Preferred Series dividends per share			
Series A	0.17981	0.17981	0.17981	0.17981
Series B	0.16505	0.22099	0.33700	0.37991
Series C	0.25169	0.36588	0.36588	0.36588
Series D	0.25169	0.28841	0.40442	0.45578
Series E	0.32463	0.32463	0.43088	0.43088
Series G	0.31175	0.31175	0.31175	0.31175

Non-Controlling Interests

As of Dec. 31, 2022, the Company owns 60.1 per cent (2021 – 60.1 per cent) of TransAlta Renewables. TransAlta Renewables is a publicly traded company whose common shares are listed on the TSX under the symbol "RNW." TransAlta Renewables holds a diversified, highly contracted portfolio of assets with comparatively lower carbon intensity.

We also own 50.01 per cent of TA Cogen (2021 – 50.01 per cent) , which owns, operates or has an interest in three natural-gas-fired cogeneration facilities (Ottawa, Windsor and Fort Saskatchewan) and one natural-gas-fired facility (Sheerness). Sheerness operated as a dual-fuel generating facility in 2021.

Since we own a controlling interest in TA Cogen and TransAlta Renewables, we consolidate the entire earnings, assets and liabilities in relation to those subsidiaries.

The reported net earnings attributable to non-controlling interests for the year ended Dec. 31, 2022, decreased by $1 million compared to 2021, due to higher TA Cogen net earnings being offset by lower TransAlta Renewables net earnings. TA Cogen net earnings attributable to non-controlling interests has increased by $29 million compared to 2021, primarily due to higher merchant pricing in the Alberta market, partially offset by lower generation due to dispatch optimization.

TransAlta Renewables net earnings attributable to non-controlling interests decreased by $30 million compared to 2021. The decrease was primarily due to lower finance income related to subsidiaries of TransAlta, higher asset impairments primarily related to higher discount rates, higher OM&A, lower foreign exchange gains and higher interest expense from the issuance of the Windrise Green bond in late 2021. In addition, net earnings decreased due to the extended outage at the Kent Hills 1 and 2 wind facilities. The decrease was partially offset by higher revenues and the receipt of insurance proceeds for the replacement costs for the collapsed tower at the Kent Hills site. The Company recognized liquidated damages recoverable due to turbine availability being below the contractual target at the Windrise wind facility. Finance income related to subsidiaries of TransAlta was lower as higher distributions were classified as return of capital. Refer to Note 12 of the consolidated financial statements for further details.

Reported net earnings attributable to non-controlling interests for the year ended Dec. 31, 2021, increased by $78 million to $112 million compared to 2020. Earnings increased at TransAlta Renewables in 2021 mainly due to higher finance income from investments in subsidiaries of TransAlta and no fair value losses recognized in the current year, partially offset by liquidated damages provisions related to unplanned outages at the Sarnia cogeneration facility, unfavourable steam reconciliation adjustment to Canadian Gas, lower wind production from the Canadian wind fleet, lower foreign exchange gains and higher asset impairments. Earnings from TA Cogen were higher in 2021 mainly due to higher prices in the Alberta market.

Other Consolidated Analysis

Unconsolidated Structured Entities or Arrangements

Disclosure is required of all unconsolidated structured entities or arrangements such as transactions, agreements or contractual arrangements with unconsolidated entities, structured finance entities, special purpose entities or variable interest entities that are reasonably likely to materially affect liquidity or the availability of, or requirements for, capital resources. We currently have no such unconsolidated structured entities or arrangements.

Related Party Transactions

In the normal course of operations, we enter into transactions on market terms with related parties, including consolidated and equity accounted entities, which have been measured at exchange value and are recognized in the consolidated financial statements, including, but not limited to: asset management fees, power purchase and derivative contracts. Refer to Note 36, Related-Party Transactions in the consolidated financial statements for further details.

Guarantee Contracts

We have obligations to issue letters of credit and cash collateral to secure potential liabilities to certain parties, including those related to potential environmental obligations, commodity risk management and hedging activities, pension plan obligations, construction projects and purchase obligations. At Dec. 31, 2022, we provided letters of credit totalling $1.2 billion (2021 – $902 million) and cash collateral of $304 million (2021 – $55 million). These letters of credit and cash collateral secure certain amounts included on our Consolidated Statements of Financial Position under risk management liabilities, defined benefit obligations and other long-term liabilities and decommissioning and other provisions. The increase in the amount of letters of credit issued during 2022 relates to the increased collateral required for asset hedging and energy marketing activity, partially offset by lower letters of credit related to pension plan commitments and the Highvale mine pension plan and reclamation obligations.

Proceeds from Divestitures

During 2022, the Company closed the sale of two hydro facilities, sold equipment related to its Sundance Unit 5 energy transition assets, and other equipment. As a result of these sales, the Company received proceeds of $66 million and recorded gains on sale of $32 million. In addition, during the fourth quarter of 2022, the Company recorded a contract settlement that was recognized in gain on sale of assets and other on the Consolidated Statements of Earnings (Loss).

Commitments

Contractual commitments are as follows:

	2023	2024	2025	2026	2027	2028 and thereafter	Total
Natural gas, transportation and other contracts[1]	56	47	45	45	46	457	**696**
Transmission[1]	10	7	7	3	1	39	**67**
Coal supply and mining agreements[1]	83	87	71	—	—	—	**241**
Long-term service agreements[1]	51	49	35	32	21	140	**328**
Operating leases[1,2]	3	3	3	2	2	29	**42**
Long-term debt[3]	170	527	142	177	154	2,393	**3,563**
Exchangeable securities[4]	—	—	750	—	—	—	**750**
Principal payments on lease liabilities[5]	(7)	4	4	3	4	127	**135**
Interest on long-term debt and lease liabilities[1,6]	205	192	166	158	150	836	**1,707**
Interest on exchangeable securities[1,4]	52	62	—	—	—	—	**114**
Growth[1,7]	446	—	—	—	—	—	**446**
TransAlta Energy Transition Bill[1]	6	—	—	—	—	—	**6**
Total	**1,075**	**978**	**1,223**	**420**	**378**	**4,021**	**8,095**

(1) Not recognized as a financial liability on the Consolidated Statements of Financial Position.
(2) Includes leases that have not been recognized as a lease liability and leases that have not yet commenced.
(3) Excludes impact of hedge accounting and derivatives.
(4) Assumes the exchangeable securities will be exchanged by Brookfield on Jan. 1, 2025.
(5) Lease liabilities include a lease incentive of $12 million, expected to be received in 2023.
(6) Interest on long-term debt is based on debt currently in place with no assumption as to refinancing on maturity.
(7) For further details on growth commitments, refer to the Strategy and Capability to Deliver Results section of this MD&A.

Contingencies

TransAlta is occasionally named as a party in various claims and legal and regulatory proceedings that arise during the normal course of its business. TransAlta reviews each of these claims, including the nature of the claim, the amount in dispute or claimed and the availability of insurance coverage. There can be no assurance that any particular claim will be resolved in the Company's favour or that such claims may not have a material adverse effect on TransAlta. Inquiries from regulatory bodies may also arise in the normal course of business, to which the Company responds as required.

The Company conducts internal reviews of its offers and offer behaviour in both the energy and ancillary services markets in Alberta on an ongoing basis and will self-report suspected contraventions or respond to inquiries from regulatory agencies as required. There currently is no certainty that any particular matter will be resolved in the Company's favour or that such matters may not have a material adverse effect on TransAlta.

Brazeau Facility - Claim against the Government of Alberta

On Sept. 9, 2022, the Company filed a Statement of Claim against the Government of Alberta in the Alberta Court of King's Bench seeking a declaration that: (i) granting mineral leases within five kilometres of the Brazeau facility is a breach of a 1960 agreement between the Company and the Government of Alberta; and (ii) the Government of Alberta is required to indemnify the Company for any costs or damages that result from the risks of hydraulic fracturing near the Brazeau facility. On Sept. 29, 2022, the Government of Alberta filed its Statement of Defence, which asserts, among other things, that the Company: (i) is trying to usurp the jurisdiction of the Alberta Energy Regulator ("AER"); and (ii) is out of time under the Limitations Act (Alberta). The trial is scheduled to take place during the first quarter of 2024.

Brazeau Facility - Well Licence Applications to Consider Hydraulic Fracturing Activities

The AER issued a subsurface order on May 27, 2019 that does not permit any hydraulic fracturing within three kilometres of the Brazeau facility but permits fracking in all formations (except the Duvernay) from three-to-five kilometres of the Brazeau facility. Subsequently, two oil and gas operators submitted applications to the AER for approval of 10 well licences (which include hydraulic fracturing activities) within three-to-five kilometres of the Brazeau facility. The regulatory hearing to consider the applications - Proceeding 379 - is currently scheduled to be heard between Feb. 27 and March 10, 2023. The Company's position is that hydraulic fracturing activities within any formation within five kilometres of the Brazeau Facility pose an unacceptable risk and that the applications should be denied.

Hydro Power Purchase Arrangement - Emission Performance Credits

Balancing Pool is claiming entitlement to the Emission Performance Credits ("EPCs") earned by the Alberta Hydro facilities as a result of those facilities being opted into the Carbon Competitiveness Incentive Regulation and Technology Innovation and Emissions Reduction Regulation from 2018 to 2020, inclusive. The Balancing Pool claims ownership of the EPCs because it believes the change-in-law provisions under the Hydro Power Purchase Arrangement require the EPCs to be passed through to the Balancing Pool. TransAlta has not received any benefit from the EPCs nor from any purported change-in-law and believes that the Balancing Pool has no rights to these credits. An arbitration has commenced and the hearing was scheduled for Feb. 6 to 10, 2023. However, due to the resignation of one of the panel members, the hearing has been adjourned. A new panel member has been appointed and a two-week hearing will be held from May 18 to June 1, 2023. TransAlta holds approximately 1,750,000 EPCs with no recorded book value that were created between 2018 and 2020, which are at risk as a result of the Balancing Pool's claim.

Sundance A Decommissioning

TransAlta filed an application with the Alberta Utilities Commission ("AUC") seeking payment from the Balancing Pool for TransAlta’s decommissioning costs for Sundance A, including its proportionate share of the Highvale mine. The Balancing Pool and Utilities Consumer Advocate are participating as interveners because they take issue with the decommissioning costs claimed by TransAlta. Due to various factors, including the COVID-19 pandemic and significant information requests from the Balancing Pool, the application has been delayed. While a hearing date has not been set, the application will likely be heard in the second half of 2023. TransAlta expects to receive payment from the Balancing Pool for its decommissioning costs; however, the amount that the AUC will award is uncertain.

Cash Flows

The following highlights significant changes in the Consolidated Statements of Cash Flows for the years ended Dec. 31, 2022 and Dec. 31, 2021:

Year ended Dec. 31	2022	2021	Increase/ (decrease)
Cash and cash equivalents, beginning of year	**947**	703	244
Provided by (used in):			
Operating activities	**877**	1,001	(124)
Investing activities	**(741)**	(472)	(269)
Financing activities	**45**	(282)	327
Translation of foreign currency cash	**6**	(3)	9
Cash and cash equivalents, end of year	**1,134**	947	187

Cash from operating activities for the year ended Dec. 31, 2022, decreased compared with 2021 primarily due to higher unfavourable changes in working capital, mainly from higher accounts receivable and collateral paid, partially offset by higher accounts payable and collateral received, and higher fuel and purchased power. Movements in the collateral accounts relate to high commodity prices and volatility in the markets. This was partially offset by higher revenues net of unrealized gains and losses from risk management activities, higher net other operating (income) loss and lower carbon compliance costs.

Cash from investing activities for the year ended Dec. 31, 2022, decreased compared with 2021, largely due to:

- Higher cash spent on growth projects and Kent Hills remediation construction activities in PP&E ($438 million) and investments during the year ($10 million); and
- The prior year included proceeds received on the sale of the Pioneer Pipeline ($128 million) partially offset by:
    - Lower net cash spent on acquisitions ($110 million) as the prior year included the North Carolina Solar acquisition;
    - Favourable change in non-cash working capital related to the timing of construction payables for the assets under construction ($71 million);
    - Higher realized gains on financial instruments ($33 million);
    - Higher proceeds from the sale of property, plant and equipment ($27 million); and
    - Higher loan receivable receipts ($21 million).

Cash from financing activities for the year ended Dec. 31, 2022, increased compared with 2021, largely due to:

- Higher net borrowings under the Company's credit facilities ($563 million);
- Higher proceeds from issuance of long-term debt ($359 million); and
- Higher realized gains on financial instruments ($39 million) partially offset by:
    - Higher repayments of long-term debt ($529 million);
    - Higher common share repurchases under the NCIB ($48 million);
    - Increased distributions paid to subsidiaries' non-controlling interests ($31 million);
    - Higher dividends paid on common shares and preferred shares ($10 million);
    - Higher financing fees and other ($9 million); and
    - Lower proceeds on issuances of common shares ($5 million).

Additional IFRS Measures and Non-IFRS Measures

An additional IFRS measure is a line item, heading or subtotal that is relevant to an understanding of the consolidated financial statements but is not a minimum line item mandated under IFRS, or the presentation of a financial measure that is relevant to an understanding of the consolidated financial statements but is not presented elsewhere in the consolidated financial statements. We have included line items entitled gross margin and operating income (loss) in our Consolidated Statements of Earnings (Loss) for the years ended Dec. 31, 2022, 2021 and 2020. Presenting these line items provides management and investors with a measurement of ongoing operating performance that is readily comparable from period to period.

We use a number of financial measures to evaluate our performance and the performance of our business segments, including measures and ratios that are presented on a non-IFRS basis, as described below. Unless otherwise indicated, all amounts are in Canadian dollars and have been derived from our consolidated financial statements prepared in accordance with IFRS. We believe that these non-IFRS amounts, measures and ratios, read together with our IFRS amounts, provide readers with a better understanding of how management assesses results.

Non-IFRS amounts, measures and ratios do not have standardized meanings under IFRS. They are unlikely to be comparable to similar measures presented by other companies and should not be viewed in isolation from, as an alternative to, or more meaningful than, our IFRS results.

Non-IFRS Financial Measures

Adjusted EBITDA, FFO, FCF, total net debt, total consolidated net debt and adjusted net debt are non-IFRS measures that are presented in this MD&A. Refer to the Segmented Financial Performance and Operating Results, Segmented Financial Performance and Operating Results for the Fourth Quarter, Selected Quarterly Information, Financial Capital and Key Non-IFRS Financial Ratios sections of this MD&A for additional information, including a reconciliation of such non-IFRS measures to the most comparable IFRS measure.

Adjusted EBITDA

Each business segment assumes responsibility for its operating results measured by adjusted EBITDA. Adjusted EBITDA is an important metric for management that represents our core business profitability. In the second quarter of 2022, our adjusted EBITDA composition was adjusted to include the impact of closed positions that are effectively settled by offsetting positions with the same counterparty to reflect the performance of the assets and the Energy Marketing segment in the period in which the transactions occur. Accordingly, the Company has applied this composition to all previously reported periods. Interest, taxes, depreciation and amortization are not included, as differences in accounting treatments may distort our core business results. In addition, certain reclassifications and adjustments are made to better assess results, excluding those items that may not be reflective of ongoing business performance. This presentation may facilitate the readers' analysis of trends.

The following are descriptions of the adjustments made.

Adjustments to revenue

- Certain assets that we own in Canada and in Australia are fully contracted and recorded as finance leases under IFRS. We believe that it is more appropriate to reflect the payments we receive under the contracts as a capacity payment in our revenues instead of as finance lease income and a decrease in finance lease receivables.
- Adjusted EBITDA is adjusted to exclude the impact of unrealized mark-to-market gains or losses and unrealized foreign exchange gains or losses on commodity transactions.
- Gains and losses related to closed positions effectively settled by offsetting positions with exchanges that have been recorded in the period the positions are settled.

Adjustments to fuel and purchased power

- Depreciation on our mining equipment is included in fuel and purchased power.
- Write-downs of coal inventory in 2020 and 2021 are excluded and related to the decision to be off-coal and the accelerated shutdown of the Highvale mine at the end of 2021 and are not reflective of ongoing business performance.
- On the commissioning of the South Hedland facility in July 2017, we prepaid approximately $74 million of electricity transmission and distribution costs. Interest income is recorded on the prepaid funds. We reclassify this interest income as a reduction in the transmission and distribution costs expensed each period to reflect the net cost to the business.

Adjustments to operations, maintenance and administration

- Write-down of parts and material inventory related to the Highvale mine and coal operations at our natural gas converted facilities.
- Curtailment gains resulting from the shutdown Highvale mine and impacting the defined benefit pension plan are excluded as they do not reflect on-going performance.

Adjustments to net other operating income (loss)

- An onerous contract provision for future royalty payments recognized with the shutdown of the Highvale mine is excluded as these are not part of operating income.
- Contract termination penalties as a result of the Company's Clean Energy Transition plan are not included.
- Sheerness facility moving off-coal resulted in the remaining coal supply payments on the existing coal supply agreement being recognized as an onerous contract in 2020, and is excluded.
- Insurance recoveries related to the Kent Hills tower collapse are not included as these relate to investing activities and are not reflective of ongoing business performance.

Adjustments to earnings (loss) in addition to interest, taxes, depreciation and amortization

- Asset impairment charges (reversals) are not included as these are accounting adjustments that impact depreciation and amortization and do not reflect ongoing business performance.
- Any gains or losses on asset sales or foreign exchange gains or losses are not included as these are not part of operating income.

Adjustments for equity accounted investments

- During the fourth quarter of 2020, we acquired a 49 per cent interest in the Skookumchuck wind facility, which is treated as an equity investment under IFRS and our proportionate share of the net earnings is reflected as equity income on the statement of earnings under IFRS. As this investment is part of our regular power-generating operations, we have included our proportionate share of the adjusted EBITDA of the Skookumchuck wind facility in our total adjusted EBITDA. In addition, in the Wind and Solar adjusted results, we have included our proportionate share of revenues and expenses to reflect the full operational results of this investment. We have not included EMG International, LLC's adjusted EBITDA in our total adjusted EBITDA as it does not represent our regular power-generating operations.

Average Annual EBITDA

Average annual EBITDA is a non-IFRS financial measure that is forward-looking, used to show the average annual EBITDA that the project currently under construction is expected to generate upon completion.

Funds From Operations ("FFO")

FFO is an important metric as it provides a proxy for cash generated from operating activities before changes in working capital and provides the ability to evaluate cash flow trends in comparison with results from prior periods. FFO is a non-IFRS measure.

Adjustments to cash flow from operations

- Includes FFO related to the Skookumchuk wind facility, which is treated as an equity accounted investment under IFRS and equity income, net of distributions from joint ventures is included in cash flow from operations under IFRS. As this investment is part of our regular power generating operations, we have included our proportionate share of FFO.
- Payments received on finance lease receivables are reclassified to reflect cash from operations.
- We adjust for items included in cash from operations related to the decision in 2020 to accelerate being off-coal and the shutdown of the Highvale mine in 2021, the write-down on parts and material inventory for our coal operations and voluntary contribution made to fund the Sunhills Mining Ltd. Pension Plan in 2022 (grouped in the line item under "Clean energy transition provisions and adjustments").
- Cash received/paid on closed positions are reflected in the period that the position is settled.
- The Company's share of the Skookumchuck wind equity accounted joint venture is excluded from the TransAlta deconsolidated results from 2021 onwards due to the sale of an economic interest in the 137 MW Skookumchuck wind facility to TransAlta Renewables.
- Other adjustments include payments/receipts for production tax credits, which are reductions to tax equity debt and include distributions from equity accounted joint venture.

Free Cash Flow ("FCF")

FCF is an important metric as it represents the amount of cash that is available to invest in growth initiatives, make scheduled principal repayments on debt, repay maturing debt, pay common share dividends or repurchase common shares. Changes in working capital are excluded so FFO and FCF are not distorted by changes that we consider temporary in nature, reflecting, among other things, the impact of seasonal factors and timing of receipts and payments. FCF is a non-IFRS measure.

Non-IFRS Ratios

FFO per share, FCF per share and adjusted net debt to adjusted EBITDA are non-IFRS ratios that are presented in the MD&A. Refer to the Reconciliation of Cash Flow from Operations to FFO and FCF and Key Non-IFRS Financial Ratios sections of this MD&A for additional information.

FFO per Share and FCF per Share

FFO per share and FCF per share are calculated using the weighted average number of common shares outstanding during the period. FFO per share and FCF per share are non-IFRS ratios.

Supplementary Financial Measures

Financial highlights presented on a proportional basis of TransAlta Renewables, deconsolidated adjusted EBITDA, deconsolidated FFO and deconsolidated adjusted EBITDA to deconsolidated FFO are supplementary financial measures that the Company uses to present adjusted EBITDA on a deconsolidated basis. Refer to the Financial Highlights on a Proportional Basis of TransAlta Renewables and Key Non-IFRS Financial Ratios sections of this MD&A for additional information.

The Alberta Electricity Portfolio metrics disclosed are also supplementary financial measures used to present the gross margin by segment for the Alberta market. Refer to the Alberta Electricity Portfolio section of this MD&A for additional information.

Reconciliation of Non-IFRS Measures on a Consolidated Basis by Segment

The following table reflects adjusted EBITDA by segment and provides reconciliation to earnings (loss) before income taxes for the three months ended Dec. 31, 2022:

Three months ended, Dec. 31 2022	Hydro	Wind & Solar[1]	Gas	Energy Transition	Energy Marketing	Corporate	Total	Equity accounted investments[1]	Reclass adjustments	IFRS financials
Revenues	159	98	276	281	44	—	858	(4)	—	854
Reclassifications and adjustments:										
Unrealized mark-to-market (gain) loss	1	23	238	(7)	12	—	267	—	(267)	—
Realized loss on closed exchange positions	—	—	7	—	20	—	27	—	(27)	—
Decrease in finance lease receivable	—	—	12	—	—	—	12	—	(12)	—
Finance lease income	—	—	4	—	—	—	4	—	(4)	—
Unrealized foreign exchange gain on commodity	—	—	—	—	(1)	—	(1)	—	1	—
Adjusted revenues	160	121	537	274	75	—	1,167	(4)	(309)	854
Fuel and purchased power	5	11	196	234	—	—	446	—	—	446
Reclassifications and adjustments:										
Australian interest income	—	—	(1)	—	—	—	(1)	—	1	—
Adjusted fuel and purchased power	5	11	195	234	—	—	445	—	1	446
Carbon compliance	—	—	27	—	—	—	27	—	—	27
Gross margin	155	110	315	40	75	—	695	(4)	(310)	381
OM&A	22	18	57	19	12	30	158	(1)	—	157
Taxes, other than income taxes	—	5	2	2	—	—	9	(1)	—	8
Net other operating (income) loss	—	(5)	(8)	—	—	—	(13)	3	—	(10)
Adjusted EBITDA[2]	133	92	264	19	63	(30)	541			
Equity income										4
Finance lease income										4
Depreciation and amortization										(188)
Asset impairment charges										(5)
Net interest expense										(67)
Foreign exchange loss										(13)
Gain on sale of assets and other										46
Earnings before income taxes										7

(1) The Skookumchuck wind facility has been included on a proportionate basis in the Wind and Solar segment.
(2) Adjusted EBITDA is not defined and has no standardized meaning under IFRS. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.

The following table reflects adjusted EBITDA by segment and provides reconciliation to earnings (loss) before income taxes for the three months ended Dec. 31, 2021:

Three months ended, Dec. 31 2021	Hydro	Wind & Solar[1]	Gas	Energy Transition	Energy Marketing	Corporate	Total	Equity accounted investments[1]	Reclass adjustments	IFRS financials
Revenues	84	98	172	238	26	(2)	616	(6)	—	610
Reclassifications and adjustments:										
Unrealized mark-to-market (gain) loss	—	3	82	(8)	(12)	—	65	—	(65)	—
Realized gain on closed exchange positions[2]	—	—	(7)	—	(20)	—	(27)	—	27	—
Decrease in finance lease receivable	—	—	11	—	—	—	11	—	(11)	—
Finance lease income	—	—	6	—	—	—	6	—	(6)	—
Adjusted revenues	84	101	264	230	(6)	(2)	671	(6)	(55)	610
Fuel and purchased power[3]	3	6	110	149	—	(2)	266	—	—	266
Reclassifications and adjustments:										
Australian interest income	—	—	(1)	—	—	—	(1)	—	1	—
Mine depreciation	—	—	—	(11)	—	—	(11)	—	11	—
Coal inventory write-down	—	—	—	(1)	—	—	(1)	—	1	—
Adjusted fuel and purchased power	3	6	109	137	—	(2)	253	—	13	266
Carbon compliance	—	—	14	25	—	—	39	—	—	39
Gross margin	81	95	141	68	(6)	—	379	(6)	(68)	305
OM&A[3]	13	17	46	20	5	29	130	—	—	130
Reclassifications and adjustments:										
Parts and materials write-down	—	—	—	3	—	—	3	—	(3)	—
Curtailment gain	—	—	—	6	—	—	6	—	(6)	—
Adjusted OM&A	13	17	46	29	5	29	139	—	(9)	130
Taxes, other than income taxes	1	2	2	1	—	—	6	—	—	6
Net other operating income	—	—	(10)	(8)	—	—	(18)	—	—	(18)
Reclassifications and adjustments:										
Royalty onerous contract and contract termination penalties	—	—	—	9	—	—	9	—	(9)	—
Adjusted net other operating (income) loss	—	—	(10)	1	—	—	(9)	—	(9)	(18)
Adjusted EBITDA[4]	67	76	103	37	(11)	(29)	243			
Equity income										4
Finance lease income										6
Depreciation and amortization										(134)
Asset impairment charges										(28)
Net interest expense										(59)
Foreign exchange loss										(6)
Loss on sale of assets and other										(2)
Loss before income taxes										(32)

(1) The Skookumchuck wind facility has been included on a proportionate basis in the Wind and Solar segment.
(2) In 2022, our adjusted EBITDA composition was adjusted to include the impact of closed positions that are effectively settled by offsetting positions with the same counterparty to reflect the performance of the assets and the Energy Marketing segment in the period in which the transactions occur.
(3) In 2021, $6 million was reclassified from OM&A to fuel and purchased power for station service costs in the Hydro segment.
(4) Adjusted EBITDA is not defined and has no standardized meaning under IFRS. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.

Reconciliation of Cash Flow from Operations to FFO and FCF

The table below reconciles our cash flow from operating activities to our FFO and FCF for the three months ended Dec. 31, 2022 and 2021:

Three months ended Dec. 31	2022	2021
Cash flow from operating activities[1]	**351**	54
Change in non-cash operating working capital balances	**64**	148
Cash flow from operations before changes in working capital	**415**	202
Adjustments		
Share of adjusted FFO from joint venture[1]	**1**	6
Decrease in finance lease receivable	**12**	11
Clean energy transition provisions and adjustments[2]	**7**	(6)
Realized (gain) loss on closed exchanged positions	**21**	(27)
Other[3]	**3**	—
FFO[4]	**459**	186
Deduct:		
Sustaining capital[1]	**(67)**	(55)
Productivity capital	**(1)**	(2)
Dividends paid on preferred shares	**(12)**	(10)
Distributions paid to subsidiaries' non-controlling interests	**(61)**	(38)
Principal payments on lease liabilities	**(3)**	(2)
FCF[4]	**315**	79
Weighted average number of common shares outstanding in the period	**269**	271
FFO per share[4]	**1.71**	0.69
FCF per share[4]	**1.17**	0.29

(1) Includes our share of amounts for Skookumchuck wind facility, an equity accounted joint venture.
(2) 2022 includes amounts related to onerous contracts recognized in 2021. 2021 includes a write-down on parts and material inventory and coal inventory for our coal operations and amounts related to onerous contracts and contract termination penalties.
(3) Other consists of production tax credits, which is a reduction to tax equity debt, less distributions from equity accounted joint venture.
(4) These items are not defined and have no standardized meaning under IFRS. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.

The table below provides a reconciliation of our adjusted EBITDA to our FFO and FCF for the three months ended Dec. 31, 2022 and 2021:

Three months ended Dec. 31	2022	2021
Adjusted EBITDA[1]	**541**	243
Provisions	**20**	(18)
Interest expense	**(49)**	(51)
Current income tax (expense) recovery	**(29)**	2
Realized foreign exchange loss	**(18)**	(4)
Decommissioning and restoration costs settled	**(12)**	(5)
Other non-cash items	**6**	19
FFO[2]	**459**	186
Deduct:		
Sustaining capital[3]	**(67)**	(55)
Productivity capital	**(1)**	(2)
Dividends paid on preferred shares	**(12)**	(10)
Distributions paid to subsidiaries' non-controlling interests	**(61)**	(38)
Principal payments on lease liabilities	**(3)**	(2)
FCF[2]	**315**	79

(1) Adjusted EBITDA is defined in the Additional IFRS Measures and Non-IFRS Measures section of this MD&A and reconciled to earnings (loss) before income taxes above.
(2) These items are not defined and have no standardized meaning under IFRS. FFO and FCF are defined in the Additional IFRS Measures and Non-IFRS Measures section of this MD&A and reconciled to cash flow from operating activities above.
(3) Includes our share of amounts for Skookumchuck wind facility, an equity accounted joint venture.

Reconciliation of Non-IFRS Measures on a Consolidated Basis by Segment

The following table reflects adjusted EBITDA by segment and provides reconciliation to earnings (loss) before income taxes for the year ended Dec. 31, 2022:

Year ended, Dec. 31, 2022	Hydro	Wind & Solar[1]	Gas	Energy Transition	Energy Marketing	Corporate	Total	Equity accounted investments[1]	Reclass adjustments	IFRS financials
Revenues	606	303	1,209	714	160	(2)	2,990	(14)	—	2,976
Reclassifications and adjustments:										
Unrealized mark-to-market loss	1	104	251	10	12	—	378	—	(378)	—
Realized (gain) loss on closed exchange positions	—	—	(4)	—	47	—	43	—	(43)	—
Decrease in finance lease receivable	—	—	46	—	—	—	46	—	(46)	—
Finance lease income	—	—	19	—	—	—	19	—	(19)	—
Unrealized foreign exchange gain on commodity	—	—	—	—	(1)	—	(1)	—	1	—
Adjusted revenues	607	407	1,521	724	218	(2)	3,475	(14)	(485)	2,976
Fuel and purchased power	22	31	641	566	—	3	1,263	—	—	1,263
Reclassifications and adjustments:										
Australian interest income	—	—	(4)	—	—	—	(4)	—	4	—
Adjusted fuel and purchased power	22	31	637	566	—	3	1,259	—	4	1,263
Carbon compliance	—	1	83	(1)	—	(5)	78	—	—	78
Gross margin	585	375	801	159	218	—	2,138	(14)	(489)	1,635
OM&A	55	68	195	69	35	101	523	(2)	—	521
Taxes, other than income taxes	3	12	15	4	—	1	35	(2)	—	33
Net other operating (income) loss	—	(23)	(38)	—	—	—	(61)	3	—	(58)
Insurance recovery	—	7	—	—	—	—	7	—	(7)	—
Adjusted net other operating (income) loss	—	(16)	(38)	—	—	—	(54)	3	(7)	(58)
Adjusted EBITDA[2]	527	311	629	86	183	(102)	1,634			
Equity income										9
Finance lease income										19
Depreciation and amortization										(599)
Asset impairment charges										(9)
Net interest expense										(262)
Foreign exchange gain										4
Gain on sale of assets and other										52
Earnings before income taxes										353

(1) The Skookumchuck wind facility has been included on a proportionate basis in the Wind and Solar segment.
(2) Adjusted EBITDA is not defined and has no standardized meaning under IFRS. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.

The following table reflects adjusted EBITDA by segment and provides reconciliation to earnings (loss) before income taxes for the year ended Dec. 31, 2021:

Year ended, Dec. 31, 2021	Hydro	Wind & Solar[1]	Gas	Energy Transition	Energy Marketing	Corporate	Total	Equity accounted investments[1]	Reclass adjustments	IFRS financials
Revenues	383	323	1,109	709	211	4	2,739	(18)	—	2,721
Reclassifications and adjustments:										
Unrealized mark-to-market (gain) loss	—	25	(40)	19	(38)	—	(34)	—	34	—
Realized (gain) loss on closed exchange positions[2]	—	—	(6)	—	29	—	23	—	(23)	—
Decrease in finance lease receivable	—	—	41	—	—	—	41	—	(41)	—
Finance lease income	—	—	25	—	—	—	25	—	(25)	—
Unrealized foreign exchange gain on commodity	—	—	(3)	—	—	—	(3)	—	3	—
Adjusted revenues	383	348	1,126	728	202	4	2,791	(18)	(52)	2,721
Fuel and purchased power	16	17	457	560	—	4	1,054	—	—	1,054
Reclassifications and adjustments:										
Australian interest income	—	—	(4)	—	—	—	(4)	—	4	—
Mine depreciation	—	—	(79)	(111)	—	—	(190)	—	190	—
Coal inventory write-down	—	—	—	(17)	—	—	(17)	—	17	—
Adjusted fuel and purchased power	16	17	374	432	—	4	843	—	211	1,054
Carbon compliance	—	—	118	60	—	—	178	—	—	178
Gross margin	367	331	634	236	202	—	1,770	(18)	(263)	1,489
OM&A	42	59	175	117	36	84	513	(2)	—	511
Reclassifications and adjustments:										
Parts and materials write-down	—	—	(2)	(26)	—	—	(28)	—	28	—
Curtailment gain	—	—	—	6	—	—	6	—	(6)	—
Adjusted OM&A	42	59	173	97	36	84	491	(2)	22	511
Taxes, other than income taxes	3	10	13	6	—	1	33	(1)	—	32
Net other operating loss (income)	—	—	(40)	48	—	—	8	—	—	8
Reclassifications and adjustments:										
Royalty onerous contract and contract termination penalties	—	—	—	(48)	—	—	(48)	—	48	—
Adjusted net other operating loss (income)	—	—	(40)	—	—	—	(40)	—	48	8
Adjusted EBITDA[3]	322	262	488	133	166	(85)	1,286			
Equity income										9
Finance lease income										25
Depreciation and amortization										(529)
Asset impairment charges										(648)
Net interest expense										(245)
Foreign exchange gain										16
Gain on sale of assets and other										54
Loss before income taxes										(380)

(1) The Skookumchuck wind facility has been included on a proportionate basis in the Wind and Solar segment.
(2) In 2022, our adjusted EBITDA composition was adjusted to include the impact of closed positions that are effectively settled by offsetting positions with the same counterparty to reflect the performance of the assets and the Energy Marketing segment in the period in which the transactions occur.
(3) Adjusted EBITDA is not defined and has no standardized meaning under IFRS. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.

The following table reflects adjusted EBITDA by segment and provides reconciliation to earnings (loss) before income taxes for the year ended Dec. 31, 2020:

Year ended, Dec. 31, 2020	Hydro	Wind & Solar[1]	Gas	Energy Transition	Energy Marketing	Corporate	Total	Equity accounted investments[1]	Reclass adjustments	IFRS financials
Revenues	152	332	787	704	122	7	2,104	(3)	—	2,101
Reclassifications and adjustments:										
Unrealized mark-to-market (gain) loss	—	2	33	(14)	21	—	42	—	(42)	—
Realized gain on closed exchange positions[2]	—	—	—	—	(10)	—	(10)	—	10	—
Decrease in finance lease receivable	—	—	17	—	—	—	17	—	(17)	—
Finance lease income	—	—	7	—	—	—	7	—	(7)	—
Unrealized foreign exchange loss on commodity	—	—	4	—	—	—	4	—	(4)	—
Adjusted revenues	152	334	848	690	133	7	2,164	(3)	(60)	2,101
Fuel and purchased power	8	25	325	435	—	12	805	—	—	805
Reclassifications and adjustments:										
Australian interest income	—	—	(4)	—	—	—	(4)	—	4	—
Mine depreciation	—	—	(100)	(46)	—	—	(146)	—	146	—
Coal inventory write-down	—	—	—	(37)	—	—	(37)	—	37	—
Adjusted fuel and purchased power	8	25	221	352	—	12	618	—	187	805
Carbon compliance	—	—	120	48	—	(5)	163	—	—	163
Gross margin	144	309	507	290	133	—	1,383	(3)	(247)	1,133
OM&A	37	53	166	106	30	80	472	—	—	472
Taxes, other than income taxes	2	8	13	9	—	1	33	—	—	33
Net other operating income	—	—	(11)	—	—	—	(11)	—	—	(11)
Reclassifications and adjustments:										
Impact of Sheerness going off-coal	—	—	(28)	—	—	—	(28)	—	28	—
Adjusted net other operating income	—	—	(39)	—	—	—	(39)	—	28	(11)
Adjusted EBITDA[3]	105	248	367	175	103	(81)	917			
Equity income										1
Finance lease income										7
Depreciation and amortization										(654)
Asset impairment charges										(84)
Net interest expense										(238)
Foreign exchange gain										17
Gain on sale of assets and other										9
Loss before income taxes										(303)

(1) The Skookumchuck wind facility has been included on a proportionate basis in the Wind and Solar segment.
(2) In 2022, our adjusted EBITDA composition was adjusted to include the impact of closed positions that are effectively settled by offsetting positions with the same counterparty to reflect the performance of the assets and the Energy Marketing segment in the period in which the transactions occur.
(3) Adjusted EBITDA is not defined and has no standardized meaning under IFRS. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.

Reconciliation of Cash Flow from Operations to FFO and FCF

The table below reconciles our cash flow from operating activities to our FFO and FCF:

Year ended Dec. 31	2022	2021	2020
Cash flow from operating activities[1]	**877**	1,001	702
Change in non-cash operating working capital balances	**316**	(174)	(89)
Cash flow from operations before changes in working capital	**1,193**	827	613
Adjustments			
Share of adjusted FFO from joint venture[1]	**8**	13	3
Decrease in finance lease receivable	**46**	41	17
Clean energy transition provisions and adjustments[2][3]	**42**	79	37
Realized (gain) loss on closed positions with same counterparty	**37**	23	(10)
Other[4]	**20**	11	15
FFO[5]	**1,346**	994	675
Deduct:			
Sustaining capital[1]	**(142)**	(199)	(157)
Productivity capital	**(4)**	(4)	(4)
Dividends paid on preferred shares	**(43)**	(39)	(39)
Distributions paid to subsidiaries' non-controlling interests	**(187)**	(159)	(102)
Principal payments on lease liabilities	**(9)**	(8)	(25)
FCF[5]	**961**	585	348
Weighted average number of common shares outstanding in the year	**271**	271	275
FFO per share[5]	**4.97**	3.67	2.45
FCF per share[5]	**3.55**	2.16	1.27

(1) Includes our share of amounts for Skookumchuck, an equity accounted joint venture.
(2) 2021 includes a write-down on parts and material inventory and coal inventory for our coal operations and amounts related to onerous contracts and contract termination penalties. 2020 includes a write-down on coal inventory for our coal operations.
(3) During the third quarter of 2022, to support the employees affected by the closure of the Highvale mine and our transition off coal to cleaner sources, the Company made a voluntary special contribution of $35 million to the Highvale mine pension plan. 2022 also includes amounts related to onerous contracts recognized in 2021.
(4) Other consists of production tax credits, which is a reduction to tax equity debt, less distributions from equity accounted joint venture.
(5) These items are not defined and have no standardized meaning under IFRS. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.

The table below bridges our adjusted EBITDA to our FFO and FCF:

Year ended Dec. 31	2022	2021	2020
Adjusted EBITDA[1]	**1,634**	1,286	917
Provisions	**25**	(43)	7
Interest expense	**(200)**	(200)	(192)
Current income tax expense	**(65)**	(56)	(35)
Realized foreign exchange gain (loss)	**—**	(2)	8
Decommissioning and restoration costs settled	**(35)**	(18)	(18)
Other cash and non-cash items	**(13)**	27	(12)
FFO[2]	**1,346**	994	675
Deduct:			
Sustaining capital[3]	**(142)**	(199)	(157)
Productivity capital	**(4)**	(4)	(4)
Dividends paid on preferred shares	**(43)**	(39)	(39)
Distributions paid to subsidiaries' non-controlling interests	**(187)**	(159)	(102)
Principal payments on lease liabilities	**(9)**	(8)	(25)
FCF[2]	**961**	585	348

(1) Adjusted EBITDA is defined in the Additional IFRS Measures and Non-IFRS Measures section of this MD&A and reconciled to earnings (loss) before income taxes above.
(2) These items are not defined and have no standardized meaning under IFRS. FFO and FCF are defined in the Additional IFRS Measures and Non-IFRS Measures section of this MD&A and reconciled to cash flow from operating activities above.
(3) Includes our share of amounts for Skookumchuck wind facility, an equity accounted joint venture.

For explanations for the current period, refer to the Highlights section of this MD&A.

FCF increased by $376 million in 2022, compared to 2021, driven primarily by higher adjusted EBITDA and a decrease in sustaining capital spending due to lower planned maintenance, partially offset by higher distributions paid to subsidiaries' non-controlling interests.

Financial Highlights on a Proportional Basis of TransAlta Renewables

The proportionate financial information below reflects TransAlta's share of TransAlta Renewables relative to TransAlta's total consolidated figures. The financial highlights presented on a proportional basis of TransAlta Renewables are supplementary financial measures to reflect TransAlta Renewables' portion of the consolidated figures.

Consolidated Results for the Year Ended Dec. 31

The following table reflects the generation and summary financial information on a consolidated basis for the year ended Dec. 31:

	Actual generation (GWh)			Adjusted EBITDA[1]			Earnings (loss) before income taxes[2]		
Year ended, Dec. 31	2022	2021	2020	2022	2021	2020	2022	2021	2020
TransAlta Renewables									
Hydro	**410**	434	429	**13**	17	21			
Wind and Solar[3]	**4,248**	3,898	4,042	**273**	248	256			
Gas[3]	**3,308**	3,236	2,919	**223**	217	205			
Corporate	**—**	—	—	**(22)**	(19)	(20)			
TransAlta Renewables before adjustments	**7,966**	7,568	7,390	**487**	463	462	**57**	133	188
Less: Proportion of TransAlta Renewables not owned by TransAlta Corporation	**(3,178)**	(3,020)	(2,938)	**(194)**	(185)	(182)	**(23)**	(53)	(74)
Portion of TransAlta Renewables owned by TransAlta Corporation	**4,788**	4,548	4,452	**293**	278	280	**34**	80	114
Add: TransAlta Corporation's owned assets excluding TransAlta Renewables									
Hydro	**1,578**	1,502	1,703	**514**	305	84			
Wind and Solar	**—**	—	27	**38**	14	(8)			
Gas	**8,140**	7,329	7,861	**406**	271	162			
Energy Transition	**3,574**	5,706	7,999	**86**	133	175			
Energy Marketing	**—**	—	—	**183**	166	103			
Corporate	**—**	—	—	**(80)**	(66)	(61)			
TransAlta Corporation with proportionate share of TransAlta Renewables	**18,080**	19,085	22,042	**1,440**	1,101	735	**330**	(433)	(377)
Non-controlling interests	**3,178**	3,020	2,938	**194**	185	182	**23**	53	74
TransAlta consolidated	**21,258**	22,105	24,980	**1,634**	1,286	917	**353**	(380)	(303)

(1) Adjusted EBITDA is defined in the Additional IFRS Measures and Non-IFRS Measures section of this MD&A and reconciled to earnings (loss) before income taxes above.
(2) TransAlta Renewables amounts are comprised of its reported earnings before income taxes plus the reported earnings before income taxes of the assets in which it holds an economic interest less finance income related to subsidiaries of TransAlta.
(3) Wind and Solar and Gas segments include those assets in which TransAlta Renewables holds an economic interest.

Key Non-IFRS Financial Ratios

The methodologies and ratios used by rating agencies to assess our credit rating are not publicly disclosed. We have developed our own definitions of ratios and targets to help evaluate the strength of our financial position. These metrics and ratios are not defined and have no standardized meaning under IFRS and may not be comparable to those used by other entities or by rating agencies. We maintained a strong and flexible financial position in 2022.

Adjusted Net Debt to Adjusted EBITDA

As at Dec. 31	2022	2021	2020
Period-end long-term debt[1]	**3,653**	3,267	3,361
Exchangeable securities	**339**	335	330
Less: Cash and cash equivalents[2]	**(1,118)**	(947)	(703)
Add: 50 per cent of issued preferred shares and exchangeable preferred shares[3]	**671**	671	671
Other[4]	**(20)**	(19)	(13)
Adjusted net debt[5]	**3,525**	3,307	3,646
Adjusted EBITDA[6]	**1,634**	1,286	917
Adjusted net debt to adjusted EBITDA(times)	**2.2**	2.6	4.0

(1) Consists of current and long-term portion of debt, which includes lease liabilities and tax equity financing.
(2) Cash and cash equivalents, net of bank overdraft.
(3) Exchangeable preferred shares are considered equity with dividend payments for credit-rating purposes. For accounting purposes, they are accounted for as debt with interest expense in the consolidated financial statements. For purposes of this ratio, we consider 50 per cent of issued preferred shares, including these, as debt.
(4) Includes principal portion of TransAlta OCP restricted cash ($17 million for both 2022 and 2021, $10 million for 2020) and fair value of hedging instruments on debt (included in risk management assets and/or liabilities on the Consolidated Statements of Financial Position).
(5) The tax equity financing for the Skookumchuck wind facility, an equity accounted joint venture, is not represented in this amount. Adjusted net debt is not defined and has no standardized meaning under IFRS. Presenting this item from period to period provides management and investors with the ability to evaluate earnings trends more readily in comparison with prior periods' results. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.
(6) Last 12 months.

The Company's capital is managed internally and evaluated by management using a net debt position. We use the adjusted net debt to adjusted EBITDA ratio as a measurement of financial leverage and to assess our ability to service debt. Our target for adjusted net debt to adjusted EBITDA is 3.0 to 3.5 times. Our adjusted net debt to adjusted EBITDA ratio for 2022 was better than the low end of our target and improved compared to 2021, as strong adjusted EBITDA more than offset the impact of higher adjusted net debt.

Deconsolidated Adjusted EBITDA by Segment

We invest in our assets directly as well as with joint venture partners. Deconsolidated financial information is a supplementary financial measure and is not intended to be presented in accordance with IFRS.

Adjusted EBITDA is a key metric for TransAlta and TransAlta Renewables and provides management and shareholders a representation of core business profitability. Deconsolidated adjusted EBITDA is used in key planning and credit metrics, and segment results highlight the operating performance of assets held directly at TransAlta that are comparable from period to period.

A reconciliation of adjusted EBITDA to deconsolidated adjusted EBITDA by segment results is set out below:

Year ended Dec. 31	2022			2021			2020		
	TransAlta Consolidated	**TransAlta Renewables**	**TransAlta Deconsolidated**	TransAlta Consolidated	TransAlta Renewables	TransAlta Deconsolidated	TransAlta Consolidated	TransAlta Renewables	TransAlta Deconsolidated
Hydro	**527**	**13**		322	17		105	21	
Wind and Solar	**311**	**273**		262	248		248	256	
Gas	**629**	**223**		488	217		367	205	
Energy Transition	**86**	**—**		133	—		175	—	
Energy Marketing	**183**	**—**		166	—		103	—	
Corporate	**(102)**	**(22)**		(85)	(19)		(81)	(20)	
Adjusted EBITDA	**1,634**	**487**	**1,147**	1,286	463	823	917	462	455
Less: TA Cogen adjusted EBITDA			**(197)**			(133)			(54)
Less: EBITDA from joint venture investments[1]			**—**			—			(3)
Add: Dividend from TransAlta Renewables			**151**			151			151
Add: Dividend from TA Cogen			**52**			34			17
Deconsolidated TransAlta adjusted EBITDA			**1,153**			875			566

(1) As of the second quarter of 2021, our share of amounts for the Skookumchuck wind equity accounted joint venture is excluded from the TransAlta deconsolidated results due to the sale of an economic interest in the 137 MW Skookumchuck wind facility to TransAlta Renewables.

Deconsolidated FFO

The Company has set capital allocation targets based on deconsolidated FFO available to shareholders. Deconsolidated financial information is a supplementary financial measure and is not defined, has no standardized meaning under IFRS and may not be comparable to those used by other entities or by rating agencies. See also the Additional IFRS Measures and Non-IFRS Measures section of this MD&A for further details. Deconsolidated FFO for the years ended Dec. 31 is detailed below:

Year ended Dec. 31	2022			2021			2020		
	TransAlta Consolidated	**TransAlta Renewables**	**TransAlta Deconsolidated**	TransAlta Consolidated	TransAlta Renewables	TransAlta Deconsolidated	TransAlta Consolidated	TransAlta Renewables	TransAlta Deconsolidated
Cash flow from operating activities	**877**	**257**		1,001	336		702	267	
Change in non-cash operating working capital balances	**316**	**(5)**		(174)	(13)		(89)	31	
Cash flow from operations before changes in working capital	**1,193**	**252**		827	323		613	298	
Adjustments:									
Decrease in finance lease receivable	**46**	**—**		41	—		17	—	
Clean energy transition provisions and adjustments[1]	**42**	**—**		79	—		37	—	
Share of FFO from joint venture	**8**	**—**		13	—		3	—	
Realized (gain) loss on closed exchange positions	**37**	**—**		23	—		(10)	—	
Finance income - economic interests	**—**	**(40)**		—	(108)		—	(69)	
FFO - economic interests[2]	**—**	**182**		—	191		—	180	
Other[3]	**20**	**—**		11	—		15	—	
FFO	**1,346**	**394**	**952**	994	406	588	675	409	266
Dividend from TransAlta Renewables			**151**			151			151
Distributions to TA Cogen's Partner			**(87)**			(56)			(17)
Less: Share of adjusted FFO from joint venture[4]			**—**			—			(3)
Deconsolidated TransAlta FFO			**1,016**			683			397

(1) During the third quarter of 2022, to support the employees affected by the closure of the Highvale mine and our transition off coal to cleaner sources, the Company made a voluntary special contribution of $35 million to the Highvale mine pension plan. 2022 also includes amounts related to onerous contracts recognized in 2021. 2021 includes a write-down on parts and material inventory and coal inventory for our coal operations and amounts related to onerous contracts and contract termination penalties. 2020 includes a write-down on coal inventory for our coal operations.

(2) FFO - economic interests calculated as FCF economic interests plus sustaining capital expenditures economic interests and tax equity distributions, and plus/minus currency adjustment.

(3) Other consists of production tax credits, which is a reduction to tax equity debt, less distributions from equity accounted joint venture.

(4) As of the second quarter of 2021, our share of amounts for the Skookumchuck wind equity accounted joint venture is excluded from the TransAlta deconsolidated results due to the sale of an economic interest in the 137 MW Skookumchuck wind facility to TransAlta Renewables.

Deconsolidated Net Debt to Deconsolidated Adjusted EBITDA

In addition to reviewing fully consolidated ratios and results, management reviews net debt to adjusted EBITDA on a deconsolidated basis to highlight TransAlta's financial flexibility, balance sheet strength and leverage. Deconsolidated financial information is a supplementary financial measure and is not defined under IFRS, and may not be comparable to measures used by other entities or by rating agencies. Also, refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A for further details.

As at Dec. 31	2022	2021	2020
Adjusted net debt[1]	**3,525**	3,307	3,646
Add: TransAlta Renewables cash and cash equivalents[2]	**234**	244	582
Less: TransAlta Renewables long-term debt	**(790)**	(814)	(692)
Less: US tax equity financing and South Hedland debt[3]	**(834)**	(867)	(906)
Deconsolidated net debt	**2,135**	1,870	2,630
Deconsolidated adjusted EBITDA[4][5]	**1,153**	875	566
Deconsolidated net debt to deconsolidated adjusted EBITDA[6] (times)	**1.9**	2.1	4.6

(1) Adjusted net debt is a Non-IFRS measure. Refer to the Adjusted Net Debt to Adjusted EBITDA calculation under the Key Financial Non-IFRS Financial Ratios section of this MD&A for the reconciliation and composition of adjusted net debt.
(2) In 2022, includes cash held within TransAlta Energy (Australia) Pty Ltd. reserved for future funding of Australian growth projects by TransAlta Renewables.
(3) Relates to assets where TransAlta Renewables has economic interests.
(4) Refer to the Deconsolidated Adjusted EBITDA by Segment section of this MD&A for the reconciliation and composition of deconsolidated adjusted EBITDA and the Additional IFRS Measures and Non-IFRS Measures section of this MD&A for the composition of adjusted EBITDA.
(5) Last 12 months.
(6) The non-IFRS ratio is not a standardized financial measure under IFRS and might not be comparable to similar financial measures disclosed by other issuers.

Our target for deconsolidated net debt to deconsolidated adjusted EBITDA is 2.5 to 3.0 times. Our deconsolidated net debt to deconsolidated adjusted EBITDA ratio for 2022 improved compared with 2021, as higher deconsolidated adjusted EBITDA more than offset the increase in deconsolidated net debt. Higher deconsolidated net debt is a result of higher corporate debt, partially offset by an increase in cash balances.

2023 Outlook

Our annual outlook highlights continuing strong cash flow expectations for 2023. Our fleet remains well positioned to capture the ongoing strength that we see in the Alberta merchant market. The Company is focused on redeploying these cash flows towards growing our contracted renewables asset base. On Nov. 7, 2022, the Board of Directors approved an increase to the annualized dividend to $0.22 per share, beginning with the Jan. 1, 2023 dividend.

The following table outlines our expectations on key financial targets and related assumptions for 2023 and should be read in conjunction with the narrative discussion that follows and the Governance and Risk Management section of this MD&A:

Measure	2023 Target	2022 Updated target	2022 Actuals
Adjusted EBITDA[1][2]	$1,200 million-$1,320 million	$1,380 million-$1,460 million	$1,634 million
FCF[1][2]	$560 million-$660 million	$725 million-$775 million	$961 million
Dividend	$0.22 per share annualized	$0.20 per share annualized	$0.20 per share annualized

(1) These items are not defined and have no standardized meaning under IFRS. Refer to the Reconciliation of Non-IFRS Measures section of this MD&A for further discussion of these items, including, where applicable, reconciliations to measures calculated in accordance with IFRS. See also the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.
(2) During the third quarter of 2022, the Company revised and increased our 2022 guidance for adjusted EBITDA and FCF based on the strong financial performance attained to date and our expectations for the balance of year.

Range of key 2023 power and gas price assumptions

Market	2023 Assumption
Alberta Spot ($/MWh)	$105 to $135
Mid-C Spot (US$/MWh)	US$75 to US$85
AECO Gas Price ($/GJ)	$4.60

Alberta spot price sensitivity: a +/- $1/MWh change in spot price is expected to have a +/- $4 million impact on adjusted EBITDA for 2023.

Other assumptions relevant to the 2023 outlook	
Sustaining capital	$140 million - $170 million
Energy Marketing gross margin	$90 million - $110 million

Alberta Hedging

Range of hedging assumptions	2023[(1)]
Hedged production (GWh)	6,874
Hedge price ($/MWh)	$98
Hedged gas volumes (GJ)	64 million
Hedge gas prices ($/GJ)	$2.54

(1) In the fourth quarter of 2022, the Company revised the range of hedging assumptions for 2023 based on current hedge levels.

Adjusted EBITDA is estimated to be between $1.2 billion and $1.3 billion. The midpoint of the range represents an 11 per cent decrease from the midpoint of the 2022 outlook. FCF is expected to be between $560 million and $660 million and excludes the impact of the rehabilitation capital expenditures required at Kent Hills 1 and 2 wind facilities. The midpoint of the range represents a 19 per cent decrease from the midpoint of the 2022 outlook. These changes to adjusted EBITDA and FCF are largely driven by lower expected pricing levels in Alberta based on our fundamental forecast and adjusted performance expectations from the Energy Marketing segment, partially offset by contributions from newly commissioned projects that will include the Garden Plain wind project, White Rock wind projects, Horizon Hill wind projects, Northern Goldfields solar project, Mount Keith 132kV transmission expansion and completion of the Kent Hills 1 and 2 rehabilitation and the full return of the wind facilities to service in the second half of 2023.

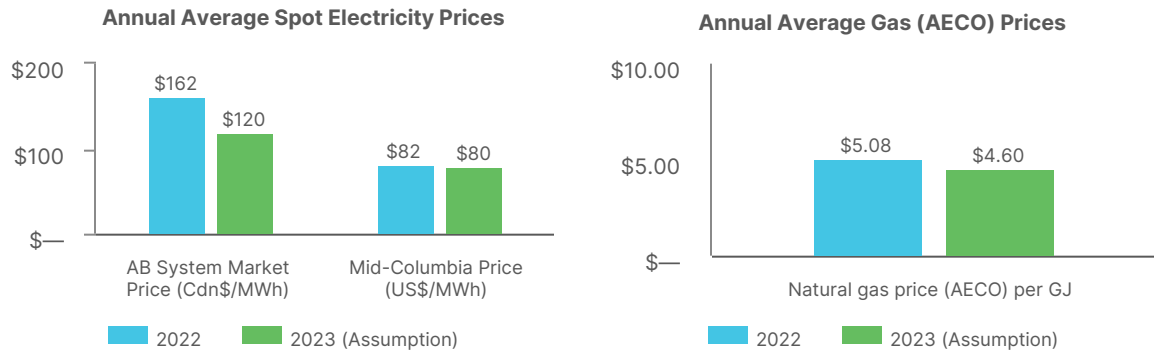
The Company's outlook for 2023 may be impacted by a number of factors as detailed further below.

Operations

The following provides an update to our assumptions included in the 2023 Outlook.

Market Pricing

The following graphs include 2023 pricing based on a range of assumptions and is subject to change:



For 2023, we see strong merchant pricing levels continuing in Alberta and the Pacific Northwest, although at lowered target ranges for both regions. Lower year-over-year pricing in Alberta is expected to be driven by normalized weather expectations and the expected additions of new gas, wind and solar supply, including TransAlta's new Garden Plain wind facility, which is expected to achieve commercial operation in the first half of 2023. Lower year-over-year pricing in the Pacific Northwest will be impacted by weaker natural gas prices and will also depend on the actual hydrology for the region during the year. Ontario power prices for 2023 are expected to be lower than 2022 due to lower natural gas prices despite ongoing nuclear refurbishment outages.

The objective of our portfolio management strategy in Alberta is to balance opportunity and risk and to deliver optimization strategies that contribute to our total investment, which includes a return of and on invested capital. We can be more or less hedged in a given period and we expect to realize our annual targets through a combination of forward hedging and selling generation into the spot market. The assets within the Alberta Electricity Portfolio are managed as a portfolio to maximize the overall value of generation and capacity from our hydro, wind and energy storage and thermal facilities. Financial hedging is a key component of cash flow certainty and the hedges are tied to the portfolio of assets rather than a single facility.

Kent Hills Wind Facilities Outage

It is expected that the rehabilitation of the Kent Hills 1 and 2 wind facilities will be completed and they will fully return to service in the second half of 2023.

Fuel and Compliance Costs

For the Alberta Gas fleet, gas consumption is expected to decrease from lower generation. This will drive lower GHG emissions, and the combined effect will result in lower total fuel and GHG costs for a given volume of power production. This will be partially offset by an increased carbon tax in Alberta.

In the Pacific Northwest of the US, the coal mine adjacent to our Centralia thermal facility is in the reclamation stage. Fuel at Centralia has been purchased from external suppliers in the Powder River Basin and delivered by rail. The delivered fuel cost in 2023 is expected to be higher than 2022 due to higher expected generation.

Most of the generation from gas turbine-based power facilities is sold under contracts with pass-through provisions for fuel. For gas generation with no pass-through provisions, we purchase natural gas from outside companies in line with production, thereby minimizing our risk to changes in prices.

We closely monitor the risks associated with changes in electricity and input fuel prices on our future operations and, where we consider it appropriate, use various physical and financial instruments to hedge our assets and operations from such price risks.

Energy Marketing

Adjusted EBITDA from our Energy Marketing segment is affected by prices and volatility in the market, overall strategies adopted and changes in regulation and legislation. Our outlook has been adjusted to reflect the exceptional performance achieved in 2021 and 2022. We continuously monitor both the market and our exposure to maximize earnings while still maintaining an acceptable risk profile. Our 2023 objective for the Energy Marketing segment is to contribute between $90 million and $110 million in realized gross margin for the year, which is consistent with normalized performance expectations.

Exposure to Fluctuations in Foreign Currencies

Our strategy is to minimize the impact of fluctuations in the Canadian dollar against the US dollar and Australian dollar by offsetting foreign-denominated assets with foreign-denominated liabilities and by entering into foreign exchange contracts. We also have foreign-denominated expenses, including principal and interest charges, which largely offset our net foreign-denominated revenues.

Decommissioning and Restoration Costs

Decommissioning and restoration costs are expected to be higher in 2023, largely driven by increases in restoration costs associated with the retired Alberta assets within the Energy Transition segment.

Sustaining Capital Expenditures

The Company expects sustaining capital to be in the range of $140 million to $170 million. The midpoint for the range represents a 3 per cent decrease from the midpoint of the 2022 outlook sustaining capital range of $150 million to $170 million. This is driven by lower sustaining capital expenditures for planned major maintenance related to the Centralia Unit 2 and the Sheerness facility offset by higher capital expenditure across our Hydro fleet.

The Kent Hills foundation rehabilitation capital expenditure has been segregated from our sustaining capital range due to the extraordinary and rare nature of this expenditure. Refer to the Wind and Solar section of this MD&A for more details.

Our estimate for total sustaining capital is as follows:

	Spent in 2022	Spent in 2021	Expected spend in 2023
Total sustaining capital	**142**	199	140-170

Liquidity and Capital Resources

We expect to maintain adequate available liquidity under our committed credit facilities, including the Term Facility (as defined above), which the Company entered into during the third quarter of 2022. We currently have access to $2.1 billion in liquidity, including $1.1 billion in cash. On Nov. 17, 2022, the Company issued US$400 million Senior Green Bonds, which have a coupon rate of 7.75 per cent per annum and mature on Nov. 15, 2029. Including the effects of settled interest rate swaps, the notes have an effective yield of approximately 5.98 per cent. The funds required for committed growth, sustaining capital and productivity projects are not expected to be significantly impacted by the current economic environment. Refer to the Significant and Subsequent Events and Financial Capital sections of this MD&A for further details.

Net Interest Expense

Interest expense for 2023 is expected to be slightly higher than in 2022, largely due to higher levels of debt, partially offset by higher capitalized interest on growth project expenditures. In addition, changes in interest rates on variable debt and in the value of the Canadian dollar relative to the US and Australian dollars can affect the amount of interest expense incurred.

Strategy and Capability to Deliver Results

Our goal is to be a leading customer-centred electricity company, committed to a sustainable future, focused on increasing shareholder value by growing our portfolio of high-quality generation facilities with stable and predictable cash flows. Our strategy includes meeting our customers' needs for clean, safe, low-cost, reliable electricity and providing operational excellence and continuous improvement in everything we do.

The Company's enhanced focus on renewable generation and storage solutions for customers is driven largely by global decarbonization policies and the increase in demand and growth projections in the renewable sector, namely for companies to achieve their ESG ambitions. For additional information on regulatory developments, refer to the ESG section of this MD&A.

On Sept. 28, 2021, TransAlta announced its strategic growth targets and a five-year Clean Electricity Growth Plan. Our Clean Electricity Growth Plan established the following strategic priorities and targets to guide our path from 2021 to 2025. These include:

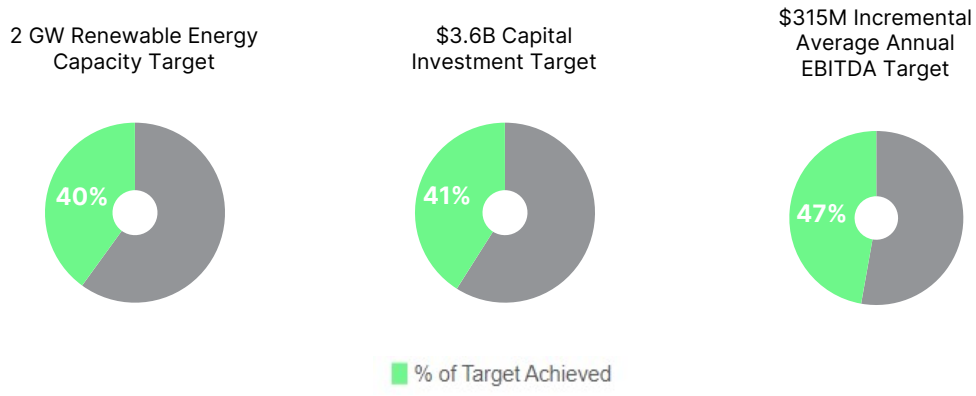
- Deliver 2 GW of incremental renewable capacity with a targeted capital investment of $3.6 billion[1] by the end of 2025. These new assets, once fully operational, are targeted to deliver incremental average annual EBITDA[2] of $315 million[1];
- Accelerate growth into customer-centred renewables and storage through the deployment of our 3 GW development pipeline;
- Expand the Company's development pipeline to 5 GW by 2025 to enable a two-fold increase in its renewables fleet between 2025 and 2030;
- Realize targeted diversification and value creation by focusing on expanding our platform in each of our core geographies (Canada, the US and Australia);
- Lead in ESG policy development to enable the successful evolution of the markets in which we operate and compete; and
- Define the next generation of power solutions and technologies and potential for parallel investments in new complementary sectors by the end of 2025.

Our 2023 priorities for the Clean Electricity Growth Plan include:

- Reaching final investment decision on 500 MW of additional clean energy projects across Canada, the US and Australia; and
- Adding at least 1,500 MW of new development sites to our pipeline.

We expect the Company's adjusted EBITDA generated from renewable sources, including hydro, wind and solar technologies, to increase to 70 per cent by the end of 2025. The Clean Electricity Growth Plan will largely be funded from current cash balances, cash generated from operations and asset-level financing.

As of Feb. 22, 2023, we have made significant progress in achieving the targets of the Clean Electricity Growth Plan.



1 The targeted capital investment of $3 billion and average annual EBITDA of $250 million, as previously disclosed in 2021, were revised upwards for the current inflationary environment.

2 Average annual EBITDA is not defined and has no standardized meaning under IFRS, and is forward-looking. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A for further discussion.

Our progress towards achieving our strategic targets is summarized below:

Strategic Targets

Goals	Target	Results	Comments
Accelerate Growth in Customer-centered Renewables and Storage	Deliver 2 GW of renewable capacity with an estimated capital investment of $3.6 billion[1] by the end of 2025.	On track	In 2022, the Company delivered two new projects. The 200 MW Horizon Hill wind project and the Mount Keith 132kV transmission expansion in Australia. Construction on these new projects commenced in 2022 and they are both planned for completion in the second half of 2023. As of the end of 2022, we have successfully delivered 800MW of new growth, 40% of our 2 GW target.
	Deliver incremental average annual EBITDA of $315 million.[1]	On track	The Horizon Hill wind project will add incremental EBITDA in the range of US$30-US$33 million and the Mount Keith 132kV transmission expansion will add incremental EBITDA in the range of AU$6-AU$7 million. Our cumulative progress towards our incremental EBITDA target is approximately $149 million.
	Expand the Company's development pipeline to 5 GW by 2025 to enable a two-fold increase in its renewables fleet between 2025 and 2030.	On track	The Company continues to evaluate opportunities to add new development sites to our pipeline. These include acquisitions of individual early-stage development sites, small development portfolios and prospecting of new sites. For 2022, we have grown our development pipeline by approximately 1,980 MW in the US, Canada and Australia.
Take a Targeted Approach to Diversification	Grow our asset base in our core geographies of Canada, Australia and the US to realize diversification and value creation.	On track	The Company has successfully added new contracted renewable assets in each of its three core geographies. We have diversified within the US market through our North Carolina Solar facility acquisition In 2021 and the new Oklahoma investments, which added three new investment-grade customers in 2022.
Maintain Our Financial Strength and Capital Allocation Discipline	Deliver strong cash flow from our existing portfolio to allocate towards our funding priorities including growth, dividends and share buybacks.	On track	The Company had liquidity of $2.1 billion as at Dec. 31, 2022. The Company returned $54 million to shareholders through share buybacks in 2022 under our NCIB. The Company increased the annual common share dividend by 10 per cent to $0.22 per year effective Jan. 1, 2023.
Define the Next Generation of Energy Solutions and Technologies	Meet the needs of our customers and communities through the implementation of innovative energy solutions and parallel investments in new complementary sectors by the end of 2025.	On track	The Company established an Energy Innovation team to progress our goals in this area. The team has recently completed an equity investment in Ekona Power Inc., an early-stage hydrogen production company, in order to pursue commercialization of low cost, net-zero aligned hydrogen. The Company also committed to invest US$25 million over the next four years in the Energy Impact Partners Frontier Fund, which provides a portfolio approach to investing in emerging technologies focused on net-zero emissions. In 2022, the Company invested $10 million (US$8 million).
Lead in ESG Policy Development	Actively participate in policy development to ensure the electricity that we provide contributes to emissions reduction, grid reliability and competitive energy prices to enable the successful evolution of the markets in which we operate and compete.	On track	The Company is actively engaging the Government of Canada and Government of Alberta regarding the proposed federal Clean Electricity Regulations. Throughout the engagement, TransAlta continues to provide input regarding how to achieve emissions reductions while maintaining necessary reliability and affordability. The Company worked with the Government of Canada as the government designed new investment tax credits for clean technologies.
Successfully Navigate through the COVID-19 Pandemic	Continue to maintain an effective response to COVID-19 and plan a safe return to our offices.	Achieved	Our staff have returned to our offices and sites, and we continue to monitor local public health authority and government guidelines in all jurisdictions in which we operate to ensure the ongoing health and safety of all employees and contractors.

(1) The targeted capital investment of $3 billion and average annual EBITDA of $250 million, as previously disclosed in 2021, were revised upwards for the current inflationary environment.

Growth

The Company announced two new projects in 2022: the 200 MW Horizon Hill wind project and the Mount Keith 132kV expansion project. We have established, and are continuing to expand, our pipeline of potential growth projects. Our pipeline includes 374 MW of advanced-stage development projects along with 3,891 MW to 4,991 MW of projects in earlier stages of development.

We are primarily evaluating greenfield opportunities in Alberta, Western Australia and the US along with acquisitions in markets in which we have existing operations.

Projects under Construction

The following projects have been approved by the Board of Directors, have executed PPAs and are currently under construction. The projects under construction will be financed through existing liquidity in the near term. We will continue to explore project financing or tax equity as a long-term financing solution on an asset-by-asset basis.

				Total project (millions)						
Project	Type	Region	MW	Estimated spend	Spent to date	Target completion date[1]	PPA Term[2]	Average annual EBITDA[3]	Status
Canada									
Garden Plain[4]	Wind	AB	130	$ 190 — $200	$ 171	H1 2023	17	$14-$15	• Fully contracted • All major equipment deliveries are complete • Turbine erection and commissioning is now underway • Grid interconnection completed
United States									
White Rock[5]	Wind	OK	300	US$ 470 — US$490	US$273	H2 2023	—	US$48-US$52	• Long-term PPAs executed • Wind turbine component deliveries in progress • Construction activities have commenced • On track to be completed on schedule
Horizon Hill[5]	Wind	OK	200	US$ 300 — US$315	US$141	H2 2023	—	US$30-US$33	• Long-term PPA executed • Wind turbine component deliveries in progress • Construction activities have commenced • On track to be completed on schedule
Australia									
Northern Goldfields	Hybrid Solar	WA	48	AU$ 69 — AU$73	AU$59	H1 2023	16	AU$9-AU$10	• All major equipment deliveries are complete • Solar panel installation is complete • On track to be completed in early 2023
Mount Keith 132kV Expansion	Transmission	WA	n/a	AU$ 50 — AU$53	AU$17	H2 2023	15	AU$6-AU$7	• Engineering, procurement, and construction executed • Construction activities have commenced • On track to be completed on schedule

(1) H1 or H2 is defined as the first or second half of the year.
(2) The PPA term is confidential for the White Rock wind projects and Horizon Hill wind project.
(3) This item is not defined and has no standardized meaning under IFRS and is forward-looking. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A for further discussion.
(4) The Garden Plain wind project is fully contracted, with Pembina off-taking 100 MW of the total 130 MW capacity of the facility and the remaining 30 MW contracted to an investment-grade globally recognized customer. Refer to the Significant and Subsequent Events section of this MD&A for further details.
(5) The expected average annual EBITDA and estimated capital spending for the White Rock wind projects and Horizon Hill wind projects have been revised upwards based on the impact of the Inflation Reduction Act of 2022, which results in the projects qualifying for 100 per cent production tax credits, partially offset by incremental payments to the turbine supplier.

Advanced-Stage Development

These projects have detailed engineering, advanced position in the interconnection queue and are progressing offtake opportunities. The following table shows the pipeline of future growth projects currently under advanced-stage development:

Project	Type	Region	Gross installed capacity (MW)	Estimated spend	Average annual EBITDA[1]
Tempest	Wind	Alberta	100	$210-$230	$20-$23
SCE Capacity Expansion	Gas	Western Australia	94	AU$180-AU$200	AU$24-AU$28
WaterCharger	Battery Storage	Alberta	180	$150-$180	$14-$17
Australia Transmission Expansion	Transmission	Western Australia	n/a	AU$34-AU$36	AU$3-AU$4

(1) This item is not defined, has no standardized meaning under IFRS and is forward-looking. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A for further discussion.

Early-Stage Development

These projects are in the early stages and may or may not move ahead. Generally, these projects will have:

- Collected meteorological data;
- Begun securing land control;
- Started environmental studies;
- Confirmed appropriate access to transmission; and
- Started preliminary permitting and other regulatory approval processes.

The following table shows the pipeline of future growth projects currently under early-stage development:

Project	Type	Region		Gross installed capacity (MW)
Canada				
Riplinger Wind	Wind	Alberta		300
Red Rock	Wind	Alberta		100
Willow Creek 1	Wind	Alberta		70
Willow Creek 2	Wind	Alberta		70
Sunhills Solar	Solar	Alberta		115
McNeil Solar	Solar	Alberta		57
Canadian Battery opportunity	Battery	New Brunswick		10
Canadian Wind opportunities	Wind	Various		370
Tent Mountain Pumped Storage	Hydro	Alberta		160
Brazeau Pumped Hydro	Hydro	Alberta		300-900
Alberta Thermal Redevelopment	Various	Alberta		250-500
			Total	**1,802-2,652**
United States				
Old Town	Wind	Illinois		185
Trapper Valley	Wind	Wyoming		225
Monument Road	Wind	Nebraska		152
Dos Rios	Wind	Oklahoma		242
Prairie Violet	Wind	Illinois		130
Big Timber	Wind	Pennsylvania		50
Oklahoma Solar	Solar	Oklahoma		100
Milligan 3	Wind	Nebraska		126
Other Wind and Solar prospects	Wind and Solar	Various		409
Centralia site redevelopment	Various	Washington		250-500
			Total	**1,869-2,119**
Australia				
Australian prospects	Gas, Solar, Wind	Western Australia		170
South Hedland Solar	Solar	Western Australia		50
			Total	**220**
Canada, United States and Australia			**Total**	**3,891-4,991**

Financial Instruments

Financial instruments are used for proprietary trading purposes and to manage our exposure to interest rates, commodity prices and currency fluctuations, as well as other market risks. We may currently use physical and financial swaps, forward sale and purchase contracts, futures contracts, foreign exchange contracts, interest rate swaps and options to achieve our risk management objectives. Some of our physical commodity contracts have been entered into and are held for the purposes of meeting our expected purchase, sale or usage requirements and, as such, are not considered financial instruments, and are not recognized as a financial asset or financial liability. Other physical commodity contracts that are not held for normal purchase or sale requirements, and derivative financial instruments are recognized on the Consolidated Statements of Financial Position and are accounted for using the fair value method of accounting. The initial recognition of fair value and subsequent changes in fair value can affect reported earnings in the period the change occurs if hedge accounting is not elected. Otherwise, changes in fair value will generally not affect earnings until the financial instrument is settled.

Some of our financial instruments and physical commodity contracts qualify for, and are recorded under, hedge accounting rules. The accounting for those contracts, for which we have elected to apply hedge accounting, depends on the type of hedge. Our financial instruments are mainly used for cash flow hedges or non-hedges. These categories and their associated accounting treatments are explained in further detail below.

For all types of hedges, we test for effectiveness at the end of each reporting period to determine if the instruments are performing as intended and hedge accounting can still be applied. The financial instruments we enter into are designed to ensure that future cash inflows and outflows are predictable. In a hedging relationship, the effective portion of the change in the fair value of the hedging derivative does not impact net earnings (loss), while any ineffective portion is recognized in net earnings (loss).

We have certain contracts in our portfolio that, at their inception, do not qualify for, or we have chosen not to elect to apply, hedge accounting. For these contracts, we recognize in net earnings (loss) mark-to-market gains and losses resulting from changes in forward prices compared to the price at which these contracts were transacted. These changes in price alter the timing of earnings recognition, but do not necessarily determine the final settlement amount received. The fair value of future contracts will continue to fluctuate as market prices change. The fair value of derivatives that are not traded on an active exchange, or extend beyond the time period for which exchange-based quotes are available, are determined using valuation techniques or models.

Cash Flow Hedges

Cash flow hedges are categorized as project, foreign exchange, interest rate or commodity hedges and are used to offset foreign exchange, interest rate and commodity price exposures resulting from market fluctuations.

Foreign currency forward contracts may be used to hedge foreign exchange exposures resulting from anticipated contracts and firm commitments denominated in foreign currencies, primarily related to capital expenditures and currency exposures related to US-denominated debt.

Physical and financial swaps, forward sale and purchase contracts, futures contracts and options may be used primarily to offset the variability in future cash flows caused by fluctuations in electricity and natural gas prices. Foreign exchange forward contracts and cross-currency swaps may be used to offset the exposures resulting from foreign-denominated long-term debt. Interest rate swaps may be used to convert the fixed interest cash flows related to interest expense at debt to floating rates and vice versa.

In a cash flow hedge, changes in the fair value of the hedging instrument (a forward contract or financial swap, for example) are recognized in risk management assets or liabilities and the related gains or losses are recognized in other comprehensive income or loss ("OCI"). These gains or losses are subsequently reclassified from OCI to net earnings (loss) in the same period as the hedged forecast cash flows impact net earnings (loss) and offset the losses or gains arising from the forecast transactions. For project hedges, the gains and losses reclassified from OCI are included in the carrying amount of the related PP&E.

Hedge accounting follows a principles-based approach for qualifying hedges that is aligned with an entity's approach to risk management. When we do not elect hedge accounting or when the hedge is no longer effective and does not qualify for hedge accounting, the gains or losses as a result of changes in prices, interest or exchange rates related to these financial instruments are recorded in net earnings (loss) in the period in which they arise.

Net Investment Hedges

Foreign-denominated long-term debt is used to hedge exposure to changes in the carrying values of our net investments in foreign operations that have a functional currency other than the Canadian dollar. Our net investment hedges using US-denominated debt remain effective and in place. Gains or losses on these instruments are recognized and deferred in OCI and reclassified to net earnings on the disposal of the foreign operation. We also manage foreign exchange risk by matching foreign-denominated expenses with revenues, such as offsetting revenues from our US operations with interest payments on our US-dollar debt.

Non-Hedges

Financial instruments not designated as hedges are used for proprietary trading and to reduce commodity price, foreign exchange and interest rate risks. Changes in the fair value of financial instruments not designated as hedges are recognized in risk management assets or liabilities and the related gains or losses are recognized in net earnings (loss) in the period in which the change occurs.

Fair Values

The majority of fair values for our project, foreign exchange, interest rate, commodity hedges and non-hedge derivatives are calculated using adjusted quoted prices from an active market or inputs validated by broker quotes. We may enter into commodity transactions involving non-standard features for which market-observable data is not available. These transactions are defined under IFRS as Level III instruments. Level III instruments incorporate inputs that are not observable from the market and fair value is therefore determined using valuation techniques. Fair values are validated by using reasonably possible alternative assumptions as inputs to valuation techniques and any material differences are disclosed in the notes to the consolidated financial statements. At Dec. 31, 2022, Level III instruments had a net liabilities carrying value of $782 million (2021 – net asset $159 million). Our risk management profile and practices have not changed materially from Dec. 31, 2021. Refer to the Material Accounting Policies and Critical Accounting Estimates section of this MD&A for further details regarding valuation techniques.

Material Accounting Policies and Critical Accounting Estimates

The selection and application of accounting policies is an important process that has developed as our business activities have evolved and as accounting rules and guidance have changed. Accounting rules generally do not involve a selection among alternatives, but involve an implementation and interpretation of existing rules and the use of judgment relative to the circumstances existing in the business. Every effort is made to comply with all applicable rules on or before the effective date and we believe the proper implementation and consistent application of accounting rules is critical.

However, not all situations are specifically addressed in the accounting literature. In these cases, our best judgment is used to adopt a policy for accounting for these situations. We draw analogies to similar situations and the accounting guidelines governing them, consider foreign accounting standards and consult with our independent auditors about the appropriate interpretation and application of these policies. Each of the critical accounting policies involves complex situations and a high degree of judgment either in the application and interpretation of existing literature or in the development of estimates that impact our consolidated financial statements.

Our material accounting policies are described in Note 2 of the consolidated financial statements. Each policy involves a number of estimates and assumptions to be made about matters that are uncertain at the time the estimate is made. Different estimates, with respect to key variables used for the calculations, or changes to estimates, could potentially have a material impact on our financial position or results of operations. Estimates to the extent to which geopolitical events such as the Russia-Ukraine conflict or inflationary and supply chain dynamics may, directly or indirectly, impact the Company's operations, financial results and conditions in future periods are also subject to significant uncertainty. Uncertainty related to COVID-19 and the geopolitical events has been considered in our estimates for the year ended Dec. 31, 2022.

We have discussed the development and selection of these critical accounting estimates with the Audit, Finance and Risk Committee ("AFRC") of the Board of Directors and our independent auditors. The AFRC has reviewed and approved our disclosure relating to critical accounting estimates in this MD&A. These critical accounting estimates are described as follows:

Revenue Recognition

Revenue from Contracts with Customers

Identification of Performance Obligations
Where contracts contain multiple promises for goods or services, management exercises judgment in determining whether goods or services constitute distinct goods or services or a series of distinct goods or services that are substantially the same and that have the same pattern of transfer to the customer. The determination of a performance obligation affects whether the transaction price is recognized at a point in time or over time. Management considers both the mechanics of the contract and the economic and operating environment of the contract in determining whether the goods or services in a contract are distinct.

Transaction Price
In determining the transaction price and estimates of variable consideration, management considers the past history of customer usage and capacity requirements when estimating the goods and services to be provided to the customer. The Company also considers the historical production levels and operating conditions for its variable generating assets.

Allocation of Transaction Price to Performance Obligations
When multiple performance obligations are present in a contract, transaction price is allocated to each performance obligation in an amount that depicts the consideration the Company expects to be entitled to in exchange for transferring the good or service.

The Company's contracts generally outline a specific amount to be invoiced to a customer associated with each performance obligation in the contract. Where contracts do not specify amounts for individual performance obligations, the Company estimates the amount of the transaction price to allocate to individual performance obligations based on their standalone selling price, which is primarily estimated based on the amounts that would be charged to customers under similar market conditions.

Satisfaction of Performance Obligations
The satisfaction of performance obligations requires management to use judgment as to when control of the underlying good or service transfers to the customer. Determining when a performance obligation is satisfied affects the timing of revenue recognition. Management considers both customer acceptance of the good or service and the impact of laws and regulations such as certification requirements, in determining when this transfer occurs. Management also applies judgment in determining whether the invoice practical expedient permits recognition of revenue at the invoiced amount if that invoiced amount corresponds directly with the entity's performance to date.

Revenue from Other Sources

Revenue from Derivatives
Commodity risk management activities involve the use of derivatives such as physical and financial swaps, forward sales contracts, futures contracts and options that are used to earn revenues and to gain market information. These derivatives are accounted for using fair value accounting. The determination of the fair value of commodity risk management contracts and derivative instruments is complex and relies on judgments concerning future prices, volatility and liquidity, among other factors. Some of our derivatives are not traded on an active exchange or extend beyond the time period for which exchange-based quotes are available, requiring us to use internal valuation techniques or other models such as numerical derivative valuation or scenario analysis.

Merchant Revenue
Revenues from non-contracted capacity (i.e., merchant) are comprised of energy payments, at market price, for each MWh produced and are recognized upon delivery.

Financial Instruments

The fair value of a financial instrument is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. Fair values can be determined by reference to prices for instruments in active markets to which we have access. In the absence of an active market, we determine fair values based on valuation models or by reference to other similar products in active markets.

Fair values determined using valuation models require the use of assumptions. In determining those assumptions, we look primarily to external readily observable market inputs. However, if not available, we use inputs that are not based on observable market data.

Level Determinations and Classifications

The Level I, II and III classifications in the fair value hierarchy are utilized by the Company. The fair value measurement of a financial instrument is included in only one of the three levels, the determination of which is based on the lowest level input that is significant to the derivation of the fair value. Refer to Note 14(B)(I) and (II) from our consolidated financial statements for further details on the inputs used for each level.

The effect of using reasonably possible alternative assumptions as inputs to valuation techniques for contracts included in the Level III fair value measurements at Dec. 31, 2022, is an estimated total upside of $193 million (2021 – $105 million) and total downside of $287 million (2021 – $220 million) impact to the carrying value of the financial instruments. The amount of $15 million upside (2021 – $22 million) and $163 million downside (2021 – $145 million) in stress value stems from a power sale contract in Pacific Northwest that is designated as a cash flow hedge. Fair values are stressed for unobservable inputs, which can include variable volumes, unobservable prices and wind discounts, among other inputs. The variable volumes are stressed up and down based on historically available production data. Prices are stressed for longer-term deals where there are no liquid market quotes using various internal and external forecasting sources to establish a high and a low price range. Wind discounts represent price to volume relationships and are stressed specific to each location.

In addition to the Level III fair value measurements discussed above, the Brookfield Investment Agreement allows Brookfield the option to exchange all of the outstanding exchangeable securities into an equity ownership interest of up to a maximum of 49 per cent in an entity formed to hold TransAlta's Alberta Hydro Assets after Dec. 31, 2024. The fair value of the option to exchange is considered a Level III fair value measurement, with an estimated downside of $25 million (2021 – $32 million) potential impact to the carrying value of nil as at Dec. 31, 2022 (2021 – nil). The sensitivity analysis has been prepared using the Company's assessment that a change in the implied discount rate of the future cash flow of one per cent is a reasonably possible change.

Valuation of PP&E and Associated Contracts

At the end of each reporting period, we assess whether there is any indication that PP&E and finite life intangible assets are impaired or whether a previously recognized impairment may no longer exist or may have decreased.

Our operations, the market and business environment are routinely monitored and judgments and assessments are made to determine whether an event has occurred that indicates a possible impairment. If such an event has occurred, an estimate is made of the recoverable amount of the asset or cash-generating unit ("CGU") to which the asset belongs. A CGU is the smallest identifiable group of assets that generates cash inflows that are largely independent of the cash inflows from other assets or groups of assets and goodwill is allocated to each CGU or group of CGUs that is expected to benefit from the synergies of the acquisition from which the goodwill arose. The recoverable amount is the higher of an asset's fair value less costs of disposal or its value in use. Fair value is the price that would be received to sell an asset in an orderly transaction between market participants at the measurement date. In determining fair value less costs of disposal, information about third-party transactions for similar assets is used and if none is available, other valuation techniques, such as discounted cash flows, are used. Value in use is computed using the present value of management's best estimates of future cash flows based on the current use and present condition of the asset. In estimating either fair value less costs of disposal or value in use using discounted cash flow methods, estimates and assumptions must be made about sales prices, cost of sales, production, fuel consumed, capital expenditures, retirement costs and other related cash inflows and outflows over the life of the facilities, which can range from 30 to 60 years. In developing these assumptions, management uses estimates of contracted and future market prices based on expected market supply and demand in the region in which the facility operates, anticipated production levels, planned and unplanned outages, changes to regulations and transmission capacity or constraints for the remaining life of the facilities.

Discount rates are determined by employing a weighted average cost of capital methodology that is based on capital structure, cost of equity and cost of debt assumptions based on comparable companies with similar risk characteristics and market data as the asset, CGU or group of CGUs subject to the test. These estimates and assumptions are susceptible to change from period to period and actual results can and often do, differ from the estimates and can have either a positive or negative impact on the estimate of the impairment charge and may be material.

The impairment outcome can also be impacted by the determination of CGUs or groups of CGUs for asset and goodwill impairment testing. The allocation of goodwill is reassessed upon changes in the composition of segments, CGUs or groups of CGUs. In respect of determining CGUs, significant judgment is required to determine what constitutes independent cash flows between power facilities that are connected to the same system. We evaluate the market design, transmission constraints and the contractual profile of each facility, as well as our commodity price risk management plans and practices, in order to inform this determination. With regard to the allocation or reallocation of goodwill, significant judgment is required to evaluate synergies and their impacts. Minimum thresholds also exist with respect to segmentation and internal monitoring activities. We evaluate synergies with regard to opportunities from combined talent and technology, functional organization and future growth potential and we consider our own performance measurement processes in making this determination. No changes arose in our CGUs in 2022.

Impairment charges can be reversed in future periods if circumstances improve. No assurances can be given if any reversal will occur or the amount or timing of any such reversal. Refer to the Financial Position section of this MD&A for further details.

Asset Impairments

Hydro
During 2022, the Company recorded net impairment charges of $21 million on four hydro facilities as a result of changes in key assumptions, that included significant increases in discount rates, changes in pricing and changes in estimated future cash flows.

Wind and Solar
During 2022, the Company recorded net impairment charges of $43 million on five wind facilities and one solar facility as a result of changes in key assumptions, that included significant increases in discount rates, changes in pricing and changes in estimated future cash flows.

Valuation of Goodwill

We evaluate goodwill for impairment at least annually, or more frequently if indicators of impairment exist. If the carrying amount of a CGU or group of CGUs, including goodwill, exceeds the unit's fair value, the excess represents a goodwill impairment loss.

For purposes of the 2022, 2021 and 2020 annual goodwill impairment reviews, the Company determined the recoverable amounts of the CGUs by calculating the fair value less costs of disposal using discounted cash flow projections based on the Company's long-range forecasts for the period extending to the last planned asset retirement in 2072. The resulting fair value measurement is categorized within Level III of the fair value hierarchy. We have determined there were no goodwill impairments for 2022, 2021 and 2020.

Determining the fair value of the CGUs or group of CGUs is susceptible to changes from period to period as management is required to make assumptions about future cash flows, including estimates of contracted and future market prices based on expected market supply and demand in the region in which the facility operates, anticipated production levels, planned and unplanned outages, changes to regulations and transmission capacity or constraints for the remaining life of the facilities.

Project Development Costs

Project development costs include external, direct and incremental costs that are necessary for completing an acquisition or construction project. The appropriateness of capitalization of these costs is evaluated each reporting period and amounts capitalized for projects no longer probable of occurring are charged to net earnings (loss).

Useful Life of PP&E

Each significant component of an item of PP&E is depreciated over its estimated useful life. A component is a tangible asset that can be separately identified as an asset and is expected to provide a benefit of greater than one year. Estimated useful lives are determined based on current facts and past experience and take into consideration the anticipated physical life of the asset, existing long-term sales agreements and contracts, current and forecasted demand, the potential for technological obsolescence and regulations. The useful lives of PP&E and depreciation rates used are reviewed at least annually to ensure they continue to be appropriate.

Change in Estimate - Useful Lives
During 2022, the Company adjusted the useful lives of certain assets included in the Gas segment to reflect changes made based on the future operating expectations of the assets. This resulted in an increase of $132 million in depreciation expense that was recognized in the Consolidated Statement of Earnings (Loss) in 2022.

Leases

In determining whether our contracts contain, or are, leases, management must use judgment in assessing whether the contract provides the customer with the right to substantially all of the economic benefits from the use of the asset during the lease term and whether the customer obtains the right to direct the use of the asset during the lease term. For those agreements considered to contain, or be, leases, further judgment is required to determine the lease term by assessing whether termination or extension options are reasonably certain to be exercised. Judgment is also applied in identifying in-substance fixed payments (included) and variable payments that are based on usage or performance factors (excluded) and in identifying lease and non-lease components (services that the supplier performs) of contracts and in allocating contract payments to lease and non-lease components.

For leases where we are a lessor, judgment is required to determine if substantially all of the significant risks and rewards of ownership are transferred to the customer or remain with us, to appropriately account for the agreement as either a finance or operating lease. These judgments can be significant and impact how we classify amounts related to the arrangement as either PP&E or as a finance lease receivable on the Consolidated Statements of Financial Position and therefore the amount of certain items of revenue and expense are dependent upon such classifications.

Income Taxes

Preparation of the consolidated financial statements involves determining an estimate of, or provision for, income taxes in each of the jurisdictions in which we operate. The process also involves making an estimate of taxes currently payable and income taxes expected to be payable or recoverable in future periods, referred to as deferred income taxes. An assessment must also be made to determine the likelihood that our future taxable income will be sufficient to permit the recovery of deferred income tax assets. To the extent that such recovery is not probable, deferred income tax assets must be reduced. The reduction of the deferred income tax asset can be reversed if the estimated future taxable income improves. No assurances can be given if any reversal will occur or the amount or timing of any such reversal. Management must exercise judgment in its assessment of continually changing tax interpretations, regulations and legislation to ensure deferred income tax assets and liabilities are complete and fairly presented. Differing assessments and applications than our estimates could materially impact the amount recognized for deferred income tax assets and liabilities. Our tax filings are subject to audit by taxation authorities. The outcome of some audits may change our tax liability, although we believe that we have adequately provided for income taxes in accordance with IFRS based on all information currently available. The outcome of pending audits is not known nor is the potential impact on the consolidated financial statements determinable.

Employee Future Benefits

We provide selected pension and other post-employment benefits to employees, such as health and dental benefits. The cost of providing these benefits is dependent upon many factors, including actual plan experience and estimates and assumptions about future experience.

The liabilities for pension, other post-employment benefits and associated pension costs included in annual compensation expenses are impacted by employee demographics, including age, compensation levels, employment periods, the level of contributions made to the plans and earnings on plan assets.

Changes to the provisions of the plans may also affect current and future pension costs. Pension costs may also be significantly impacted by changes in key actuarial assumptions, including, for example, the discount rates used in determining the defined benefit obligation and the net interest cost on the net defined benefit liability. The discount rate used to estimate our obligation reflects high-quality corporate fixed income securities currently available and expected to be available during the period to maturity of the pension benefits.

Defined Benefit Obligation

The liability for pension and post-employment benefits and associated costs included in compensation expenses are impacted by estimates related to changes in key actuarial assumptions, including discount rates. The defined benefit obligation has decreased by $78 million to $150 million as at Dec. 31, 2022, from $228 million as at Dec. 31, 2021. The decrease is primarily driven by increases in discount rates in 2022, largely driven by increases in market benchmark rates and the voluntary contribution of $35 million made to the Sunhills Mining Ltd. Pension Plan, partially offset by a decrease in plan assets due to poor market returns.

The Company made a voluntary contribution of $35 million during 2022 to further improve the funded status of the Sunhills Mining Ltd. Pension Plan for the Highvale mine and to support the employees affected by the closure of the Highvale mine in 2021 and our transition off-coal to cleaner sources. The contribution reduces the amount of the Company's future funding obligations, including amounts secured by the letters of credit.

A 1 per cent increase in discount rates would have a $39 million impact on the defined benefit obligation.

Decommissioning and Restoration Provisions

We recognize decommissioning and restoration provisions for generating facilities and mine sites in the period in which they are incurred if there is a legal or constructive obligation to remove the facilities and restore the site. The amount recognized as a provision is the best estimate of the expenditures required to settle the provision. Expected values are probability weighted to deal with the risks and uncertainties inherent in the timing and amount of settlement of many decommissioning and restoration provisions. Expected values are discounted at the current market-based risk-free interest rate adjusted to reflect the market’s evaluation of our credit standing.

The Company recognizes provisions for decommissioning obligations. Initial decommissioning provisions and subsequent changes thereto, are determined using the Company’s best estimate of the required cash expenditures, adjusted to reflect the risks and uncertainties inherent in the timing and amount of settlement.

During 2022, the Company accelerated the expected timing on decommissioning and restoration for certain facilities. This increased the decommissioning and restoration provision by $95 million of which $46 million increased operating assets in PP&E and $49 million was recognized as an impairment charge in net earnings related to retired assets.

In 2021, the Company increased the decommissioning and restoration provision $167 million related to an engineering study on the decommissioning costs of the wind sites of $120 million and the Sundance and Keephills Units useful lives of $47 million. Of the total increase in decommissioning and restoration provisions, $133 million increased operating assets in PP&E and $34 million was recognized as an impairment charge in net earnings related to retired assets.

During 2022, the decommissioning and restoration provision decreased by $225 million (2021 – $6 million) due to a significant increase in discount rates, largely driven by increases in market benchmark rates. On average, discount rates increased with rates ranging from 7.0 to 9.7 per cent as at Dec. 31, 2022 (2021 –3.6 to 6.5 per cent). This has resulted in a corresponding decrease in PP&E of $123 million (2021 – $6 million) on operating assets and recognition of a $102 million (2021 – nil) impairment reversal in net earnings related to retired assets.

We estimate the undiscounted amount of cash flow required to settle the decommissioning and restoration provisions is approximately $1.6 billion, which will be incurred between 2023 and 2072. The majority of these costs will be incurred between 2023 and 2050.

Other Provisions

Where necessary, we recognize provisions arising from ongoing business activities, such as interpretation and application of contract terms, ongoing litigation and force majeure claims. These provisions and subsequent changes thereto, are determined using our best estimate of the outcome of the underlying event and can also be impacted by determinations made by third parties, in compliance with contractual requirements. The actual amount of the provisions that may be required could differ materially from the amount recognized.

Classification of Joint Arrangements

Upon entering into a joint arrangement, the Company must classify it as either a joint operation or joint venture and the classification affects the accounting for the joint arrangement. In making this classification, the Company exercises judgment in evaluating the terms and conditions of the arrangement to determine whether the parties have rights to the assets and obligations or rights to the net assets. Factors such as the legal structure, contractual arrangements and other facts and circumstances, such as where the purpose of the arrangement is primarily for the provision of the output to the parties and when the parties are substantially the only source of cash flows for the arrangement, must be evaluated to understand the rights of the parties to the arrangement.

Significant Influence

Upon entering into an investment, the Company must classify it as either an investment as an associate or an investment under IFRS 9. In making this classification, the Company exercises judgment in evaluating whether the Company has significant influence over the investee. Significant influence is the power to participate in the financial and operating policy decisions of the investee, but is not control or joint control over those policies. If the Company holds 20 per cent or more of the voting rights in the investee, it is presumed that the entity has significant influence, unless it can be clearly demonstrated that this is not the case. Other factors such as representation on the board of directors, participation in policy-making processes, material transactions between the Company and investee, interchange of managerial personnel or providing essential technical information are considered when assessing if the Company has significant influence over an investee.

Accounting Changes

Current Accounting Changes

Amendments to International Accounting Standards ("IAS") 37 Provisions, Contingent Liabilities and Contingent Assets

On May 14, 2020, the IASB issued Onerous Contracts – Cost of Fulfilling a Contract and amendments to IAS 37 Provisions, Contingent Liabilities and Contingent Assets to specify which costs to include when assessing whether a contract will be loss-making. The amendments are effective for annual periods beginning on or after Jan. 1, 2022, and the Company adopted these amendments as of Jan. 1, 2022. The amendments are effective for contracts for which an entity has not yet fulfilled all its obligations on or after the effective date. No adjustments resulted on adoption of the amendments on Jan. 1, 2022.

Future Accounting Changes

Amendments to IAS 12 Deferred Tax Related to Assets and Liabilities Arising from a Single Transaction

On May 7, 2021, the IASB issued amendments to IAS 12 Deferred Tax Related to Assets and Liabilities Arising from a Single Transaction. The amendments clarify that the initial recognition exemption under IAS 12 does not apply to transactions such as leases and decommissioning obligations. These transactions give rise to equal and offsetting temporary differences in which deferred tax should be recognized.

The amendments are effective for annual periods beginning on or after Jan. 1, 2023, with early application permitted. The Company's current position aligns with the amendment and no financial impact is therefore expected upon adoption on the effective date.

Amendments to IAS 1 Classification of Liabilities as Current or Non-Current

In October 2022, the IASB issued amendments to clarify how conditions with which an entity must comply within 12 months after the reporting period affect the classification of a liability, in addition to the amendment from January 2020 where the IASB issued amendments to IAS 1 Presentation of Financial Statements, to provide a more general approach to the presentation of liabilities as current or non-current based on contractual arrangements in place at the reporting date. These amendments specify that the rights and conditions existing at the end of the reporting period are relevant in determining whether the Company has a right to defer settlement of a liability by at least 12 months, provided that management's expectations are not a relevant consideration as to whether the Company will exercise its rights to defer settlement of a liability and clarify when a liability is considered settled.

The amendments are effective for annual periods beginning on or after Jan. 1, 2024, and are to be applied retrospectively. The Company has not yet determined the impact of these amendments on its consolidated financial statements.

Amendments to IFRS 16 Lease Liability in a Sale-and-Leaseback

In September 2022, the IASB issued Lease Liability in a Sale and Leaseback, which amends IFRS 16 Leases to provide additional specifications when subsequently measuring the lease liability that require the seller-lessee to determine lease payments and revised lease payments in a way that does not result in the seller-lessee recognizing any amount of the gain or loss that relates to the right of use it retains. The current effective date is Jan. 1, 2024. The Company is currently reviewing the impacts of this amendment on its consolidated financial statements.

Comparative Figures

Certain comparative figures have been reclassified to conform to the current period’s presentation. These reclassifications did not impact previously reported net earnings (loss).

Environmental, Social and Governance

Sustainability, or ESG management and performance, is a priority at TransAlta. Sustainability is one of our core values, which means it is part of our corporate culture. We perpetually strive to further integrate sustainability into our governance, decision-making, risk management and day-to-day business processes, while enabling our growth strategy. The ultimate outcome of our sustainability focus is continuous improvement on key, material ESG issues and ensuring our economic value creation is balanced with a value proposition for the environment and our stakeholders.

Our key strategic sustainability pillars build on our corporate strategy and weave through our business. Our track record in these areas illustrates our commitment to sustainability (including climate change leadership and safety). In other areas, where we have set new goals in recent years (including equity, diversity and inclusion), we believe the focus will only strengthen our corporate strategy and support value creation into the future. Our pillars include:

- **Clean, Reliable and Sustainable Electricity Production**
- **Safe, Healthy, Diverse and Engaged Workplace**
- **Positive Indigenous, Stakeholder and Customer Relationships**
- **Progressive Environmental Stewardship**
- **Technology and Innovation**

Reporting on Our Material Sustainability Factors

TransAlta has been reporting on sustainability since 1994. The Company's ESG reporting content is integrated within this MD&A to provide information on how ESG affects our business (including material focus areas) and is guided by leading ESG reporting frameworks. We adopt guidance from the International Integrated Reporting Framework, the Global Reporting Initiative and the Sustainability Accounting Standards Board ("SASB") requirements for electric utilities and power generators. We continue to monitor the development of sustainability and climate-related disclosure requirements to assess our future reporting, such as the International Sustainability Standards Board (“ISSB”), the Taskforce on Nature-related Financial Disclosures (“TNFD”), the Canadian Securities Administrators, and the U.S. Securities and Exchange Commission.

Climate-related data to be disclosed is informed by the recommendations of the Task Force on Climate-related Financial Disclosures ("TCFD") and climate change questionnaires from CDP (the global disclosure system for environmental impacts known formerly as the Carbon Disclosure Project). In 2022, we reviewed and updated our management response to our 2021 climate-related scenario analysis that enhanced our alignment with both international sustainability frameworks. We also developed our first consolidated Climate Transition Plan and prepared climate-related financial metrics. GHG emissions data for scopes 1 and 2 follow the accounting and reporting standards of the GHG Protocol. We continue to improve our scope 3 accounting for future reporting in alignment with the GHG Protocol. For further information on climate change management and the findings of our scenario analysis, refer to the Decarbonizing Our Energy Mix section of this MD&A.

The disclosure of our most relevant sustainability factors is guided by our sustainability materiality assessment. In 2022, we refreshed our materiality assessment by evaluating key sector-specific research on material issues, supported by internal and external engagement on key sustainability issues. Our Enterprise Risk Management ("ERM") program is designed to help the organization focus its efforts on key enterprise risks, within the planning horizon, that could significantly impact the success of its strategy, including its sustainability objectives. We consider a sustainability factor as material if it could substantively affect our ability to create value.

In 2022, we reviewed key topics identified within SASB, TCFD, IFRS and TNFD to inform the identification of our material sustainability factors. We also considered sustainability factors from the electricity sector through Electricity Canada’s 2021 Sustainable Electricity Report. In addition, we conducted a peer review of material sustainability factors. This work was validated by our executive team and resulted in the identification of 21 material sustainability factors presented in the Sustainability Governance section of this MD&A.

For further guidance on our risk factors, refer to the Governance and Risk Management section of this MD&A.

Accelerating Our Business Transformation to Become Net-Zero by 2045

At TransAlta, our mission is to provide safe, low-cost and reliable clean electricity to our customers. As a customer-centred clean electricity leader, we are well positioned to support our customers' ESG and sustainability goals. To achieve this goal, in today's evolving economy and increasingly electrified world, our strategy focuses on renewable electricity growth and a deep commitment to sustainability. We believe that we are uniquely positioned as the world continues to electrify and adopt sustainability practices. For further information, refer to the Description of the Business section of this MD&A.

Our President and Chief Executive Officer, John Kousinioris, speaks about our decarbonization journey below.

TransAlta has adopted a 2045 net-zero target. Why did the company choose to take that step?

"Our new net-zero target is a function of our growth strategy. Simply put, by focusing on growing our contracted renewable assets, we are growing our business and not our emissions. This type of growth, along with our investments in new technologies and ongoing participation in environmental markets, makes us confident that we will be able to reach this new target. We believe it is important for the Company to publicly hold itself accountable for delivering these results and ensuring our investors, customers and stakeholders are aware of where we are going in this important effort."

How does the Company's strategy align with the Paris Agreement goals?

"We are committed to maintaining a leadership position in climate change and contributing to a net-zero future. Our growth strategy focuses on renewable and storage projects, which is in line with the Paris Agreement goal to limit global warming to 1.5°C. On a percentage basis, TransAlta has already achieved emissions reductions beyond the 2030 national targets in our operating jurisdictions and we anticipate further reductions before the end of the decade. Our GHG reduction trajectory is consistent with the Paris Agreement. Our public policy engagement is aligned with TransAlta's climate change commitments, and supports appropriate policy measures to mitigate climate risks."

What technologies will TransAlta adopt to help customers to decarbonize?

"TransAlta helps our customers by delivering and operating reliable renewable and storage projects and on-site generation that meet their needs. Underneath that core commitment is a set of technologies and contracting options that we tailor to ensure customers receive the energy they require and the environmental outcomes that are aligned with their ESG commitments. Since 2021, our Energy Innovation team has been building our expertise in emerging technologies. This work led to a $2 million equity investment in Ekona for commercialization of a methane pyrolysis technology platform, which produces cleaner and lower-cost turquoise hydrogen. We have also committed to investing US$25 million over the next four years in the Energy Impact Partners Frontier Fund 1. This allows us to identify, pilot and commercialize technologies that will support our decarbonization goals. We will continue to make strategic investments moving forward. In doing so, we will strengthen our position as a customer-centric clean electricity partner and mitigate technology risks to our merchant assets."

How can the Company make its energy transition work for people?

"Our energy transition is focused on implementing decarbonization strategies within an inclusive transition framework. For example, since 2015, TransAlta has been investing US$55 million over 10 years to support energy efficiency, economic and community development, education and retraining initiatives in Washington State. In Alberta, since 2016, we have committed to investing in programs and initiatives to support the communities surrounding the plants negatively impacted by the phase-out of coal generation during the transition. We can never understate the difficulty of these transitions for our workers and the communities where our operations are changing. Our goal is to work through the transition and contribute to a positive future where new opportunities emerge."

2023+ Sustainability Targets

Our 2023 and longer-term sustainability targets support the success of our business so that the Company will continue to be positioned as an ESG leader in the future. Goals and targets are established to improve our ESG performance and manage current and emerging material sustainability issues in support of the United Nations Sustainable Development Goals ("UN SDGs") and the Future-Fit Business Benchmark, which also defines sustainable goals for businesses. TransAlta is committed to decarbonizing our energy generation and accelerating clean energy growth. We believe that we can make a greater positive impact on UN SDG 7 “Affordable and Clean Energy” and SDG 13 “Climate Action”, while supporting seven other SDGs.

TransAlta has adopted five new sustainability targets in the areas of climate change, biodiversity, safety and supply chain.

We adopted a more stringent climate-related target to achieve net-zero for 100 per cent of TransAlta’s scope 1 and 2 GHG emissions by 2045. In 2021, TransAlta approved a climate-related target to reduce 75 per cent of our scope 1 and 2 GHG emissions by 2026 from a 2015 base year. We estimate that this target is in line with the latest climate science and the electricity sector decarbonization pathway to limit global warming to 1.5°C and meet the Paris Agreement goals. We have also committed to verifying and disclosing 80 per cent of our total scope 3 emissions by 2024.

In addition, TransAlta approved two new biodiversity targets that support the intent of the TNFD recommendations.

We also enhanced the target of our Total Recordable Injury Frequency ("TRIF") and a new supply chain target was set to integrate sustainability considerations into our supply chains.

Our targets to reduce air emissions and fleet-wide water consumption were achieved in 2022, four years ahead of the 2026 target date. In 2023, we will review setting new targets for air emissions and water consumption consistent with our commitment to continuously improve our environmental performance.

Targets are outlined below:

ESG Alignment: Environmental

Sustainability goal	Sustainability target	Alignment with UN SDG Target or Future-Fit Business Benchmark
Reclaim land utilized for mining	By 2040, complete full reclamation of our Centralia coal mine in Washington State	Future-Fit Business Benchmark: "Positive Pursuits 13: Ecosystems are restored"
	By 2046, complete full reclamation of our Highvale coal mine in Alberta	Future-Fit Business Benchmark: "Positive Pursuits 13: Ecosystems are restored"
Responsible water management	By 2026, reduce fleet-wide water consumption (withdrawals minus discharge) by 20 million m^3 or 40 per cent over the 2015 baseline	UN SDG Target 6.4: "By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity"
Reduce air emissions	By 2026, achieve a 95 per cent reduction of SO_2 emissions and an 80 per cent reduction of NO_x emissions below 2005 levels	UN SDG Target 9.4: "By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes"
Protecting nature and biodiversity	By 2024, assess and disclose nature-related risks and opportunities including TransAlta’s dependencies and impacts on ecosystems, land, water and air	UN SDG Target 15.5: "Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species”
	Achieve zero biodiversity-related incidents	

Sustainability goal	Sustainability target	Alignment with UN SDG Target or Future-Fit Business Benchmark
Reduce GHG emissions	By 2026, achieve a 75 per cent reduction of scope 1 and 2 GHG emissions from 2015 base year	UN SDG Target 13.2: "Integrate climate change measures into national policies, strategies and planning"
	By 2045, achieve net-zero for 100 per cent of TransAlta's scope 1 and 2 GHG emissions	
	By 2024, verify and disclose 80 per cent of TransAlta's scope 3 emissions	

ESG Alignment: Social

Sustainability goal	Sustainability target	Alignment with UN SDG Target or Future-Fit Business Benchmark
Reduce safety incidents	Achieve a Total Recordable Injury Frequency rate below 0.32	UN SDG Target 8.8: "Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment"
Integrate sustainability into supply chain	By 2024, 80 per cent of our spend will be with suppliers that have a sustainability policy or commitment	UN SDG Target 12.7: "Promote public procurement practices that are sustainable, in accordance with national policies and priorities"
Support prosperous Indigenous communities	Support equal access to all levels of education for youth and Indigenous peoples through financial support and employment opportunities	UN SDG Target 4.5: "By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, Indigenous peoples and children in vulnerable situations"
	Provide Indigenous cultural awareness training to all TransAlta employees by the end of 2023	UN SDG Target 12.8: "By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature"

ESG Alignment: Governance

Sustainability goal	Sustainability target	Alignment with UN SDG Target or Future-Fit Business Benchmark
Strengthen gender equality	Achieve 50 per cent female representation on the Board by 2030	UN SDG Target 5.5: "Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision making in political, economic and public life"
	Achieve at least 40 per cent female employment among all employees of the Company by 2030	
	Maintain equal pay for women in equivalent roles as men	
Demonstrate leadership on ESG reporting within financial disclosures	Maintain our position as a leader on integrated ESG disclosure through increased annual alignment with leading sustainability disclosure frameworks	UN SDG Target 12.6: "Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle"

ESG Alignment: Environmental and Social

Sustainability goal	Sustainability target	Alignment with UN SDG Target or Future-Fit Business Benchmark
Coal transition	No further coal generation by the end of 2025 with 100 per cent of our owned net generation capacity to be from renewables and gas	UN SDG Target 7.1: "By 2030, ensure universal access to affordable, reliable and modern energy services"
Clean energy solutions for customers	Develop new renewable projects that support customer sustainability goals to achieve both long-term power price affordability and carbon reductions	UN SDG Target 7.2: "By 2030, increase substantially the share of renewable energy in the global energy mix"

Our 2022 Sustainability Performance

In 2022, we achieved our target to reduce TransAlta's total waste generation by 80 per cent over a 2019 baseline. We also achieved our 2026 targets to reduce air emissions and water consumption. In 2022, TransAlta's strong safety performance was a key accomplishment amongst our social performance metrics. Our TRIF exceeded our exceptional performance target and was our best on record.

Performance against our 2022 sustainability targets is outlined below:

ESG Alignment: Environmental

Sustainability goal	Sustainability target	Results	Comments
Reclaim land utilized for mining	By 2040, complete full reclamation of our Centralia coal mine in Washington State	On track	Reclamation work at Centralia is underway
	By 2046, complete full reclamation of our Highvale coal mine in Alberta	On track	Our Highvale coal mine in Alberta closed on Dec. 31, 2021, and reclamation is underway
Responsible water management	By 2026, reduce fleet-wide water consumption (withdrawals minus discharge) by 20 million m^3 or 40 per cent over a 2015 baseline	Achieved	Since 2015, we have reduced our fleet-wide water consumption by 20 million m^3 or 43 per cent
Reduce operational waste	By 2022, reduce total waste generation by 80 per cent over a 2019 baseline	Achieved	In 2022, we reduced total waste generation by 1,325,000 tonnes equivalent or 86 per cent over 2019 levels
Reduce air emissions	By 2026, achieve a 95 per cent reduction of SO_2 emissions and an 80 per cent reduction of NOx emissions below 2005 levels	Achieved	Since 2005, we have reduced SO_2 emissions by 98 per cent and NO_x emissions by 83 per cent
Reduce GHG emissions	By 2026, achieve a 75 per cent reduction of scope 1 and 2 GHG emissions from a 2015 base year	On track	Since 2015, we have reduced GHG emissions by 68 per cent. In 2022, we reduced approximately 2.3 million tonnes of CO_2e or 18 per cent over 2021 levels
	By 2050, achieve carbon neutrality	On track	

ESG Alignment: Social

Sustainability goal	Sustainability target	Results	Comments
Reduce safety incidents	Achieve a Total Recordable Injury Frequency rate below 0.61	Achieved	In 2022, we achieved a TRIF of 0.39 compared to 0.82 in 2021. Our strong safety performance can be attributed to our focus on maturing our safety culture, reducing hazards, assessing and addressing risk tolerance and standardizing safety information and data collection technology
Support prosperous Indigenous communities	Support equal access to all levels of education for youth and Indigenous peoples through financial support and employment opportunities	Achieved	Support in 2022 represented a total value of $457,000. For the 2021/2022 year, this included funding for 20 students through our partnership with Indspire and support for the Southern Alberta Institute of Technology academic upgrading program for Indigenous students
	Provide Indigenous cultural awareness training to all TransAlta employees by the end of 2023	On track	In 2022, we provided Indigenous awareness training to all Canadian employees. Australian and US employees will receive the training by the end of 2023

ESG Alignment: Governance

Sustainability goal	Sustainability target	Results	Comments
Strengthen gender equality	Achieve 50 per cent female representation on the Board by 2030	On track	As of Dec. 31, 2022, women made up 36 per cent of our total Board composition compared to 42 per cent in 2021, due to the retirement of one female Board member
	Achieve at least 40 per cent female employment among all employees of the Company by 2030	On track	As of Dec. 31, 2022, women made up 26 per cent of all employees, an increase over 2021 levels (24 per cent)
	Maintain equal pay for women in equivalent roles as men	Achieved	In 2022, we achieved a 99 per cent female/male pay equity ratio. We reviewed base compensation levels for non-executive, non-union employees, comparing female pay to male pay for employees in comparable positions
Demonstrate leadership on ESG reporting within financial disclosures	Maintain our position as a leader on integrated ESG disclosure through increased annual alignment with leading sustainability disclosure frameworks	Achieved	In 2022, we received an 'A-' score with CDP (the global disclosure system for environmental impacts known formerly as the Carbon Disclosure Project). This is higher than the North America regional average of C and the thermal power generation sector average of B. In 2022, TransAlta's MSCI ESG Rating was upgraded to 'A' from 'BBB'. The upgrade reflects the Company's strong renewable energy growth compared to peers

ESG Alignment: Environmental and Social

Sustainability goal	Sustainability target	Results	Comments
Leading clean power company by 2025	No further coal generation by the end of 2025 with 100 per cent of our owned net generation capacity to be from clean electricity (renewables and gas)	On track	In 2021, we retired or converted all coal plants in Canada and closed the Highvale coal mine, thus ceasing all coal generation in Canada. Our Centralia plant in the US is set to retire on Dec. 31, 2025
Clean energy solutions for customers	Develop new renewable projects that support customer sustainability goals to achieve both long-term power price affordability and carbon reductions	On track	In 2022, we have successfully delivered 800 MW of new growth or 40 per cent of incremental renewable capacity. We are on track to meet the target of 2 GW by 2025, as part of our Clean Electricity Growth Plan

Decarbonizing Our Energy Mix

ESG is more than a business strategy at TransAlta; it is a competitive advantage. Sustainability is one of our core values; therefore, we strive to integrate climate change into governance, decision-making, risk management and our day-to-day business operations. The outcome of our climate change focus is continuous improvement on key climate-related issues and ensuring our economic value creation is balanced with a value proposition for the environment and people.

We recognize the impact of climate change on society and our business both today and into the future. Our renewable energy commitment began 111 years ago when we built the first hydro assets in Alberta, which still operate today. In 1997, we began operating our first wind facility, in 2014, our first solar facility and, in 2020, our first battery storage facility. Today, we operate over 50 renewable facilities across Canada, the US and Australia.

Our reporting on climate change management has been guided by the TCFD recommendations since 2018. This framework helps inform discussion and provide context on how climate change affects our business.

Strategy and Risk Management

Climate Change Strategy

As described in the following sections, our risks and opportunities assessment and climate scenarios analysis support the development and continuous improvement of our climate change strategy. We actively monitor and manage climate-related risks and opportunities as part of our overall business strategy to ensure we remain resilient across all scenarios.

TransAlta remains committed to creating a path to resiliency in a decarbonizing world in support of the goals adopted under the Paris Agreement, and the goals adopted during subsequent international climate meetings. Our strategy is focused on the operation of our existing assets (wind, hydro, solar, natural gas, battery storage and coal), the phase-out of coal-fired electricity generation, and the development of renewable energy and storage projects. Our customers are increasingly integrating ESG risk into their business decisions; therefore, we see an advantage in growing our clean power business to support our customers' sustainability goals. Our investments and growth in renewable energy are highlighted by our portfolio of renewable energy-generating assets. From 2000 to 2022, we grew our nameplate renewables capacity from approximately 900 MW to over 2,900 MW. Today, our diversified renewable fleet makes us one of the largest renewable power producers in North America, one of the largest producers of wind power in Canada and the largest producer of hydro power in Alberta.

Another way we contribute to our customers' sustainability goals is through environmental attributes. The environmental attributes that we generate include carbon offsets, renewable energy credits and emission offsets. Our customers can use environmental attributes to lower compliance costs attributed to carbon policies or renewable portfolio standards. Further, environmental attributes can help achieve voluntary corporate sustainability or carbon reduction goals.

To combat the challenges of renewable energy intermittency, we continue to invest in battery storage. In 2020, we launched WindCharger, a "first of its kind in Alberta" battery storage project that stores energy produced by our Summerview II wind facility and discharges electricity onto the Alberta grid during system supply shortages, as well as providing critical system support services to the system operator. Further, in 2021, we agreed to provide solar electricity supported with a battery energy storage system to BHP Nickel West through the construction of the Northern Goldfields solar project in Western Australia. This project will support BHP in meeting its emissions reduction targets and delivering lower-carbon, sustainable nickel to its customers. The Northern Goldfields solar project is on track to be completed in early 2023 and is expected to reduce BHP's scope 2 electricity GHG emissions by 540,000 tonnes of CO_2e over the first 10 years of operation. In 2022, TransAlta entered into an engineering, procurement and construction agreement for the expansion of the Mount Keith 132kV transmission system to support the Northern Goldfields solar project. The expansion will facilitate the connection of additional generating capacity to our network to support BHP's operations and increase its competitiveness as a supplier of low-carbon nickel.

In support of our own path to climate resiliency, we have taken significant steps to reduce our carbon footprint over the last several years. In 2021, we adopted a more stringent climate-related target to reduce 75 per cent of our scope 1 and 2 GHG emissions by 2026 from a 2015 base year. We estimate that this target is in line with the latest climate science and the electricity sector decarbonization pathway to limit global warming to 1.5°C and meet the Paris Agreement goals. Furthermore, we adopted an accelerated long-term climate-related target to achieve net-zero for 100 per cent of TransAlta's scope 1 and 2 GHG emissions by 2045. This ambitious target aligns us with the Canadian Net-Zero Emissions Accountability Act to achieve net-zero emissions by 2050.

We are also taking strategic steps to decarbonize the power sector and support the energy transition. In 2022, we achieved a cumulative progress of 800 MW toward our Clean Electricity Growth Plan announced in 2021. The plan will see the Company execute on 2 GW of renewables growth by 2025 and a 5 GW growth pipeline by 2025. In 2023, we are targeting final investment decisions on 500 MW of additional clean energy projects across Canada, the US and Australia. In 2025, we will retire our single remaining coal unit, located in the US, to complete TransAlta's transition away from coal generation.

To date, we have retired 4,664 MW of coal-fired generation capacity since 2018 while converting 1,659 MW to natural gas. Comparatively, our converted natural gas units' CO_2 intensity is approximately 57 per cent less than coal generation. Repurposing the facilities rather than decommissioning them reduces the cost and emissions associated with new construction and aligns with the UN SDGs, specifically "Goal 9: Industry, Innovation and Infrastructure." The completed conversions and the closure of the Highvale coal mine also contribute to the goals of the Powering Past Coal Alliance, which TransAlta joined in 2021 at COP26.

We actively engage policymakers and stakeholders on how to facilitate a transition where the electricity systems we serve can reach net-zero emissions while maintaining reliability. We will continue investing in renewables and assessing the best options to deliver energy storage, including incorporating learnings from our industrial-scale battery into our Company strategy and sharing those learnings with government. At the same time, natural gas will play an essential role in the electricity sector, providing dispatchable generation to support current system demands and a smooth energy transition. We always seek energy-efficiency improvements and opportunities to achieve emissions reductions at competitive costs. Further, we are committed to investing in climate change mitigation solutions to maximize value for our shareholders, customers, local communities and the environment.

Climate Transition Plan

A climate-related transition plan describes how a company aims to minimize climate-related risks and increase opportunities, in alignment with the TCFD recommendations. In 2022, TransAlta developed its first consolidated Climate Transition Plan, which lays out our approach to reducing operational and value chain emissions to deliver net-zero operations by 2045. In addition, our Climate Transition Plan includes sustainable finance and inclusive transition actions reflecting TransAlta's commitment to a successful transition toward a low-carbon economy. For further information, refer to Sustainable Finance in the Decarbonizing Our Energy Mix section of this MD&A and Inclusive Transition in the Engaging with Our Stakeholders to Create Positive Relationships section of this MD&A.

Our Climate Transition Plan defines TransAlta's past, short-term (2023-2025) and medium- to long-term actions (beyond 2026). For each of these actions, we assessed our ability to control ("C") intended outcomes, partner ("P") with stakeholders to drive outcomes or influence ("I") outcomes that will help us achieve our decarbonization targets.

The highest level of climate change oversight, including the actions of our Climate Transition Plan, is at the Board level. For further information, refer to Oversight by the Board of Directors in the Climate Change Governance section of this MD&A. Information on executive compensation linked to climate-related targets is described in ESG-Linked Compensation in the Building a Diverse and Inclusive Workforce section of this MD&A. Metrics and targets supporting our Climate Transition Plan, including climate-related financial metrics, are described in Climate Change Metrics and Targets in the Decarbonizing Our Energy Mix section of this MD&A.

Delivering Net-Zero Operations by 2045

	Past actions	Short-term actions (2023-2025)	Medium to long-term actions (2026 +)
Hydro	Became the largest producer of hydro power in Alberta (C)	Deliver 2 GW of incremental renewable capacity with a targeted capital investment of $3.6 billion by the end of 2025 (C) Achieve 70 per cent of EBITDA from renewables and storage by the end of 2025 (C) Accelerate growth in customer-centred renewable energy solutions through the deployment of our 5 GW development pipeline by the end of 2025 (C)	Enable a two-fold increase in renewables by 2030 (C) Develop new opportunities for growth in renewables and storage by 2030 (C)
Wind and Solar	From 2000 to 2022, we grew our nameplate renewables capacity by approximately 2,000 MW (C) In 2022, announced 200 MW of new build projects and 100 MW of advanced-stage wind development projects (C)		
Battery Storage	First battery storage facility delivered in 2020 (C) In 2022, started the construction of a 48 MW solar and battery storage system in Australia (C)	Develop up to 180 MW battery storage in Canada (C) Evaluate and deploy battery storage alongside renewable facilities where appropriate (C)	
Natural Gas	Completed our coal-to-gas conversions in Canada in 2021 (C) Converted 1,659 MW from coal to natural gas since 2018 (C)	Operate simple-cycle, combined-cycle and cogeneration facilities in Canada, the United States and Australia (C) Assess deployment of nature-based or engineered solutions to neutralize unabated gas-fired generation where appropriate (C) Evaluate use of renewable and low-carbon natural gas (C)	Neutralize residual emissions from gas-fired generation through fuel switching, new technologies or nature-based solutions (C)
Emerging Abatement Technologies and Solutions	Started exploring new technologies such as storage, hydrogen and carbon capture (P) In 2022, supported the development of low-cost, low-emissions hydrogen production through $2 million investment in a Canadian-based venture (P)	Identify the next generation of power solutions and technologies and potential for parallel investments in new complementary sectors by the end of 2025 (P) Assess ways to support customers with broader decarbonization technologies beyond electrification (P) Partner with leading global companies to target early-stage revolutionary technologies through a US$25 million investment in a deep decarbonization fund (P) Identify opportunities to partner, pilot and deploy novel, net-zero generation technologies (P) Assess and deploy GHG removal technologies where appropriate (C)	Deploy new net-zero generation technologies and solutions where appropriate (C) Choose materials, products and processes that generate fewer GHG emissions, mainly through energy savings (C)
Energy Transition (Coal)	Retired 4,664 MW of coal-fired generation capacity since 2018 including ending coal generation in Canada in 2021 (C) Closed last coal mine in 2021 (C)	Continue to execute reclamation work at our coal mines (C) Contribute to a circular economy through mining waste reuse or by-product sales (C)	Cease coal generation by 2026 (C) Complete full reclamation in Washington State by 2040 and in Alberta by 2046 (C)

Legend: (C) Control intended outcomes, (P) partner with stakeholders to drive outcomes, and (I) influence outcomes that will help us achieve our decarbonization targets.

Delivering Net-Zero Operations by 2045 (Continued)

	Past actions	Short-term actions (2023-2025)	Medium to long-term actions (2026 +)
Supply Chain	Enhanced supplier management functionality within the corporate procurement system (C)	Develop ESG criteria for supply chain engagement (C) Understand direct suppliers, GHG emissions profile and targets (C) Incorporate ESG data reporting capability in corporate procurement system (C)	Engage with suppliers to explore enhancement of their GHG emissions reduction targets (I) Set direction for engaging suppliers with GHG emissions reduction targets (C)
Value Chain	Disclosed range of scope 3 GHG emissions at company level (C)	Update scope 3 GHG emissions reporting methodology (C) Verify and disclose 80 per cent of our total scope 3 emissions (C)	Consider scope 3 GHG emissions targets (C)
Sustainable Finance	In 2021, converted existing $1.3 billion loan into a Sustainability-Linked Loan aligned with GHG emissions reduction and female employment targets at the company level (C) In 2021, secured $173 million green bond financing for eligible wind project in Alberta (C) In 2022, issued US$400 million Senior Green Bonds for eligible renewable energy and energy-efficiency projects (C) Linked ESG performance to employees' and executive remuneration (C)	Continue to evaluate the use of sustainable or green financing instruments to fund renewable energy and battery storage projects (C) Link ESG performance to employees' and executive remuneration (C)	Continue to evaluate the use of sustainable or green financing instruments to grow our renewables and storage capacity (C)
Inclusive Transition	Developed a five-year Equity, Diversity and Inclusion (ED&I) strategy (C) Conducted ED&I census to help drive a greater sense of belonging for all employees across our company (C) Set organizational health and ED&I targets as part of ESG-linked compensation (C) In 2015, announced community investment of US$55 million over 10 years to support energy efficiency, economic and community development and education and retraining initiatives in Washington State (P) In 2016, agreed to invest in the communities impacted by the phase-out of coal generation in Alberta (P)	Expand number of employee resource groups available (C) Adapt workplaces to incorporate structural changes for inclusive work environments (C) Deliver year-round ED&I learning and awareness, and celebration campaigns (C) Continue energy transition investment in Washington State communities of up to US$55 million by 2025 (P) Continue to invest in the communities impacted by the phase-out of coal generation in Alberta (P) Strengthen Indigenous relations focused on community engagement and consultation, community investment and partnership opportunities (P) Provide Indigenous cultural awareness training to all employees by the end of 2023 (C) Promote supplier diversity in our operations (C)	Implement employee resource groups with the support of ED&I partners (P) Enhance recruitment and retention of female employees to achieve gender-based targets (C) Maintain succession practices to increase female representation at senior management level (C) Increase female representation in Generation by encouraging women to pursue a career in electricity (C) Enhance opportunities for diverse suppliers in our procurement processes (C) Continue to enhance our Indigenous relations focused on partnership opportunities with local communities (P) Ongoing support to local community organizations aligned with our community investment pillars where we operate and grow communities (P)

Climate Change Governance

Climate-related risks and opportunities can significantly impact our business, especially regulatory changes and shifting customer preferences toward lower-carbon energy. Therefore, we actively manage risks and opportunities so that we can continue to grow and achieve our goals. Climate-related issues are identified at every level of management, including the Board, executive team, business units and corporate functions (for example, government relations, regulatory, emissions trading, sustainability, commercial, customer relations, investor relations). Ensuring climate-related issues are acknowledged and addressed at the most senior levels of the Company (including at the Board and executive level) has allowed us to establish actionable emissions reduction targets and grow our generation capacity through renewable energy and storage.

Oversight by the Board of Directors

The highest level of climate change oversight is at the Board level, with specific oversight of certain aspects of the Company's response to climate change being delegated to our Governance, Safety and Sustainability Committee (“GSSC”), our Audit, Finance and Risk Committee ("AFRC") and our Investment Performance Committee (“IPC”) of the Board.

Meeting quarterly, the GSSC assists the Board in monitoring and assessing compliance with climate change regulation and reporting. The GSSC receives management reports from the Executive Vice President ("EVP"), Legal, Commercial and External Affairs on changes in climate-related legislation and the potential impact of policy developments on TransAlta's business. The GSSC then supports the Board in developing Company-wide climate change strategies, policies and practices. The GSSC also reviews environmental protection guidelines, including with respect to GHG mitigation, and considers whether our environmental procedures are being effectively implemented.

The AFRC and IPC also play a role in managing TransAlta's climate-related risks and opportunities. The AFRC assists the Board in overseeing the integrity of our consolidated financial statements and ensures climate risks and opportunities are factored into financial decision-making. Further, the AFRC is responsible for approving our Commodity and Financial Exposure Management policies and reviewing quarterly ERM reporting. The IPC considers and assesses risks related to capital investment projects, including overseeing climate risk assessments and mitigation plans. As a result, climate-related capital expenditures, acquisitions and budgets are reviewed by the AFRC and IPC on a case-by-case basis.

The Board reviews and updates the Company's strategy annually. In 2022, the Board's strategic planning sessions included climate-related issues considering growth initiatives and strategies, capital allocation and other matters. Our Board is composed of individuals with a mix of skills, knowledge and experience critical to our strategy success and business growth. In 2022, four of our 11 Board members identified environment/ climate change among their top four relevant competencies.

Role of Senior Management

TransAlta’s President and CEO maintains the highest level of oversight on climate-related issues at the executive level. Our EVP, Legal, Commercial and External Affairs provides the Board, as well as the President and CEO, with updates on climate-related risks and opportunities to inform business strategy and to ensure alignment with TransAlta’s GHG emissions reduction goals. Our business units and corporate functions work closely together to support the executive team in understanding climate-related risks and opportunities. Our executive team reviews risks and opportunities quarterly and reports to the GSSC and AFRC.

At the business unit level, climate change risks are identified through our Total Safety Management System, asset management function and systems, energy and trading business, communication with stakeholders, active monitoring and participation in working groups.

Notably, we tie a component of executive compensation to reducing GHG emissions and climate change management. We link our annual incentive plans (short-term incentive and long-term incentives) to our strategic goals. Our strategic goals include growing renewable energy, reducing GHG emissions and supporting our customers' sustainability goals to decarbonize through on-site low carbon energy generation.

For further information on incentives for ESG performance, refer to the discussion on ESG-Linked Compensation in Building a Diverse and Inclusive Workforce section of this MD&A.

Climate Scenarios

In 2021, we conducted climate scenario analysis to understand risks and opportunities and assess our strategy's resiliency under several potential future climate scenarios. The analysis utilized scenarios from the International Energy Agency's ("IEA") 2020 World Energy Outlook, a large-scale simulation model designed to replicate how energy markets function. We used three scenarios: Stated Policies ("STEPS"); Sustainable Development ("SDS"); and Net-Zero Emissions by 2050 ("NZE").

In STEPS, the energy system has no major additional climate and environmental policies enacted by government(s). STEPS assumes that carbon pricing continues in Canada while no carbon price is set in the US or Australia. STEPS also assumes that the power sector reduces emissions by 45 per cent by 2040 while natural gas generation capacity increases. Finally, STEPS is limited to the deployment of commercial-ready technologies, including wind and solar.

In SDS, the goals of the Paris Agreement (2015) are achieved, resulting in net-zero emissions by 2070. The SDS assumes a rapid increase in clean energy policies and investments that position the energy system to also achieve key UN SDGs. In SDS, all current net-zero pledges are achieved and there are extensive efforts to reduce emissions. SDS assumes that carbon pricing continues in Canada and is set in the US and Australia. It also assumes that the power sector reduces emissions by 90 per cent by 2040 while natural gas capacity remains stable into 2030 and declines toward 2040. Finally, SDS assumes that beyond wind and solar, the energy system relies on batteries, storage and some level of carbon capture, utilization and storage ("CCUS") and hydrogen.

NZE represents a pathway for the global energy sector to achieve net-zero emissions by 2050. This scenario also assumes key energy-related SDGs are achieved through universal energy access by 2030 and major improvements in air quality. NZE is built upon the idea that a global increase in electrification supports the journey to net-zero. It assumes that an aggressive carbon price is set in Canada, the US and Australia. It also assumes the power sector reaches net-zero emissions by 2035 in advanced economies while natural gas capacity is stable to 2030 and declines significantly into 2040. Like the SDS, NZE assumes that beyond wind and solar, the energy system relies on batteries, storage and some level of CCUS and hydrogen.

In 2022, we reviewed the findings from the climate scenario analysis and updated the management response accordingly.

Key Climate Scenario Findings

Using climate scenarios, we analyzed the resiliency of our business and determined specific risks and opportunities for our individual assets. All three scenarios present opportunities for TransAlta's growth related to renewables, storage solutions and ancillary services. The scenario analysis found that our wind and solar assets have the highest prospects for growth, which aligns with our growth strategy. Under all scenarios, hydro remains a valuable asset as it allows for expansion to include storage.

The following sections highlight TransAlta's top risks, opportunities and management response across all scenarios.

Top Identified Climate-Related Risks by Scenario

	Increased competition	Decreased demand of natural gas electricity	Increased operational costs
Description	Subsidies/funds available for clean energy transition increase as governments aim to grow installed capacity of renewables to meet rising electricity demand and compensate for the closure of carbon-intensive power plants. In Canada, it is expected that major grid decarbonization investments will flow into Alberta as most other provincial markets are heavily regulated and/or are already low carbon. This will increase competition in the merchant market, making a large part of the generating fleet frequently bid at zero, driving down the average price of dispatched electricity. Simultaneously the cost of renewables, expected to decline across all scenarios, decreases the capital barrier to entry. These combined factors will increase competition for TransAlta. The IEA scenarios do not provide clear indication of electricity pricing and how it can be affected by increased competition. As such, this remains a point of uncertainty. Some structural market changes may be required to guarantee returns for power generators and successfully decarbonize the grid.	Demand for power from natural gas declines as the market shifts towards cleaner power with gas shifting to a reliability backstop role. An additional decline from Canadian oil and gas customers can occur as oil production levels drop under NZE and SDS. The transition to a lower-carbon world will likely result in volatility and market uncertainty. Counterintuitively, natural gas power may be necessary to provide power in the transition if the pace of decarbonization is slower than expected in the scenarios or if grid-scale storage solutions do not develop/ commercialize as modelled. In these cases, with coal phased out, natural gas assets will be relied on for baseload generation. This means that natural gas assets may still play a role for a smooth and efficient energy transition. Optimization of natural gas assets is required, and additional investments need to be assessed with caution to consider the pace of decarbonization and consequent risk of decreased demand for natural gas power.	Carbon price increases the cost of natural gas operations. Additional mandated emissions reductions could force remaining plants to invest in technologies like CCUS, increasing the operating costs for natural gas plants further. Natural gas assets in the US and Australia face less risk compared to assets in Alberta as they are contracted and can pass down carbon costs to their clients. Current and anticipated regional carbon pricing monitoring is required to plan and assess increases in operational costs and impacts on new projects and investments.
NZE	By 2040, renewables are expected to comprise over 85 per cent of the total electricity generation in the regions we operate. This surge in renewables will increase competition and drive electricity pricing down depending on availability and the cost of energy storage. The change in electricity prices and increased market uncertainty are expected to impact our profits.	The share of natural gas electricity generation is expected to decline over 50 per cent in the regions in which we operate by 2040 compared to 2019 levels. This lower demand for natural gas power is expected to impact our natural gas assets if no management responses are implemented.	Higher operational costs driven by an increase in carbon price to US$205/ tonne CO_2e by 2040 in all our operating regions (advanced economies under IEA scenarios) and lower operational capacity is expected to impact the profits from our natural gas assets.

Top Identified Climate-Related Risks by Scenario

	Increased competition	Decreased demand of natural gas electricity	Increased operational costs
SDS	Fewer subsidies/funds are expected under this scenario compared to NZE. However, renewable costs will still decline approximately 10 per cent in wind and 55 per cent in solar by 2040 compared to 2019 levels. This decline with some level of subsidy will increase competition and potentially decrease electricity prices, which is expected to impact our profits.	Natural gas electricity generation still falls over 50 per cent in North America while remaining flat in Australia by 2040 when compared to 2019 levels. Demand for natural gas power is expected to decrease at a slower pace than under NZE. This could potentially impact our natural gas assets if no management responses are implemented.	Increase in operational costs would happen at a slower rate compared to NZE but carbon costs are still expected to reach US$140/tonne CO_2e by 2040 in all of our operating regions. This could potentially impact the operational capacity and profits from our natural gas assets, depending on the ability to pass carbon prices on through our contracts.
STEPS	While minimal subsidies are expected and the cost of entry will not decline at the same rate as SDS or NZE, renewable costs are still expected to decline approximately 8 per cent in wind and 45 per cent in solar by 2040 compared to 2019 levels. This will still cause an increase in competition that is expected to be offset by additional electricity demand and therefore it is not expected to impact our profits.	Natural gas electricity generation is expected to increase over 15 per cent in the regions in which we operate by 2040 compared to 2019 levels. These changes are not expected to affect our natural gas assets.	Operational costs are not expected to significantly increase under this scenario as only Canada sees a carbon price in 2040. Therefore, profits from our natural gas assets are not expected to be affected.
Management Response	Navigating the uncertainty around market dynamics (structure, pricing and competition), government policies and planning is critical for TransAlta. We use hedging and PPAs to stabilize pricing and are planning on leading clean energy growth in the regions in which we operate. See more details of our strategy and risk management under the Climate Strategy section and the Managing Climate Change Risks and Opportunities section of this MD&A.	Optimize gas assets to maximize value and cash flows to support renewables and storage growth. Our converted natural gas units' CO_2 intensity is approximately 57 per cent less than coal generation. Repurposing the coal facilities rather than decommissioning them reduces the cost and emissions associated with new construction and aligns with the UN SDGs, specifically "Goal 9: Industry, Innovation and Infrastructure." In parallel, we continue growing our renewable fleet; by the end of 2025 we will have achieved a 100 per cent portfolio mix of renewables and natural gas with 70 per cent of EBITDA attributable to renewables.	We have taken significant steps to reduce our carbon footprint. Since 2015, we have reduced GHG emissions by 68 per cent. By 2026, we have a commitment to reduce scope 1 and 2 GHG emissions by 75 per cent from 2015 base year and plan to achieve net-zero emissions by 2045. Further, our corporate functions apply regionally specific carbon pricing, both current and anticipated, as a mechanism to manage future risks of uncertainty in the carbon market.

Top Identified Climate-Related Opportunities by Scenario

	Renewables become major energy source	New technology development
Description	Opportunities to grow the renewable fleet exist across all scenarios. Renewable assets (hydro, wind, solar) are expected to become the default form of generation with demand for power from these types of assets increasing. Hydro is likely to grow in value given increased renewables penetration and the need for reliable zero-emitting generation. This can make hydroelectric power a stronger source of baseload electricity in many regions. The decreasing cost of renewables also facilitates the growth of a renewable fleet, especially under NZE and SDS.	Opportunities for development of battery or hydroelectric storage systems and ancillary services exist across all scenarios as renewable energy continues to penetrate the grid. Developments in these areas are required to keep electricity flowing when the renewables in a region are not producing. Storage is especially anticipated to play an important role in the energy transition. Cost-competitive battery storage enables greater adoption of renewables.
NZE	A growth of renewable electricity generation of approximately 950 per cent is expected by 2040 compared to 2019 levels. This results in renewables comprising more than 85 per cent of the electricity generation in the regions in which we operate. The transition of hydro to baseload capacity is expected to create upside for TransAlta. An increase in TransAlta's renewable capacity and demand are expected to enable growth and higher revenues.	Increased revenues through access to new and emerging markets are expected to enable growth and higher revenues under NZE. With more than 85 per cent of electricity in areas in which we operate made up of renewables, there will be big steps forward in storage and ancillary services technologies. Storage capacity is expected to grow to approximately 250 GW in the US by 2040.
SDS	A growth of renewable electricity generation of approximately 550 per cent is expected by 2040 compared to 2019 levels. This results in renewables comprising more than 75 per cent of the electricity generation in the regions in which we operate. An increase in TransAlta's renewable capacity and demand are expected to enable growth and higher revenues.	Increased revenues through access to new and emerging markets are expected to enable growth and higher revenues under SDS. A lower share of renewables than in NZE will allow swing production to remain present; however, growth in ancillary and storage capacity will still be needed to support the market. Storage capacity is expected to grow to approximately 110 GW in the US by 2040.
STEPS	STEPS growth is muted relative to the other scenarios but still sees a growth of renewables of 280 per cent by 2040 compared to 2019 levels. This growth will allow approximately 50 per cent of electricity generation to come from renewables in areas in which we operate by 2040. An increase in TransAlta's renewable capacity and demand are expected to enable growth and higher revenues.	Access to new and emerging markets would be limited under this scenario compared to NZE and SDS. While growth in renewables is expected, the need for new technologies is not a necessity in this market and may not be profitable. Therefore, our revenues are not expected to be affected.
Management Response	Our renewable energy commitment began more than 100 years ago when we built the first hydro assets in Alberta, which still operate today. We now operate over 50 renewable facilities across Canada, the US and Australia. By the end of 2025, we expect 70 per cent of our EBITDA to be derived from renewables. Our strategy is focused on the operation of our existing assets (wind, hydro, solar, gas, storage and coal) and the development of renewable energy, storage and low-carbon natural gas generation. Our investments and growth in renewable energy are highlighted by our portfolio of renewable energy-generating assets. From 2000 to 2022, we grew our nameplate renewables capacity from approximately 900 MW to over 2,900 MW. Today, our diversified renewable fleet makes us one of the largest renewable producers in North America, one of the largest producers of wind power in Canada and the largest producer of hydro power in Alberta.	To leverage this opportunity and combat the challenges of renewable energy intermittency, we continue to invest in battery storage. In 2020, we launched WindCharger, a "first of its kind in Alberta" battery storage project that stores energy produced by our Summerview II wind facility and discharges electricity onto the Alberta grid during system supply shortages. Further, in 2021, we agreed to provide renewable solar electricity supported with a battery energy storage system to BHP Nickel West through the construction of the Northern Goldfields solar project in Western Australia. This project will support BHP in meeting its emissions reduction targets and delivering lower-carbon, sustainable nickel to its customers. Construction began in 2022 and is on track to be completed in early 2023.

NZE: The most significant risks include increased competition, decreased demand for natural gas and increased operational costs due to increased carbon pricing and emissions reduction mandates. The most significant opportunities include a shift toward renewables as the default energy source and new technology developments, including battery storage systems and ancillary services. It is worth noting that there are additional risks and opportunities for TransAlta under NZE. For example, changes in how energy market services are offered could positively or negatively impact our business. Further, as carbon credit policies evolve, so will our ability to use credits. Lastly, as renewables become the primary energy source, a rethinking of ancillary services will be necessary but could create significant opportunities for TransAlta.

SDS: The risks and opportunities remain the same under SDS as NZE; however, the impacts are reduced as market changes are slower and less extreme. Renewables still become the primary electricity source and there are new technology opportunities, particularly in batteries. Natural gas electricity demand still declines by 2040. Carbon pricing exists in the US and Australia, but the price is reduced compared to NZE. Lastly, a reevaluation of ancillary services still presents an opportunity for TransAlta.

STEPS: Under STEPS, renewable generation sees significant growth but does not become the predominant energy source. Implementing new technologies is much slower and the demand for batteries is reduced. The demand for natural gas electricity does not decline and there are no large-scale market changes making services, pricing and ancillary services more stable. This removes the risk associated with natural gas electricity demand but eliminates the opportunity for growth in ancillary services. Physical risks become more relevant under this scenario than transitional risks.

To mitigate risks and capitalize on opportunities, we have developed climate signposts to monitor the evolution of future climate scenarios. Signposts are indicators that suggest the likelihood of a particular climate scenario. Examples of signposts include directional change in carbon and oil prices. The findings from the climate scenarios and these signposts work alongside our sustainability metrics and targets to inform the evolution and resiliency of our Company's strategy and financial planning, risk management, opportunity assessment and planning for uncertainty.

Managing Climate Change Risks and Opportunities

We actively monitor and manage climate-related risks through our company-wide enterprise risk management processes. In 2021, we established a formal process to review specific risks using climate scenario analysis. As previously mentioned, climate change risks and opportunities are addressed at each of the Board level, executive and management level, business unit level and through our corporate functions. The business units and corporate functions work closely together and provide information on risks and opportunities to management, the executive team and the Board.

Climate change risks at the asset or business unit level are identified through our Total Safety Management System, asset management function and systems, energy and trading business, communication with stakeholders, active monitoring and participation in working groups. All identified material risks are added to our ERM register and scored based on likelihood and impact. We do not consider risks in isolation and major risks are the focus of management response and mitigation plans. Further discussion can be found in the Governance and Risk Management section of this MD&A.

We divide our climate change risks into two major categories as per guidance from the TCFD: (i) risks related to the transition to a lower-carbon economy; and (ii) risks related to the physical impacts of climate change.

Transition Risks to a Lower-Carbon Economy

We actively aim to understand and manage the impact of climate change on our business as the world shifts to a lower-carbon society.

Policy and Legal Risks

Changes in current environmental legislation do have, and will continue to have, an impact upon our operations and our business in Canada, the US and Australia.

For a more detailed assessment of policy and regulatory risks, refer to the Governance and Risk Management section of this MD&A.

Canada

The Government of Canada has set out ambitious objectives for carbon emissions reduction, including achieving a 40 to 45 per cent national emissions reduction over 2005 levels by 2030, a net-zero electricity grid by 2035 and a net-zero national economy by 2050. The Government plans to rely on several policy tools to achieve its emissions objectives, including carbon pricing, emissions performance regulations, funding for industrial energy transition, a Clean Fuel Regulation and incentives for consumers.

In 2021, a Supreme Court of Canada decision confirmed the federal government has significant authority to set national carbon pricing standards. We anticipate the federal government will use this authority to align provincial carbon pricing systems with national carbon targets. Canada's provinces have significant jurisdiction over their respective electricity sectors and play an important role in setting carbon pricing policy and emissions performance standards, as well as developing and operating their own funding and incentive programs. Negotiation to align carbon pricing, funding and regulatory standards will likely require significant effort and create the risk of tension and misalignment between federal and provincial governments.

Risks

- Escalation in carbon prices and emissions performance regulation may impact TransAlta's natural gas generation fleet in Canada as governments escalate policy stringency to meet 2030, 2035 and 2050 targets.
- Increased government funding for industrial energy transition may create out of market incentives for competing generation.
- Regulatory incentives, including emissions reduction crediting, may create out of market incentives for competing generation.
- Lack of federal/provincial coordination with respect to climate policy and regulation may lead to investment uncertainty.

Opportunities

- Independent estimates suggest that achieving Canada's climate targets will require a minimum of twice Canada's current non-emitting generation. This presents strong policy alignment with TransAlta's Clean Electricity Growth Plan. Further, we continue to see strong private sector demand for contracted zero emissions generation to meet corporate sustainability goals.
- Government funding for innovative technology to reduce emissions from the electricity sector offers TransAlta the potential opportunity to gain project support for uneconomic new technologies, which will enable the Company to grow its ESG and policy-aligned generation and energy storage fleet.
- Government support for industrial electrification and consumer incentives mandates for electrification, such as for the purchase of electric vehicles, will grow the electricity load over time and create new opportunities for contracted clean generation.

Management Response

- TransAlta's Clean Electricity Growth Plan positions our company to meet the rapidly growing demand for clean electricity generation driven by customers and government policy.
- We are focused on developing and acquiring contracted assets that provide long-term certainty with respect to revenue and eligibility for government incentive programs. TransAlta actively assesses available government renewable tax legislation and programs to maximize, wherever possible, access to project incentives.
- Our clean and contracted growth reduces the proportional Company exposure to potential policy and regulatory decisions that negatively impact natural gas generation.
- Our coal-to-gas facilities fit within government plans to continue providing reliable and competitively priced electricity for consumers and industry.
- Our remaining natural gas facilities operate under contract, reducing TransAlta's exposure to changes in carbon pricing.
- TransAlta actively engages with the federal and provincial governments in Canada to inform and influence policy development to ensure that our generating fleet continues to serve our customers as the country undertakes a broader energy transition.
- We actively work, directly and through industry associations, to encourage governments to adopt a level playing field within funding and crediting programs so that all new projects receive equitable government incentives and funding.
- TransAlta actively engages with all relevant Canadian governments to seek policy alignment across carbon pricing and regulatory and funding programs to create the greatest possible degree of investment certainty.

United States

The US Government has set out ambitious objectives for carbon emissions reduction, including achieving a 50 to 52 per cent national emissions reduction over 2005 levels by 2030, a net-zero electricity grid by 2035 and a net-zero national economy by 2050. The US does not have a national carbon pricing regime but does offer federal incentives for renewable generation and energy storage.

State and regional climate and market policies have a significant impact on the pace of energy transition in the US with many governments operating under renewable portfolio standards and carbon pricing regimes. Similar to Canada, independent estimates suggest that the US will require substantial growth in zero-emissions generation to meet its national climate targets.

Risks

- TransAlta operates two thermal generating facilities in the US that could be subject to short-term climate policy changes, but our exposure to this policy risk is low (refer to Management Response below).
- Significant new federal incentives for clean energy could increase competition in the renewables space.

Opportunities

- Achieving government climate goals and private sector sustainability commitments will require rapid and sustained growth in zero-emissions electricity generation over the coming decades. TransAlta's Clean Electricity Growth Plan is focused on providing renewable electricity to contracted customers in a manner aligned with federal, state and private sector goals.
- US tax incentive programs offer significant support for new renewable projects, making the US an attractive growth market.

Management Response

- TransAlta's single coal unit in Washington State is subject to a retirement agreement with the state government that exempts the facility from carbon pricing prior to its end of life in 2025. TransAlta's cogeneration unit at Ada operates under a contract that reduces the Company's exposure to policy risk.
- Our Clean Electricity Growth Plan is focused on developing and acquiring contracted assets that provide long-term certainty with respect to revenue and eligibility for government incentive programs. TransAlta actively assesses available government renewable tax legislation and programs to maximize, wherever possible, access to project incentives.

Australia

The Government of Australia has a 43 per cent national emissions reduction target over 2005 levels by 2030 and a goal to achieve a net-zero national economy by 2050. The government is currently considering changes to the Safeguard Mechanism but these changes are not expected to have a material impact on TransAlta's assets. Australian state governments have all adopted net-zero goals and a number of states have interim targets for 2030 and 2040. These state policies are driving demand for zero-emissions electricity and energy storage.

Risks

- TransAlta's Australian natural gas assets may face policy risk related to changes in government policies but remain well positioned to mitigate those risks (refer to Management Response below).

Opportunities

- Our Clean Electricity Growth Plan is focused on building new, clean generation in Australia and other markets. Government policies and funding programs are generally supportive of the types of projects contemplated within TransAlta's strategy.
- Strong corporate demand for clean energy solutions in Australia's natural resource sectors present opportunities for TransAlta to leverage its existing expertise to help customers reach their decarbonization objectives.

Management Response

- Through our Clean Electricity Growth Plan, TransAlta continues to deliver clean energy solutions to natural resource customers in Western Australia. Our growing suite of technologies, including renewables and energy storage, positions us to provide contracted solutions to customers focused on the need for reliable and sustainable energy.
- TransAlta also continues to assess opportunities to grow our clean energy generation in alignment with Australia's national and state climate goals.
- TransAlta's assets are predominantly contracted with an ability to pass through carbon compliance costs and serve remote industrial load. As a result, the Company faces reduced policy risk.

Technology Risks

Technological changes to support the low-carbon transition present both risks and opportunities for TransAlta. We evaluate existing and emerging impacts of technology through our Energy Innovation team and our ERM process. Examples of technology risks and opportunities include infrastructure changes (such as the 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). Cost-competitive battery storage will enable greater adoption of renewables and a shift to a distributed power generation model. We continue to evaluate battery storage for its financial viability while monitoring the potential impact battery technology could have on natural gas power generation. In 2020, we completed our first battery storage (10 MW) project at one of our wind facilities in southern Alberta. In 2021, we agreed to deliver a hybrid system of solar with battery storage (48 MW) in Western Australia. We continue to investigate the possibility of battery storage at our other facility locations. Our teams continuously adopt improved technology at each of our new developments, which helps protect our shareholder value and maintain reliable and affordable electricity delivery.

We are well-positioned to take advantage of technological opportunities in storage through hydro and/or battery power. We are also well-positioned to take advantage of advancements in renewable technologies as we build new facilities. We are actively accelerating our renewable growth strategy, with $3.6 billion in investment and 2 GW of growth planned by 2025. We will continue monitoring new technologies such as storage, hydrogen and CCUS for future deployment.

For further information on technology and innovation, refer to the Enabling Innovation and Technology Adoption section of this MD&A.

Market Risks

Our major market risks are associated with our coal and natural gas assets. Increased costs for natural gas supply due, in part, to carbon pricing changes could impact our operating costs. We actively monitor market risks through our energy marketing and asset optimization teams and our ERM process. We manage the market risks to our coal assets by converting them to natural gas and plan to fully transition off coal by 2025. Further, our corporate functions apply regionally specific carbon pricing, both current and anticipated, as a mechanism to manage future risks of uncertainty in the carbon market. To simultaneously manage our risks and leverage market opportunities, we continue operating our hydro, wind and solar facilities and are investing in expanding our renewable energy fleet.

We currently have over 20 renewable projects that are either under construction or in the development stage. We are committed to growing our clean energy fleet and, since 2019, have added over 400 MW of renewables and storage, including utility-scale battery storage. Further, we established organized Canadian, US and Australian clean energy growth teams. In 2022, the Company announced 200 MW of new build projects. TransAlta has established a pipeline of potential growth projects that includes 374 MW of advanced stage development projects along with 3,891 to 4,991 MW of projects in earlier stages of development. Our renewable fleet makes our overall portfolio more resilient to climate risk, provides increased flexibility in generation and creates incremental environmental value through environmental attributes. Lastly, we recognize the opportunity to grow our ancillary services, such as systems support, providing flexibility to the decarbonizing grid.

Reputation Risks

Negative reputational impacts, including revenue loss and reduced customer base, are evaluated through our ERM process. In the past, we experienced negative reputational impacts due to our coal operations, including a negative impact on the market price of our common shares. Our clear transition path away from coal mitigates this reputational risk. As consumer trends move in favour of renewable and clean electricity, we are investing in a diversified mix of renewable generation and optimizing our natural gas fleet. We continue to actively monitor and manage reputational risks by delivering renewable power solutions while maintaining competitive costs and reliability.

Physical Risks of Climate Change

As we learn more about the physical risks associated with climate change, we continue to consider acute and chronic risks that could significantly impact our operations. We continue to investigate the physical impacts of climate change on our operating assets.

Acute Physical Risks

We have operating assets in three countries and varied geographic locations, many of which could be impacted by extreme weather events. We continuously evaluate the potential impact of acute climate change on our business. Our facilities, construction projects and operations are exposed to potential interruption or loss from environmental disasters (e.g., floods, strong winds, wildfires, ice storms, earthquakes, tornados, cyclones). A significant climate change event could disrupt our ability to produce or sell power for an extended period. Therefore, we strive to mitigate future impacts with climate adaptation solutions.

For example, our gas facility at South Hedland, Australia, is built with climate adaptation in mind. We designed the facility to withstand a category 5 cyclone (the highest cyclone rating). We have mitigated the risk of floods that can occur in the area by constructing the facility above normal flood levels. In 2019, a category 4 cyclone hit this facility but did not impact operations. We were able to continue generating electricity through the storm despite widespread flooding and the shutdown of the nearby port. In Canada, as we near the 10 year anniversary of the 2013 floods in Southern Alberta, we continue to implement projects that increase the resilience of our hydro facilities to severe climate events. We have also modified operations at several of our facilities as per an agreement with the Government of Alberta. This reduces flood risk in the spring while also recognizing the potential for increased droughts as a result of climate change in the future. TransAlta continues to participate in multi-stakeholder groups developing options for climate resiliency across Southern Alberta.

For further information on weather-related risks, refer to Weather in the Progressive Environmental Stewardship section of this MD&A.

Chronic Physical Risks

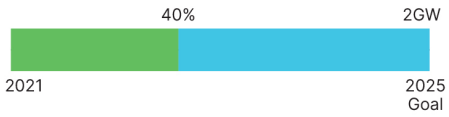
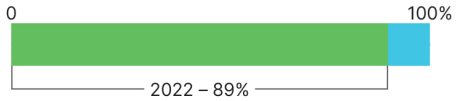
We continuously investigate the physical impacts of longer-term shifts in climate patterns on our operating assets and actively integrate climate modelling into our long-term planning. For example, changes to water flow or wind patterns could impact our hydro and wind businesses and associated revenue generation.

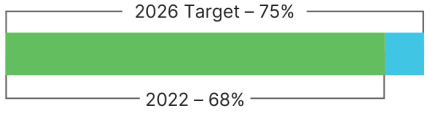
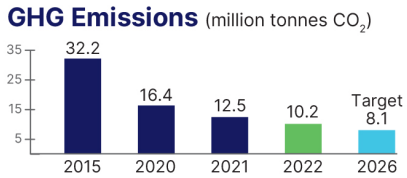
Climate Change Metrics and Targets

Metrics and Targets

At TransAlta, climate change management and performance are a top priority. We established our climate-related goals and targets with reference to the UN SDGs. Over time, we have set ourselves apart with actions that demonstrate climate change leadership.

Progress towards our climate-related targets are presented below:

Clean energy growth		
Sustainability Target	Develop new renewable projects that support our customers' sustainability goals to achieve both long-term power price affordability and carbon reductions.	No further coal generation; 100 per cent of our owned net generation capacity from renewables and gas.
Year	2022	2025
Progress	**Renewables Growth** 	
Notes	Examples of renewable energy projects in 2022 include the construction of: our Garden Plain wind project in Alberta, which is subject to a PPA with Pembina Pipeline (100 MW) and an investment-grade globally recognized customer (30 MW); our White Rock wind projects in Oklahoma (300 MW), which are subject to two PPAs with Amazon; our Horizon Hill wind project in Oklahoma (200 MW), which is subject to a PPA with a subsidiary of Meta; and our Northern Goldfields solar project with a battery energy storage system in Western Australia (48 MW), which is subject to a PPA with BHP.	In 2022, our owned net generation capacity from renewables and gas represented approximately 89 per cent of our total 6,246 MW owned net generation capacity. In 2021, we achieved full phase-out of coal in Canada. In the US, the remaining unit at Centralia is set to retire on Dec. 31, 2025.
UN SDG Alignment	Target 7.2: "By 2030, increase substantially the share of renewable energy in the global energy mix".	Target 7.1: "By 2030, ensure universal access to affordable, reliable and modern energy services".

Emissions reduction		
Sustainability Target	By 2026, achieve a 75 per cent reduction of scope 1 and 2 GHG emissions from a 2015 base year.	Achieve carbon neutrality
Year	2026	2050
Progress		
Notes	We are well on track to achieve our target of 75 per cent GHG emissions reductions by 2026. Since 2015, we have reduced GHG emissions by 22 million tonnes of CO_2e or 68 per cent.	In 2022, we reduced approximately 2.3 million tonnes of CO_2e or 18 per cent over 2021 levels. In 2022, we adopted a more ambitious target to be net-zero by 2045. We believe our Clean Electricity Growth Plan supports achieving a more ambitious target.
UN SDG Alignment	Target 13.2: "Integrate climate change measures into national policies, strategies and planning".	Target 13.2: "Integrate climate change measures into national policies, strategies and planning".

GHG Disclosures

Our GHG emissions are calculated using a number of different methodologies depending on the technologies available at our facilities. Emissions data has been aligned with the "Setting Organizational Boundaries: Operational Control" methodology set out in the GHG Protocol: A Corporate Accounting and Reporting Standard developed by the World Resources Institute and the World Business Council for Sustainable Development. We report emissions on an operation control basis, which means we report 100 per cent of emissions at the facilities that we operate.

The GHG Protocol classifies a company's GHG emissions into three scopes. Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Scope 3 emissions are all indirect emissions (not included in scope 1 or 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.

We compile our corporate GHG inventory using our business segment GHG calculations. As a result, emission factors and global warming potentials used in our GHG calculations can vary due to difference in regional compliance guidance. The Clean Energy Regulator in Australia amended global warming potentials in August 2020. Therefore, the use of global warming potentials in our GHG calculations related to our Australian assets differs from the rest of our fleet. Applying harmonized global warming potentials across our fleet would result in a minor variance to our overall calculated GHG totals.

Our 2022 GHG data was reported to a number of different regulatory bodies throughout the year for regional compliance and, as a result, may incur minor revisions as we review and report data. Any historical revisions will be captured and reported in future disclosure. 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 result from carbon dioxide emissions from stationary combustion from coal and natural-gas-powered generation.

The following tables detail our GHG emissions by scope, business segment and country in million tonnes of CO_2e. Some values do not sum to the indicated total due to rounding of tabulated emissions. Zeros (0.0) indicate truncated values.

Year ended Dec. 31	2022	2021	2020
Scope 1	**10.2**	12.4	16.3
Scope 2	**0.1**	0.1	0.1
Total GHG emissions	**10.2**	12.5	16.4

Year ended Dec. 31	2022	2021	2020
Hydro	**0.0**	0.0	0.0
Wind and Solar	**0.0**	0.0	0.0
Gas	**6.3**	6.5	7.7
Energy Transition	**4.0**	6.0	8.6
Corporate and Energy Marketing	**0.0**	0.0	0.0
Total GHG emissions	**10.2**	12.5	16.4

Year ended Dec. 31	2022	2021	2020
Australia	**0.9**	1.0	1.1
Canada	**5.2**	7.9	9.4
US	**4.1**	3.6	5.9
Total GHG emissions	**10.2**	12.5	16.4

In 2022, our GHG emissions (scopes 1 and 2) were 10.2 million tonnes as a result of normal operating activities. Compared to 2021, this represents a reduction of approximately 18 per cent or 2.3 million tonnes CO_2e. Because we sell the environmental attributes generated from our renewable energy facilities, we do not subtract this amount from our total emissions, but it should be noted that TransAlta's customers are reporting GHG emissions reductions using our renewable energy assets, projects and operations.

GHG emissions are verified to a level of reasonable assurance in locations in which we operate within a carbon regulatory framework. Any historical revisions to GHG data will be captured and reported in future disclosure. The majority of our GHG emissions result from carbon dioxide emissions from stationary combustion from coal and natural-gas-powered generation.

The following table highlights our scope 1 and 2 GHG emissions reductions since 2015 and our targeted emissions in 2026 (in line with our new GHG target). The actual GHG emissions for the Company in 2026 will vary from that presented below depending on, among other things, the growth of the Company, including its on-site generation business.

Year ended Dec. 31	2026 (forecast)	2022	2015
Total GHG emissions (million tonnes CO_2e)	**8.1**	**10.2**	32.2

Scope 3 Emissions

We estimate our scope 3 emissions in 2022 to be in the range of four million tonnes of CO_2e, which is primarily attributed to our non-operated joint venture interests.

Sustainable Finance

Sustainable finance is the process of taking due account of ESG considerations (e.g., climate change, biodiversity, human rights) when making investment decisions. Sustainable finance is a key pillar of TransAlta's Climate Transition Plan. This means we will utilize pools of capital available to sustainable economic activities and projects to finance our energy transition towards net-zero operations.

TransAlta deploys green and sustainable financing to build out our renewable energy fleet and advance our clean energy transformation. This supports our goal to deliver on our customers' needs for clean electricity. Since 2020, we have issued $703 million in green bonds and converted our four-year $1.3 billion revolving credit facility into a sustainability-linked loan.

In November 2022, TransAlta issued US$400 million ($533 million) in Senior Green Bonds, an amount equal to the net proceeds from the bonds will be used to finance or refinance new and/or existing eligible green projects. The bonds were issued under TransAlta's Green Bond Framework, which aligns with the Green Bond Principles published by the International Capital Market Association. For further details, refer to Public Offering and Pricing of US Senior Green Bonds and release of inaugural Green Bond Framework in the Significant and Subsequent Events section of this MD&A. In 2021, the Company's indirect wholly owned subsidiary, Windrise Wind LP, completed a secured green bond offering by way of private placement for approximately $173 million (face value).

In 2021, TransAlta converted an existing $1.3 billion syndicated revolving credit facility into a sustainability-linked loan. The loan aligns the cost of borrowing to the Company's GHG emissions reductions and gender diversity targets. Sustainability-linked loans are any types of loan instruments and/or contingent facilities (such as bonding lines, guarantee lines or letters of credit) that incentivize the borrower's achievement of ambitious, predetermined sustainability performance objectives.

The summary below shows the carrying value of the issued green bonds and the total facility size of our ESG financial operations portfolio.

As at Dec. 31 (in millions of Canadian dollars)	2022	2021	2020
Green bonds [1]	**703**	171	n/a
Sustainability-linked loans	**1,250**	1,250	n/a

(1) Green bonds are related to Senior Green Bonds issued in 2022 and the Windrise Wind green bond issued in 2021.

Climate-Related Financial Metrics

The results of TransAlta's 2021 climate-related scenario analysis, aligning with a 1.5°C warmer world, have shown that opportunities to grow the renewable fleet exist across all scenarios and locations. Our revenue from renewable energy generation (solar, wind and hydro) in 2022 was $1,014 million (2021 – $731 million) or 29 per cent of our total revenue in 2022.

We continue to execute the Clean Electricity Growth Plan to deliver 2 GW of new generation and a 5 GW growth pipeline by 2025 by reaching final investment decisions on 500 MW of additional clean energy projects across Canada, the United States and Australia in 2023. Our growth capital expenditures for renewable energy generation in 2022 was $666 million (2021 – $326 million).

As part of our Clean Electricity Growth Plan, our goal is to achieve 70 per cent of adjusted EBITDA from renewables and storage by the end of 2025. In 2022, adjusted EBITDA from renewable energy generation was $838 million (2021 – $584 million) or 51 per cent of our total adjusted EBITDA. Our renewable fleet makes our overall portfolio more resilient to climate-related risks, provides increased flexibility in generation and creates incremental environmental value through environmental attributes. Our revenue in 2022 from environmental attribute sales was $53 million (2021 – $40 million).

The disclosure of TransAlta's financial metrics related to our climate-related risks and opportunities align with the TCFD recommendations. A summary of our climate-related financial metrics is presented below.

Year ended Dec. 31 (in millions of Canadian dollars)	2022	2021	2020
Capital expenditures for renewable energy generation [1]	**666**	326	158
Renewable energy adjusted EBITDA [2]	**838**	584	353
Environmental attribute sales revenue [3]	**53**	40	25
Renewable energy adjusted revenue [4]	**1,014**	731	486

(1) Growth capital expenditures include amounts deployed for growth projects and acquisitions related to renewable energy generation. This includes the construction of our Windrise wind facility completed in November 2021, the acquisition of North Carolina Solar portfolio in November 2021, the construction of the Garden Plain wind project, White Rock wind projects, Horizon Hill wind project and Northern Goldfields solar project as part of our Clean Electricity Growth Plan. This excludes the Mount Keith transmission expansion project.
(2) Adjusted EBITDA from renewable energy generation includes hydro, wind, solar and battery storage facilities. These items are not defined and have no standardized meaning under IFRS. Refer to the Additional IFRS Measures and Non-IFRS Measures section of this MD&A.
(3) Environmental attribute sales revenue indicates the full amount of hydro, wind and solar environmental credits, without any other consolidation impacts.
(4) Adjusted revenue from renewable energy generation includes hydro, wind, solar and battery storage facilities.

Alignment with TCFD

The table below shows the alignment of our climate change management disclosure with TCFD recommendations.

Recommended Disclosures	Location
Governance	
Describe the board's oversight of climate-related risks and opportunities	Oversight by the Board of Directors
Describe management's role in assessing and managing climate-related risks and opportunities	Role of Senior Management
Strategy	
Describe the climate-related risks and opportunities the organization has identified over the short, medium and long term	Key Scenario Findings
Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy and financial planning	Climate Change Strategy, Key Climate Scenario Findings
Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario	Climate Scenarios, Key Climate Scenario Findings
Risk management	
Describe the organization's processes for identifying and assessing climate-related risks	Climate Change Strategy
Describe the organization's processes for managing climate-related risks	Managing Climate Change Risks and Opportunities
Describe how processes for identifying, assessing and managing climate-related risks are integrated into the organization's overall risk management	Managing Climate Change Risks and Opportunities
Metrics and targets	
Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process	Climate Change Metrics and Targets
Disclose scope 1, scope 2 and, if appropriate, scope 3 greenhouse gas (GHG) emissions and the related risks	Climate Change Metrics and Targets
Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets	Climate Change Metrics and Targets

Enabling Innovation and Technology Adoption

Technology and innovation are an existing and increasing focus at TransAlta. We have long been innovators. TransAlta has been at the forefront of innovation in the power-generation sector since the early 1900s when we developed hydro assets. We have been an early adopter and developer of wind technology in Canada and are now one of the largest wind generators in the country. In 2015, we made our first investment in solar technology in Massachusetts and, in 2020, we installed the first utility-scale battery in Alberta. We are now looking to advance a new technology roadmap that aligns with the Clean Electricity Growth Plan. This section covers manufactured and intellectual capital management as per guidance from the International Integrated Reporting Framework.

Our Energy Innovation Team

As part of our Clean Electricity Growth Plan, in 2021, we established an Energy Innovation team to investigate, prioritize and deploy new net-zero electricity generation technologies that address the four pillars of our business: affordability, reliability, safety and non-emitting. As we grow our renewables business, the Energy Innovation team is focused on what we should build next that complements our wind, solar and hydro assets to deliver reliable, affordable and clean electricity to our customers. At the same time, the Energy Innovation team is looking at electrification broadly to investigate where potential new, adjacent business opportunities may exist for TransAlta.

Renewable Energy

Today, we operate 944 MW of hydro energy, 1,906 MW of wind and battery storage, and 143 MW of solar power. We continue to look for opportunities to develop and operate solar energy.

In 2022, TransAlta executed a long-term renewable energy PPA with a subsidiary of Meta for 100 per cent of the generation from its 200 MW Horizon Hill wind project located in Oklahoma. Under this agreement, Meta will receive both renewable electricity and environmental attributes from the Horizon Hill wind project. The facility will consist of a total of 34 Vestas turbines. Construction commenced in the fall of 2022 with a target commercial operation date in the second half of 2023.

We also entered into a long-term PPA for the remaining 30 MW from our 130 MW Garden Plain wind project, to be located in Alberta. We will deliver renewable electricity and environmental attributes to a new investment-grade globally recognized customer. In 2021, TransAlta entered into a long-term PPA with Pembina Pipeline for the offtake of 100 MW from our Garden Plain wind project. The project began in 2021 and is expected to achieve its commercial operation date early in 2023.

In 2022, TransAlta identified Amazon as the customer for the 300 MW White Rock wind projects, to be located in Oklahoma. In 2021, we entered into two long-term PPAs with Amazon for the offtake of 100 per cent of the generation from the projects. Construction activities started in the fall of 2022 with a target commercial operation date in the second half of 2023.

In 2021, TransAlta acquired a 122 MW portfolio of operating solar sites located in North Carolina, which represented a significant expansion of our solar generation. We intend to further expand our solar generation by actively pursuing solar opportunities in the US and Australian markets. The Company is also focused on pursuing hybrid integrated power solutions with customers.

In 2021, TransAlta agreed to provide renewable solar electricity supported with a battery energy storage system to the Goldfields-based operations of BHP Nickel West through the construction of the Northern Goldfields solar project in Western Australia. The project consists of the 27 MW Mount Keith solar facility, 11 MW Leinster solar farm and 10 MW/5 MWh Leinster Battery Energy Storage System and interconnecting transmission infrastructure, all of which will be integrated into TransAlta's 169 MW Southern Cross Energy North remote network. The Northern Goldfields solar project is expected to reduce BHP's scope 2 electricity GHG emissions from its Leinster and Mount Keith operations by 540,000 tonnes of CO_2e over the first 10 years of operation. Construction of the project commenced in early 2022 and commercial operations are targeted in the first half of 2023.

TransAlta is actively advancing its development pipeline. In 2022, the Company announced 200 MW of new build projects. TransAlta has established a pipeline of potential growth projects that includes 374 MW of advanced stage development projects along with 3,891 to 4,991 MW of projects in earlier stages of development.

Scaling Up Energy Solutions

Battery Storage

We continue to invest in battery storage. In 2020, we commissioned WindCharger, the first utility-scale battery storage project in Alberta, located at our Summerview II wind facility. The project uses Tesla battery technology and has a capacity of 10 MW.

The Northern Goldfields solar project in Western Australia will provide both renewable solar electricity and a battery energy storage. The energy storage consists of the 10 MW/5 MWh Leinster Battery Energy Storage System which will be integrated into TransAlta's remote network. The network and new generation will support BHP Nickel West to meet its emissions reduction targets and deliver lower-carbon, sustainable nickel to its customers.

Future Solutions

Hydrogen

In February 2022, we announced a $2 million equity investment in Ekona's Series A funding round. The investment will help support the commercialization of Ekona's novel methane pyrolysis technology platform, which produces cleaner and lower-cost turquoise hydrogen. If successful, Ekona's distributed technology allows for onsite production of hydrogen, avoiding the need for costly transportation of hydrogen, and its solid carbon byproduct allows for low-cost, low-emissions hydrogen production without the need for carbon sequestration. TransAlta is a member of Ekona's Strategic Committee and will continue to work with Ekona as it develops its pyrolysis technology.

Nature-based Solutions (NBS)

Nature-based Solutions are actions to protect, sustainably manage and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people and nature. TransAlta is actively evaluating NBS as carbon removals to neutralize any limited emissions that we cannot yet eliminate.

Direct Air Capture (DAC)

Direct air capture (DAC) technologies extract CO_2 directly from the atmosphere. The CO_2 can be permanently stored in deep geological formations, thereby achieving permanent CO_2 removal. TransAlta continues to explore the benefits of DAC as a carbon dioxide removal option to support the net-zero transition of our operations and customers.

Carbon Capture, Utilization and Storage (CCUS)

Our teams continuously explore the use of applied or new technologies such as CCUS to reduce GHG emissions. We know that new technologies will emerge over the next number of years as the industry continues to drive towards lower emissions while maintaining a reliable and affordable product for customers.

Disruptive Technologies

In May 2022, we entered into a commitment to invest US$25 million over the next four years in Energy Impact Partners' ("EIP") Deep Decarbonization Frontier Fund 1 (the "Frontier Fund") that will invest in early-stage, innovative technology companies that will accelerate the transition to net-zero GHG emissions. TransAlta's investment in the Frontier Fund provides TransAlta with the opportunity to pool funds with some of the largest utilities in the United States and Europe to identify, pilot, commercialize and bring to market technologies that will support its decarbonization goals. For more information, refer to Energy Impact Partners ("EIP") Investment in the Significant and Subsequent Events section of this MD&A.

Fusion

Fusion technologies attempt to recreate the fusion reactions in the sun by fusing two hydrogen molecules together. If successful, fusion promises low-cost energy, with far shorter-lived nuclear waste. Fusion achieved some significant development milestones in 2022, including most significantly, Lawrence Livermore National Laboratory achieving net energy gain. This, coupled with unprecedented capital flow into fusion companies, has led to newfound excitement that fusion may be able to leapfrog current generation technologies.

Through EIP, TransAlta has developed a partnership with ZAP Energy, a leading fusion start up. ZAP Energy's technology stabilizes the hydrogen plasma using sheared flow (driving current through the flow creating the magnetic field confining and compressing the plasma) rather than magnetic fields. In September 2022, ZAP announced it will conduct a feasibility study of retrofitting the former TransAlta Big Hanaford gas plant located in Centralia to host its first-of-a-kind Z-pinch fusion pilot plant. ZAP received $1 million from the Centralia Coal Transition Grants Energy Technology Board as part of our energy transition investments to move away from coal in Washington State.

Idea Generation and Innovation

Idea Generation

Our Rise (formerly known as the "Greenlight") program continues to be a driving force behind the strong culture of idea generation and problem solving at TransAlta. The program emphasizes bottom-up innovation, which means business improvement ideas are generated by employees. These ideas are developed and advanced into business cases, adhering to best practices of project management, to ensure successful implementation of the improvement opportunity. From the initial ideation, to development and delivery, this process is driven entirely by employees, with support from leaders across the organization.

Supplier Innovation

Another initiative we promote is the TransAlta Innovation Series. The series aims to empower our workforce through relevant industry knowledge on innovative concepts. This includes bringing in thought leaders on new technologies to discuss conceptual ideas that initiate creative thinking and suppliers that provide insight into commercial applications of evolving technologies. The series continually advocates TransAlta's value and organizational culture of innovation and learning. The series focuses on informing our employees on the different kinds of innovative concepts and technologies developing in our industry that they can bring forward in the organization, while also developing relationships with leading-edge companies. In 2022, the series also sponsored several charities that have either benefited from the technologies being discussed or are charities the speaker's support on behalf of their organization's ESG and ED&I initiatives.

In 2022, we delivered eight sessions across four different categories, including energy innovation, operational innovation, digital innovation and innovation mindset. Under energy innovation, we looked at the evolution of ESG going from a functional requirement a few years ago to currently becoming a core value driver in corporations. We learned about the up-and-coming role that nuclear small modular reactors will play nationally and internationally. We also had one of our customers participate in a fireside chat to discuss how the partnership with TransAlta is providing clean power solutions and impacting the clean energy transition. Under operational innovation, we discussed what the future of meetings will look like in a hybrid workplace and the importance of a customer-centric shared services' business model. Our digital innovation presentations looked at safety and health apps for our frontline workers and how geospatial intelligence could be used to optimize and transform the utilities industry. Finally, the presentation focusing on developing an innovation mindset looked at the periodic table of innovation where all innovation is categorized into 10 main types and how we can use these as tools to further our own creativity.

Analytics and Automation

Asset Analytics and Optimization

TransAlta's Asset Analytics and Optimization ("AAO") team was founded in 2008. This team monitors coal-fired steam, gas-fired steam, simple-cycle, combined-cycle/cogeneration and wind-generating assets across Canada, the US and Australia. A centralized team of engineers and operations specialists remotely monitors our power facilities for emerging equipment reliability and performance issues. The AAO team also performs production reporting functions for these assets and is actively engaged in projects to improve this reporting.

AAO staff are trained in the development and use of specialized equipment monitoring and performance assessment software and they apply their experience to power facility operations. If an issue is detected, the AAO will initially assess and then notify facility operations of their findings to support investigation and remedy of the issue before there is an impact to operations. This support is critical for reliability and performance of our operations. For example, if a wind turbine starts to show very early signs of equipment change compared to others, our operation team is notified and will work to investigate and remedy the issue. The monitoring, analysis and diagnostics completed by the AAO are focused on early identification of equipment issues based on longer-term trend analysis and complements day-to-day facility operations.

Automation and Robotics

TransAlta created the Data and Innovation team in 2019 to modernize its data infrastructure and take advantage of new opportunities in analytics and data science. The Data and Innovation team is cross-functional; composed of data architects, data engineers, data analysts, software developers, integration specialists and engineers. The team focuses on the delivery of value using digital innovation, such as the modernization of data management strategy and platforms, the rapid delivery of data-driven applications, the design and implementation of advanced analytics and machine learning models and the execution of robotic process automation to eliminate manual tasks.

A few highlights from this work in 2022 include:

- The Data and Innovation team worked with partners across the company to advance its Asset Performance Management platform, GenOS, to deliver new features that increase the performance and management of our renewable asset fleet. Key process improvements, such as enhanced performance analytics that leverage machine learning, advanced analytics and data science models, provide our operators with deeper insights to help optimize asset performance across the entire fleet. Built in-house, GenOS provides data-driven insights for our wind, solar, gas and hydro fleets.
- The substantial growth of our Advanced Automation Program has increased the number of manual processes we have automated, allowing our subject matter experts to spend more time on higher-value opportunities. With industry leaders in automation, TransAlta is able to leverage high impact technology to quickly develop custom robotic process automations across the company.
- Continued engagement and Industry partnership with AltaML Applied AI Lab, a groundbreaking initiative that focuses on building and expanding local talent while improving our business through the application of machine learning and artificial intelligence. The 2022 cohort worked on six cases including component health monitoring for our wind and solar fleet forecasting models.
- With a focus on the future, the Data and Innovation team kicked off the Digital TransAlta Program to identify and plan for the core business capabilities required to respond to a changing industry and technology landscape over the next five years. This program looks to match digital innovation with key areas of opportunity across our Operations, Growth, Corporate and Trading teams. In 2022, we delivered ideation sessions across the company and with industry partners.

Drones

In April 2022, TransAlta formed the Robotics Inspection Council. The Council's purpose is to coordinate and assess the use of drones for robotic inspections to increase value to the business through improved safety, reduced inspection costs and better communication. In alignment with TransAlta's core value of safety, the Council defined the corporate requirements on the safe use of remotely piloted aircraft in TransAlta's fleet. The Council also met with vendors and industry peers to understand areas of opportunity and how these technologies are being deployed. Robotic inspections were performed in TransAlta's gas and hydro fleets. The Council is investigating additional applications in our renewable fleet for 2023.

Engaging with Our Stakeholders to Create Positive Relationships

We strive to create shared value for our stakeholders through social and relationship value creation at TransAlta. The most material impacts on our social and relationship performance are fostering positive relationships with Indigenous neighbours, communities, stakeholders, governments, industry and landowners in the areas where we operate, as well as public health and safety. This section covers sustainability factors of social and relationship capital and intellectual capital as per guidance from the International Integrated Reporting Framework.

Inclusive Transition

In support of our energy transition, since 2015, TransAlta has been investing US$55 million over 10 years to support energy efficiency, economic and community development and education and retraining initiatives in Washington State. The investment is part of the TransAlta Energy Transition Bill passed in 2011. This bill was a historic agreement between policymakers, environmentalists, labour leaders and TransAlta to transition away from coal in Washington State by closing the Centralia facility's two units, one in 2020 and the other in 2025. Three funding boards were formed to invest the US$55 million: the Weatherization Board (US$10 million), the Economic and Community Development Board (US$20 million), and the Energy Technology Board (US$25 million). To date, the Weatherization Board has invested US$9.5 million, the Economic and Community Development Board US$15 million and the Energy Technology Board US$15 million.

Specific projects that the boards funded in 2022 include a grant to Twin Transit in support of the installation of Southwest Washington's first Containerized Green Hydrogen Electrolyzer at the Port of Chehalis, providing a reliable source of local hydrogen and proximity to the market; financial support to the Formic Liquid Hydrogen Carrier Clean Energy Demonstration Project at the Port of Tacoma and other locations in the state of Washington, an initiative to replace the use of fossil fuels in the refrigeration of cargo containers; and funding to support solar systems for organizations and non-profits in Washington.

Additionally, in 2016, TransAlta announced that we had reached an agreement with the Government of Alberta for the cessation of coal-fired emissions from coal-fired electricity generation facilities in Alberta (Off-Coal Agreement). As part of the Off-Coal Agreement, TransAlta has invested in programs and initiatives to support the communities surrounding the plants negatively impacted by the phase-out of coal generation during the transition.

Customers

TransAlta serves industrial and commercial customers with power and energy services across its fleet in Canada, the US and Australia. We are focused on customer-centred renewables growth to bring high levels of service quality and reliability for our customers in a low-carbon future. As one of the largest electricity generators in Canada, our team serves businesses with:

- Sustainable solutions starting from the design phase;
- Energy consumption and cost management solutions;
- Market price risk and volume exposure mitigation; and
- Monitoring of energy market design changes, price signals and applicable and available incentives.

The Customer Solutions team at TransAlta has maintained a large portfolio of customers in Alberta across a broad range of industry segments, including commercial real estate, municipal, manufacturing, industrial, hospitality, finance and oil and gas. Our work has been recognized by our customers through an average retention rate of 88 per cent over the last three years.

Across our business in Canada, the US and Australia, we provide on-site generation for large mining and industrial customers. This requires us to be continually engaged with these customers, ensuring that current electricity requirements are provided safely, reliably and cost-effectively with the benefit of lower GHG emissions. We continue to explore opportunities to provide 24/7 carbon-free energy to help customers meet their decarbonization goals.

We continue to develop renewable energy facilities to support customers achieving their sustainability goals and targets, such as 100 per cent renewable power targets and/or GHG emissions reduction targets. Production from renewable electricity in 2022 resulted in the avoidance of approximately 2.7 million tonnes of CO_2e for our customers.

Our experience in developing and operating low-carbon power facilities is highlighted below:

Power generation type	Operating experience (years)
Hydro	111
Natural Gas	72
Wind	25
Solar	8
Battery Energy Storage Systems	2

For further details on how we support our customers' sustainability objectives, please refer to the Enabling Innovation and Technology Adoption section of this MD&A.

Human Rights

TransAlta is committed to honouring domestic and internationally accepted labour standards and supports the protection of human rights of all its employees, contractors, suppliers, partners, Indigenous partners and other stakeholders. We abide by human rights and modern slavery legislation in Canada, the US and Australia. We have a zero tolerance approach to discrimination based on age, disability, gender, race, religion, colour, national origin, political affiliation or veteran's status or any other prohibited ground as defined by human rights legislation in the jurisdictions in which we operate. We afford equal opportunities for men and women, support the right to freedom of association and the right to organize unions and bargain collectively. We do not conduct operational human rights reviews or impact assessments, but we do have governance practices in place for the protection of human rights.

Our Human Rights and Discrimination Policy communicates our commitment to human rights in our operations and supply chain to ensure that our personnel policies and practices in our global operations respect fundamental rights. Expected behaviours of all our employees are set out in our Corporate Code of Conduct. We are committed to creating a work environment where all workers feel safe and are valued for the diversity they bring to our business. Our annual mandatory Code of Conduct training is required for employees to complete before signing the Code of Conduct. We also have adopted a Supplier Code of Conduct that defines the principles and standards expected of suppliers, their employees and contractors to meet while providing goods and/or services to TransAlta.

Our Whistleblower Policy provides a mechanism for our employees, officers, directors and contractors to report, among other things, any actual or suspected ethical or legal violations. We would seek to remedy the impact promptly in order to establish a corrective action plan in collaboration with the relevant individuals and stakeholders.

In Australia, we report under the Australian modern slavery legislation. Our Modern Slavery Act Statements demonstrate the actions we have taken to assess and address modern slavery risks within our operations and supply chain. These annual statements are approved by our Board of Directors and are publicly available.

Supply Chain and Sustainable Sourcing

We continue to seek solutions to advance supply chain sustainability. As we explore major projects, we assess vendors both at the evaluation stage and as part of information requests on such elements as safe work practices, environmental practices and Indigenous spend. This means, for example and for select procurement engagements, getting information on:

- Estimated value of services that will be procured though local Indigenous businesses;
- Estimated number of local Indigenous persons that will be employed;
- Understanding overall community spend and engagement; and
- Understanding the state of community relations through interview processes and stakeholder work.

Supply chain is a pillar of our Clean Electricity Growth Plan to deliver net-zero operations. We have enhanced the supplier management functionality within our corporate procurement system and are working to incorporate ESG data reporting capability. In the next few years, we will develop ESG criteria for supply chain engagement and work to understand our direct suppliers' GHG emissions profile and targets. Our long-term plan is to engage with suppliers to explore enhancement of their GHG emissions targets and set direction for engaging suppliers with GHG emissions reduction targets.

In 2022, TransAlta approved a new goal to integrate sustainability into supply chain. Our target is "By 2024, 80 per cent of our spend will be with suppliers that have a sustainability policy or commitment". This supports the intent of the UN SDG Target 12.7: “Promote public procurement practices that are sustainable, in accordance with national policies and priorities.”

Our Supplier Code of Conduct 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 they pertain to health and safety, ethical business conduct and environmental leadership. The code also allows suppliers to report ethical or legal concerns via TransAlta’s Ethics Helpline.

Indigenous Relationships and Partnerships

At TransAlta, we value relationships and partnerships with our Indigenous neighbours, aspiring to the highest standards in our relationships with Indigenous peoples. Our core values of safety, innovation, sustainability, respect and integrity represent how we do business and engage with Indigenous peoples. Our commitment to Indigenous relations is led by a centralized corporate team who foster a relationship-based approach, involving employees at our facilities and within each business unit. These employees and teams build relationships with the neighbouring Indigenous communities and work to develop respectful, trusting relationships that help TransAlta continually improve its business practices.

Our Indigenous Relations Policy focuses on five key areas: community engagement and consultation, business development, community investment, employment, and training and awareness. We ensure that TransAlta's principles for engagement are upheld and the Company fulfils its commitments to Indigenous communities. Efforts are focused on building and maintaining solid relationships and strong communication channels that enable TransAlta to: share information regarding operations and growth initiatives; gather feedback to inform project planning; and understand priorities and interests from communities to better address concerns and unlock opportunities.

Methods of engagement include:

- Relationship building through regular communication and meetings with representatives at various levels within Indigenous communities and organizations;
- Hosting company-community activities to share both business information and cultural knowledge;
- Maintaining consistent communications with each community and following appropriate community protocols and procedures;
- Participating in community events such as pow wows and blessing ceremonies; and
- Providing both monetary and in-kind sponsorships for community initiatives.

TransAlta takes a proactive approach in engagement by initiating communication early in project development to allow concerns to be identified and addressed, which has minimized potential project delays. We strive to maintain relationships through the life cycle of our operations, from project development and construction, through operation, until decommissioning phases are complete. We work with communities to build relationships based on a foundation of ongoing communication and mutual respect. This is recognized in our Indigenous Relations Policy, which was recently updated to include our acknowledgement and understanding of the intent of the recommendations of the United Nations Declaration on the Rights of Indigenous Peoples.

Support for Indigenous Youth, Education and Employment

TransAlta recognizes the importance of investing in Indigenous students and our financial support helps students complete their education, become self-sufficient and move forward to become future leaders in their communities. We are keen to help young Indigenous students reach their full potential and achieve their dreams. We also believe in providing support to Indigenous primary school students, helping to instil a passion for lifelong learning.

In 2022, TransAlta provided more than $457,000 to support Indigenous youth, education and employment programs, representing 20 per cent of TransAlta's total community investment. Highlights include:

- **Mother Earth's Children's Charter School ("MECCS")** – Located in Treaty 6 territory, Alberta, MECCS offers education for students from kindergarten to Grade 9 and is cited as Canada's first and only Indigenous children's charter school. The student population is diverse and includes Métis, Cree, Nakoda Sioux and Stoney. Volunteers from TransAlta travel to the school to deliver Christmas gifts, providing both our employees and the students the opportunity to engage with each other.
- **Spirit North** – TransAlta is proud to support Spirit North, a national charitable organization that uses land-based activities to improve the health and well-being of Indigenous youth. Through the transformative power of sport and play, participants learn important lessons, discover untold potential and build the confidence and courage needed to overcome the hardships Indigenous youth often face.
- **The Read On Literacy Program** – In 2022, TransAlta supported the development of an Indigenous literacy program that seeks to mentor young people in First Nation schools to achieve their maximum academic, personal and social development by promoting the core values of education, literacy, taking pride in ones' culture and making good decisions in one's life. TransAlta has sponsored the Read On Literacy Program to provide this initiative to elementary students in Alberta in 2023.
- **Books In Homes** – Funding supports an early literacy program for the children of Tjiwarl Aboriginal Corporation members in Western Australia.

Indigenous Cultural Awareness Training for TransAlta Employees

In 2021, we adopted a new sustainability target that will see all employees complete Indigenous cultural awareness training by the end of 2023. We believe education is the foundation to ensuring respectful and strong relationships with Indigenous peoples into the future. In 2022, 100 per cent of Canadian employees have completed Indigenous cultural awareness training. Our employees in the US and Australia will receive the training in 2023.

Stakeholder Relationships

Fostering positive relationships with our stakeholders is important to TransAlta. Driven by our core values, we see stakeholder transparency as an integral part of our relationships. We take a proactive approach to building relationships and understanding the impacts our business and operations may have on local stakeholders.

Our Stakeholders

To act in the best interests of the Company and optimize the balance between financial, environmental and social values for both our stakeholders and TransAlta, we seek to:

- Build relationships through regular engagement with stakeholders regarding our operations, growth prospects and future developments;
- Consider feedback and make changes to project designs and plans to resolve and/or accommodate concerns expressed by our stakeholders; and
- Respond in a timely and professional manner to stakeholder inquiries and concerns and work diligently to resolve issues or complaints.

Our stakeholders are identified through stakeholder mapping exercises and prospective project development or acquisition. Through decades of establishing stakeholder relationships in the areas of our facilities, we have developed a strong knowledge of who our stakeholders are and gained understanding of our stakeholders' issues and concerns.

Our principal stakeholder groups are listed in the following table.

TransAlta stakeholders		
Non-governmental organizations	Community associations and organizations	Connecting transmission facility operators
Regulators	Industry organizations	Communities
Charitable organizations/Non-profit	Standards organizations	Retirees
All levels of government	Media	Residents/Landowners
Suppliers	Business partners	Investor organizations
Contractors	Unions/Labour organizations	Financial institutions
Government agencies	Forest associations/Industry	Mineral rights owners
System operators	Oil and gas associations/Industry	Railroad owners
Customers	Think tanks	Utility owners
Municipalities	Academics	Employees

Stakeholder Engagement

In order to run our business successfully, we maintain open communication channels with our stakeholders. We are committed to timely and professional resolution in our dialogue with stakeholders. Our stakeholder engagement practices are guided by regulatory requirements, industry best practices, international standards and corporate policies. We work internally and with each stakeholder to identify and mitigate further issues.

Examples of our methods of engagement are listed in the following table.

Information and communication	Dialogue and consultation	Relationship building
Open houses, town halls and public information sessions	In-person meetings with local groups and communities	Community advisory bodies
Newsletters, telephone conversations, emails and letters	Meetings with individual stakeholders (e.g., landowners and residents)	Capacity agreements
Websites	Targeted audience sessions	Sponsorships and donations
Social media postings	Tours of our facilities and sites	Hosting and attending events

A key focus of our work is to support business growth through proactive engagement with stakeholders in our geographic operating areas in Canada, the US and Australia to develop and maintain relationships, assess needs and fit and seek out collaborative and sustainable opportunities. This helps ensure any stakeholder concerns are identified and can be addressed early in the development process, thereby minimizing project delays. We conduct consultation primarily during project development and construction and maintain engaged communication throughout operations to decommissioning.

Examples of stakeholder engagement in 2022 include: the WaterCharger battery energy storage project virtual open house, Highvale Mine decommissioning and reclamation plan public open house, Tempest wind project public open house, virtual stakeholder meeting on the Bow River management with local stakeholders and recreational users and the Kent Hills rehabilitation plan.

Community Investments

In 2022, TransAlta contributed approximately $2.3 million in donations and sponsorships (2021 – $3.0 million), with a continued focus in three priority areas: youth and education, environmental leadership and community health and wellness.

One of our significant community investments each year is to United Way campaigns across Canada and the US. This year, TransAlta employees, retirees, contractors and the Company raised over $1.2 million for the United Way. TransAlta has been supporting the United Way for over 30 years and has contributed more than $22 million over that time.

In 2022, TransAlta made a number of other significant investments, including the following highlights:

- **Calgary Health Foundation** - In 2022, TransAlta announced a $2 million contribution to the Calgary Health Foundation to support the Newborn Needs campaign in support of the development of a new Foothills Medical Centre Neonatal Intensive Care Unit, serving all of southern Alberta.
- **Foodbank Support** – In December 2022, TransAlta donated $250,000 to local food banks near our operating assets in Canada, the US and Australia. This initiative recognizes the hardship faced in many communities and the increased reliance on food banks as families struggle to make ends meet.
- **Centralia College** - TransAlta (through the Centralia Coal Transition Board) invested $1.3 million in the Southwest Washington Flexible Training Center, located at the Centralia College campus. The center is a 12,000 square foot facility that will expand the college's ability to train-on-demand in response to and in anticipation of industry needs.

Public Health and Safety

We are committed to protecting the public and our assets, as well as the physical, psychological and social well-being of our employees.

We specifically look to minimize the following risks:

- Harm to people;
- Damage to property;
- Operational liability; and
- Loss of organizational reputation and integrity.

We work to prevent incidents and lower our risk by administering security controls such as restricting physical access around and into our operating facilities. The use of security technology such as surveillance cameras and electronic access is utilized to ensure the control of secure areas. Regular audits and security risk assessments are conducted to ensure continuous improvement of the Security Management Program. Our Security Management Program is focused on the protection of people, property, information and reputation.

The Corporate Emergency Management Program prepares employees should an emergency incident occur. The program receives executive sponsorship and includes an emergency management policy and standard, which sets an expectation for employees to continuously prepare for emergencies. It provides the overarching framework for each business unit to provide an Emergency Response Plan and Business Continuity Plan. We implement our Incident Command System, which is a standardized on-scene emergency and incident management system that provides an organizational structure able to respond to single or multiple incidents. Designed to aid in the management of resources during incidents, it combines facilities, equipment, personnel, procedures and communications operating within a common organizational structure. It is used as part of an all-hazards approach for incident management and is officially recognized for multi-agency response in emergency situations, however complex.

We develop strong relationships with local emergency responders. We periodically conduct multi-agency training events at our facilities. This ensures continuous improvement and familiarity with our assets and builds strong communication channels for emergency response.

Our processes designate how we communicate with stakeholders in the event of a crisis. This is managed by our Crisis Communications Team. The team has the responsibility and goal to provide a unified message on behalf of the Company throughout the response and recovery, ensure all messaging is approved by the Incident Commander, co-ordinate messaging with any applicable external agencies and, if necessary, deploy to an incident site.

Annual training requirements are adhered to by our employees operating at our facilities. The results are tracked, audited and presented at our annual executive review. The findings and recommendations assist in maintaining a sustainable program across the organization.

Data and Digital Asset Protection

We work diligently to protect our digital assets, including our corporate data and our digital identities that give us access into line of business applications. Cybersecurity risks that work to compromise these assets include the manipulation of data integrity, system and network hacking, use of social engineering tactics through email phishing, compromise of operations and infrastructure through the use of ransomware, credential breaches, attacks introduced through unknowing third-party vendors and service providers, as a well as malware.

Given the ever-evolving nature of cyberattacks, we are consistently adapting our cybersecurity program to focus on three key pillars: technology, processes and people. Each of these pillars can be reinforced independently to address specific cyber risks and threats through a comprehensive and multi-faceted program. TransAlta continually implements measures and controls to proactively mitigate internal and external cybersecurity risks and threats posed to the organization and to deal efficiently and effectively with threats through this program.

TransAlta complies with the North American Electric Reliability Corporation Critical Infrastructure Protection ("NERC CIP") requirements. The NERC CIP is a set of standards aimed at regulating, enforcing, monitoring and managing the security of the North American power system. These standards apply specifically to cybersecurity risks.

Refer to Cybersecurity Risk in the Governance and Risk Management section of this MD&A for further details.

Building a Diverse and Inclusive Workforce

Engaging our workforce, developing our employees, creating a diverse and inclusive work environment and minimizing safety incidents are the keys to human capital value creation at TransAlta and our most material areas for management. In 2022, we improved our ESG performance through our efforts to promote an equitable, diverse and inclusive workforce. This section covers sustainability factors of human capital as per guidance from the International Integrated Reporting Framework.

Equity, Diversity and Inclusion

TransAlta's commitment and focus on excellence in ED&I is found in our workplace, among our co-workers who advocate for the values of equity and inclusion at all working levels. This commitment is outlined in our Board and Workforce Diversity Policy and Diversity and Inclusion Pledge. We believe a strong focus on ED&I will create a culture of belonging, allowing our employees to bring their authentic selves to work where they can thrive, innovate, improve service to our customers and positively impact the communities that we live in.

In 2022, TransAlta executed the second year of our five-year ED&I strategy to achieve the goals and aspirations defined in our ED&I Pledge.

Gender Diversity

A number of case studies have highlighted the link between gender diversity and additional business value. TransAlta is an active supporter of gender diversity as a driver for value, but also as an ethical business practice. Our commitment to gender diversity in our business is evidenced by our female participation rates on both our executive team and Board. As of Dec. 31, 2022, women made up 30 per cent of our executive officer team and 36 per cent of our Board. These percentages are higher than the Canadian corporate averages of board seats held by women (24 per cent) and women on executive teams (21 per cent), according to data from all disclosing Canadian TSX-listed companies in Canada.

To further support female advancement, we have set targets to: (i) maintain equal pay for women in equivalent roles, (ii) achieve 50 per cent representation of women on our Board by 2030 and (iii) achieve 40 per cent representation of women among all employees by 2030. Currently, women employees represent 26 per cent of all employees. Though the majority of our operational roles are currently held by male employees, we remain committed to achieving the 40 per cent goal in this time period.

TransAlta was once again added to the Bloomberg Gender-Equality Index in 2022. Inclusion in the index recognizes our comprehensive investment in workplace gender equality and our commitment to driving progress by developing inclusive policies and disclosing data using Bloomberg's gender reporting framework. In 2022, the Company received the Globe and Mail's Women Lead Here award, which evaluates publicly traded Canadian companies' ratio of female-identifying to male-identifying executives in the top three tiers of executive leadership.

In 2022, we continued with the Women in Trades Scholarship with 13 different educational institutions for eligible students enrolled in post-secondary trade programs. In 2022, we also continued with a female apprenticeship program in our Generation business to strategically target the recruitment of female students and train them to gain valuable experiential learning in the trades.

Workforce Health and Safety

The safety of our people, communities and the environment is one of our core values. Our focus on Operational Excellence puts into action TransAlta's value of enabling a safe environment for our people and our communities. Operational Excellence is about powering and empowering our communities in a safe, environmentally friendly and sustainable manner by investing in clean electricity generation and ensuring our assets operate reliably and efficiently.

TransAlta's management systems underpin the delivery of safe, reliable and competitive electricity to our customers and partners. Our Total Safety Management System is a combination of recognized best practices in process safety, risk management, asset management, occupational health, safety and environmental management. Since expanding our Occupational Health and Safety program in 2015 to encompass Total Safety, we have transitioned from the development and implementation of this framework into continuous improvement, always striving to achieve our Target Zero vision to operate our business with zero unexpected asset failures and zero environmental, health and safety incidents.

We made significant progress on our safety culture transformation journey. Training and development initiatives were a top priority in which we completed behaviour-based safety training for all employees. This training provides the tools and strategies to allow employees to influence their individual behaviours and encourage personal ownership over safety outcomes. It helps create a psychologically safe environment in our workplace as it encourages personal accountability towards safety.

One of our key safety indicator is the Total Recordable Injury Frequency ("TRIF"). TRIF tracks the number of injury incidents that require treatment beyond first aid, relative to total exposure hours worked. Our TRIF result for 2022 was 0.39 compared to 0.82 in 2021. In 2022, our TRIF exceeded the target of 0.61 and was our best annual result on record. To put this into perspective, we had six recordable injuries in 2022 compared to 17 in 2021. We had zero lost-time injuries or restricted work injuries.

In part, our strong safety performance can be attributed to the extensive work we have done to support our three key strategies: mature our safety culture, assess and address risk tolerance and standardize safety information and technology. To sustain and enhance our safety culture, TransAlta conducted more than 100 one-hour peer board sessions for leaders across the fleet. These sessions reinforce the concepts learned in behaviour-based safety training and provide leaders with key safety information to share with their teams.

The following represents our corporate safety performance and includes employees and contractors:

Year ended Dec. 31	2022	2021	2020
Lost-time injuries	**0**	3	5
Medical aids	**6**	9	9
Restricted work injuries	**0**	5	2
Exposure hours	**3,058,000**	4,134,000	3,948,000
Total Recordable Injury Frequency (TRIF)	**0.39**	0.82	0.81

We also focus on Total Safety Report Frequency. This is a leading indicator that measures Total Safety Reports (hazard, near miss and positive observations) per worker per year. Total Safety Reports are proactive in nature and demonstrate the actions we are taking to identify and prevent an injury or loss from occurring. We also report and recognize positive behaviours in the workplace to enable a safe environment. This allows us to not only manage incidents when they occur but identify opportunities to prevent them from occurring in the first place. In 2022, we recorded 12 reports per worker, which is well above our threshold target of 10. Evidence of the positive impacts associated with strong reporting is apparent when looking at our overall safety performance. As a demonstration to TransAlta's commitment to safety, SunHills Mining LP was awarded the Safety Excellence Award from the Alberta Mine Safety Association in June 2022. This award is for best safety performance of all Alberta mines under one million workforce hours based on 2021 performance. In 2022, our Gas segment teams also celebrated one year with no lost-time, medical aid or restricted work injuries.

Organizational Culture and Structure

Our employees are central to value creation. Our corporate culture has evolved and adapted throughout our 111-year history. Our values are safety, innovation, sustainability, respect and integrity. These five values help provide clarity for our employees and guide our behaviour and decision-making. They also provide a foundation for leadership, collaboration, community support, personal growth and work-life balance. Through corporate initiatives and support throughout all levels of leadership, we encourage our employees to maximize their potential.

Culture Transformation

In 2022, we embarked on our culture transformation journey with our goal of becoming a culture of learning, purpose and results. We developed a three-year culture strategy, Culture Charter and Culture Roadmap that defines milestones. For alignment and transparency, all of these documents are available to our employees.

We launched an Employee Engagement Survey to gauge the employee experience, and based on survey results, leaders created action plans to drive improvement and increase engagement at the business unit and team level.

Finally, we are focused on employee well-being. To increase awareness, we have launched education sessions on a variety of topics such as mental health, women's health, men's health, nutrition, resiliency, etc.

Organizational Structure

As of Dec. 31, 2022, we had 1,222 (2021 – 1,282) active employees. This number has decreased by five per cent from 2021 levels, following a reduction in positions in our coal fleet as part of our conversions to gas and cessation of mining operations. With approximately 31 per cent of our employees being unionized, we strive to maintain open and positive relationships with union representatives and regularly meet to exchange information, listen to concerns and share ideas that further our mutual objectives. Collective bargaining is conducted in good faith and we respect the rights of employees to participate in collective bargaining.

Our organizational structure remained the same in 2022. Our business operates four generating segments, with Gas, Wind and Solar, Hydro and Energy Transition. In addition, our Alberta Business Unit and Energy Marketing Team optimize our asset fleet while managing commodity exposures. Our Corporate segment, including finance, legal, human resources, administrative, business development and investor relations functions, oversees our business and provides strategic alignment. The Company also includes a Shared Services division that oversees our information technology, supply chain, engineering and accounting functions. The consolidation and centralization of these functions has allowed us to streamline, standardize and, where appropriate, automate these functions while reducing costs and improving service delivery across the organization. Our operations portfolio is run by a single leadership team, which provides operational and financial synergies, enhancing our competitiveness.

Employee Retention and Recognition

ESG-Linked Compensation

At TransAlta we have linked our ESG performance to our employees' compensation, including that of our executive leadership team. Our annual and long-term incentive pay for performance plans are linked to TransAlta reaching various ESG goals, the targets and metrics of which are reviewed and approved annually by our Board of Directors.

In 2022, 20 per cent of our annual incentive plan was linked to achieving specific ESG objectives: five per cent related to our equity, diversity and inclusion score, five per cent referred to our organizational culture improvements and 10 per cent was linked to safety. Further, 30 per cent of our annual incentive plan was tied to growth, which is focused on expanding TransAlta's portfolio of renewable generation and will help reduce the Company's overall GHG emissions intensity. Our long-term incentive plans include strategic goals related to our focus on clean electricity, strong renewables growth, leading in ESG policy development, delivering on our culture plan and our ED&I strategy. Refer to the Management Proxy Circular for additional details on our ESG related compensation.

Employee Performance and Recognition

We strive to be an employer of choice through our total rewards programs, which include pay-for performance incentive plans, as reviewed and approved by the Board of Directors. TransAlta's annual and long-term incentive plans are designed to measure and recognize employees' contributions towards metrics and targets. In order to motivate and engage employees in a timely manner, we have implemented select employee recognition programs, including a quarterly recognition program and a peer-to-peer recognition program.

Talent Development

TransAlta places significant focus on talent development and retention of its employees. Annually, employees complete a combination of mandatory, optional and bespoke training as part of their roles. All employees have access to speakers who are experts on topics as varied as ED&I, mental health, culture, soft skills development and financial wellness.

Progressive Environmental Stewardship

We continue to increase financial value from natural or environmental capital-related business activities, while minimizing our environmental footprint and potential risk factors related to environmental impacts. This section covers natural capital management as per guidance from the International Integrated Reporting Framework.

Environmental Strategy

All energy sources used to generate electricity have some impact on the environment. While we are pursuing a business strategy that includes investing in renewable energy resources such as wind, hydro and solar, we also believe that natural gas will continue to play an important role in meeting energy needs during our clean electricity transition. Our environmental management processes support our corporate strategy of ceasing GHG-intensive coal operations. In 2026, our generation mix will be made up of natural gas and renewable energy only, with a goal of 70 per cent of EBITDA from renewables.

Environmental Policy

Reducing the environmental impact of our activities benefits not only our operations and financial results, but also the communities in which we operate. We have a proactive approach to minimizing environmental risks and we anticipate this strategy will benefit our competitive position as stakeholders and society place an increasing emphasis on successful environmental management. Our new Environmental Policy defines how we are integrating the protection of nature and the environment within TransAlta's strategy, Total Safety Management System, as well as the principles of conduct for the management of natural resources.

Environmental Management System

At TransAlta, we operate our facilities in line with best practices related to environmental management standards. Our environmental management processes are verified annually to ensure we continuously improve our environmental performance. Our knowledge of environmental management systems ("EMS") has matured since we aligned our processes in accordance with the internationally recognized ISO 14001 EMS standard. Currently, the most material natural or environmental capital impacts to our business are GHG emissions, air emissions (i.e., pollutants) and energy use. Other material impacts that we manage and track performance on via our environmental management practices include land use, water use and waste management.

In addition to our environmental management practices, we are subject to environmental laws and regulations that affect aspects of our operations, including air emissions, water quality, wastewater discharges and the generation, transport and disposal of waste and hazardous substances. The Company's activities have the potential to damage natural habitat, impact vegetation and wildlife, or cause contamination to land or water that may require remediation under applicable laws and regulations. These laws and regulations require us to obtain and comply with a variety of environmental registrations, licenses, permits and other approvals. The environmental regulations in the jurisdictions in which we operate are robust. Both public officials and private individuals may seek to enforce environmental laws and regulations against the Company. We interact with a number of regulators on an ongoing basis.

Environmental Performance

Our performance on managing environmental aspects, reducing our environmental impact and capitalizing on environmental initiatives includes the following:

Biodiversity

The importance of environmental protection and biodiversity is outlined in our new Environmental Policy as a corporate responsibility for TransAlta and a responsibility of each employee and contractor working on TransAlta's behalf. In 2022, the Company approved two new sustainability goals for the protection of nature and biodiversity. For further information, refer to the 2023+ Sustainability Targets section of this MD&A.

Overseeing Biodiversity-Related Issues

TransAlta's GSSC assists the Board in fulfilling its oversight responsibilities with respect to the Company's monitoring of environmental regulations, public policy changes and the development of strategies, policies and practices for the environment. For further information, refer to the Sustainability Governance section of this MD&A.

Assessing Biodiversity Impacts of Our Value Chain

We consider the biodiversity impact at all of our existing operations (a greater focus has been given to mining operations) and the biodiversity impacts of all new growth projects are evaluated in line with regulatory compliance and with respect to TransAlta's focus on biodiversity health. Details on how we assess biodiversity impacts of our value chain are presented in the sections below.

Growth

Each new TransAlta development project must complete an in-depth environmental assessment (as prescribed by the local regulation and in line with our own assessment practices) describing baseline environmental conditions, identifying potential effects and developing mitigation strategies for identified environmental sensitivities prior to construction and operation. These assessments have been specifically designed to meet the environmental information requirements of the respective regions in which we operate while identifying alignment with the intent of the standards and/or regulations applicable to these jurisdictions. Typically, our renewable projects are greenfield development projects that require a higher level of evaluation compared to our gas projects, which integrate into existing industrial facilities.

In addition, each greenfield development project has a detailed community engagement plan designed to ensure all potentially impacted host landowners, stakeholders, agencies, businesses, non-governmental organizations ("NGOs"), environmental NGOs and Indigenous communities understand the nature of the projects, have multiple and varied opportunities for engagement and feedback and are able to engage in meaningful dialogue and discussion with TransAlta and its representatives. The ultimate goal is addressing, resolving and mitigating stakeholder or Indigenous community concerns before filing major permit applications for all of our projects.

Day-to-day Operations

At our Alberta operations, in 2022, we continued with our Wildlife Monitoring Program designed to monitor wildlife abundance and species diversity in the study area over time. Based on these surveys, TransAlta has seen primarily stable or increasing biodiversity in the area, with various new bird species being detected over the years and incidents of vehicle collisions decreasing due to lower speed limit restrictions. Some animal population sizes fluctuate in the area based on weather conditions and available ground cover.

Our natural gas operations have a relatively limited impact on biodiversity. The facilities are frequently constructed adjacent to existing industrial operations and TransAlta may not always be the holder of the environmental permits. The land area these facilities occupy is also generally relatively small. One exception is our Sarnia cogeneration facility. This facility is made up of 260 acres of brownfield industrial land, some of which contains areas with tall grasses and potential wildlife. Care will be taken at the time of redevelopment of this land to minimize impact to species-at-risk through the completion of species-at-risk surveys as well as performing certain construction activities outside of nesting periods. For all sites that are under our environmental scope, we adhere to all relevant environmental compliance permits.

At our hydro facilities, a major focus is on reducing the impact on fish and fish habitat. We adhere to provincial and federal regulations and operate in accordance with facility approvals. We continue to work toward operational improvement and regularly review our Environmental Operational Management Plans to ensure our operating parameters are met.

At our wind and solar operations, an Operational Environmental Management Plan has been developed for each asset to ensure that our facilities use environmentally sound and responsible practices that are based on a philosophy of continuous improvement of environmental protection. Examples of environmental initiatives to support our biodiversity focus include our bird and bat protection practices (installation of covers to protect birds from possible electrocution), a bird and bat mortality database (records all injuries and mortalities), environmentally sensitive resource monitoring (monitoring sensitive wildlife features in and around our operating wind facilities), and long-term dataset collections (e.g., wildlife studies pre-construction and post-construction). In addition, we continue to collaborate with industry and the scientific community to address environmental concerns and impacts pertaining to biodiversity.

At our Centralia operations, in 2022, we built a riparian reforestation strategy for under-forested areas along the Skookumchuck River within our Skookumchuck Wildlife Habitat Management Area. Approximately 40 acres will be restored in 2023 with conifer-dominated forest types along both sides of the river. This will improve ecological functions important to river habitat including shade, sediment filtration, large woody debris input, nutrient input and bank stabilization. In addition, we planted 1600 trees in the Chehalis Basin Wetland Mitigation Bank and completed a vigorous weed control program to control reed canary grass and invasive/noxious weeds.

Energy Use

TransAlta uses energy in a number of different ways. We burn natural gas, diesel and coal (to the end of 2025 at Centralia) to generate electricity. We harness the kinetic energy of water and wind to generate electricity. We also generate electricity from the sun. In addition to combustion of fuel sources, we also track combustion of gasoline or diesel in our vehicles and the electricity use and fuel use for heating (such as natural gas) in the buildings we occupy. Knowledge of how much energy we use allows us to optimize and create energy efficiencies. As an electricity generator, we continually and consistently look for ways to optimize and create efficiencies related to the use of energy.

The following captures our energy use (million gigajoules). Energy use decreased by four (4) per cent in 2022 over 2021. Some values do not sum to the indicated total due to rounding. Zeros (0) indicate truncated values:

Year ended Dec. 31	2022	2021	2020
Hydro	**0**	0	0
Wind and Solar	**0**	0	0
Gas	**130**	118	138
Energy Transition	**64**	86	141
Corporate and Energy Marketing	**0**	0	0
Total energy use (million gigajoules)	**195**	204	279

Air Emissions

Our coal facility emits air emissions that we track, analyze and report to regulatory bodies. We also work on mitigation solutions depending on the type of air emission. We report our major air emissions from coal, which includes NO_x, SO_2, particulate matter and mercury. We continue reducing air emissions in our existing facilities through our conversion and retirement of coal units in Alberta (completed in 2021) and Washington State (planned completion by the end of 2025).

In 2022, we achieved our 2026 target of 95 per cent SO_2 and 80 per cent NO_x emissions reductions over 2005 levels. Since 2005, we have reduced SO_2 emissions by 98 per cent and NO_x by 83 per cent. By the end of 2025, mercury emissions will be eliminated following the planned retirement of the Centralia remaining unit. Particulate matter and SO_2 emissions will also be virtually eliminated or considered negligible.

None of our previous Alberta coal facilities are located within 50 kilometres of dense or urban populations and they all have been retired or converted to gas as of 2021. Our Centralia thermal facility in Washington State is 40 kilometres from a dense or urban population. As per guidance from SASB, “a facility is considered to be located near an area of dense population if it is located within 49 kilometres of an area of dense population” (being deemed to be a "minimum population of 50,000 persons"). The Centralia thermal facility has two units and we retired one unit in 2020 and will retire the additional unit by the end of 2025, at which time air emissions from our coal facilities will be eliminated.

Our gas facilities emit low levels of NO_x that trigger reporting obligations to national regulatory bodies. These gas facilities also produce trace amounts of SO_2 and particulate matter, but at levels that are deemed negligible and do not trigger any reporting requirements or compliance issues. Many of our gas facilities are located in very remote and unpopulated regions, away from dense urban areas. Our Sarnia, Windsor, Ottawa, Fort Saskatchewan and Ada gas facilities are our facilities with air emissions within 49 kilometres of dense or urban environments.

Our total air emissions in 2022 decreased compared with 2021 levels. Specifically, NO_x was reduced 21 per cent, particulate matter was reduced 82 per cent and SO_2 was reduced 86 per cent over 2021 levels. Mercury emissions also decreased by 50 per cent over 2021 levels. Reductions in emissions were primarily due to shutdowns during coal-to-gas conversions and coal unit retirements.

The following represents our material air emissions. Figures have been rounded to the nearest one thousand with the exception of particulate matter (rounded to the nearest one hundred) and mercury (rounded to the nearest ten):

Year ended Dec. 31	2022	2021	2020
SO_2 (tonnes)	**1,000**	7,000	12,000
NO_x (tonnes)	**11,000**	14,000	21,000
Particulate matter (tonnes)	**400**	800	4,000
Mercury (kilograms)	**20**	40	60

Water

Our principal water use is for cooling and steam generation in our coal and gas facilities, but our hydro operations also require water flow for operations. Water for coal and gas operations is withdrawn primarily from rivers where we hold permits and must adhere to regulations on the quality of discharged water. The difference between withdrawal and discharge, representing consumption, is due to several factors, which include evaporation loss and steam production for customers.

Our water consumption reduction target is to reduce fleet-wide water consumption (withdrawals minus discharge) by 20 million m^3 or 40 per cent in 2026 over the 2015 baseline. Water consumption in 2015 was 45 million m^3. This target is in line with the UN SDGs, specifically "Goal 6: Clean Water and Sanitation." Our water consumption will fluctuate somewhat over the period of 2020-2025 as we transition off coal, convert and repower gas facilities and ramp production upwards.

Typically, TransAlta withdraws in the range of 220-240 million m^3 of water across our fleet. In 2022, we withdrew approximately 230 million m^3 (2021 – 240 million m^3) and returned approximately 210 million m^3 (2021 – 210 million m^3) or 89 per cent. Overall, water consumption was approximately 30 million m^3 (2021 – 30 million m^3).

The following represents our total water consumption (million m^3) over the last three years. Some values do not sum to the indicated total due to rounding. Figures below have been rounded to the nearest 10 million m^3:

Year ended Dec. 31	2022	2021	2020
Water withdrawal	**230**	240	230
Water discharge	**210**	210	200
Total water consumption (million m^3)	**30**	30	40

Water Security

Our largest water withdrawal and discharge occurs at our Sarnia gas cogeneration facility (which produces both electricity and steam for our customers). The facility operates as a once-through, non-contact cooling system for our steam turbines. Despite large withdrawals from the adjacent St. Clair River to support our Sarnia operations, we return approximately 97 per cent of the water withdrawn. Water from this source is currently at low risk as per analysis from the SASB-endorsed Aqueduct Water Risk Atlas tool.

The Aqueduct Water Risk Atlas tool highlights that water risk is high at our interior and southern Western Australia facilities due to high interannual variability in the region. Interannual variability refers to wider variations in regional water supply from year to year. Our water supply at these facilities is provided at no cost under PPAs with our mining customers, hence our risk is significantly mitigated. In addition, our customers have developed conservation and re-use strategies aimed at recycling water for mining operational needs. All water used in the region is sourced from scheme water. With respect to gas and diesel turbine water use, water wash techniques and frequency of activities are continually modified to minimize consumption and environmental impact. Water used in our operations is returned to our customers, who repurpose this water for vegetation and dust suppression in their mining operations.

At the South Hedland facility in Western Australia, water risk is also high due to the risk of flooding in the region. The South Hedland facility was built above normal flood levels to mitigate potential risk from flooding. During a category 4 cyclone event in the area and associated flooding in the region in 2019, the South Hedland facility continued to generate power for the region. In addition, the South Hedland facility has developed a Water Efficiency Management Plan with Water Corporation WA, the principal supplier of water, wastewater and drainage services in Western Australia. Initiatives are aimed at reducing water consumption and costs through innovative technology and efficiencies identified through facility management.

Dam Safety

Our dam safety programs include all hydroelectric developments, constructed ponds and fluid retaining structures such as ash lagoons and canals, as well as associated equipment and structures and the personnel required to operate, maintain and inspect these items. They are governed through our Dam Safety Policy and Dam Safety Management System, which includes requirements on design, modification and decommissioning, operation, maintenance and surveillance, public safety, emergency management and risk management.

TransAlta's Board and its President and CEO oversee the effectiveness of our dam safety programs and receive regular updates. In 2022, a member of the Board was designated as the Company's Dam Safety Advisor to assist the Board in fulfilling its oversight role in regard to the Company's dam safety practices given the unique and technical aspects of dam safety. In addition, TransAlta engages an external Dam Safety Review Panel to provide external review of the program and its management, including overall assessment and benchmarking against other national and international programs.

Our monitoring programs include:

- Regular operations and engineering inspections;
- Testing of critical equipment;
- Numerous instruments in the dams monitoring water level, temperature, movement, earthquake detection;
- Use of drones and satellite remote movement monitoring;
- Emergency plans and exercises with internal and external stakeholders; and
- Regular third-party reviews that are shared with the regulators.

We work closely with local stakeholders including conservation authorities and public agencies on watershed management, emergency planning and flood response. For example, in southern Alberta, our hydroelectric facilities have played an increasingly important water management role following the flood of 2013. In 2021, we renewed our previous agreement with the Government of Alberta for another five years to manage water on the Bow River at our Ghost Reservoir facility to aid in potential flood mitigation efforts, as well as at our Kananaskis River System (which includes the Interlakes, Pocaterra and Barrier hydroelectric plants) for drought mitigation efforts. In 2022, we started decommissioning the Keephills Ash Lagoon, a facility that is no longer needed for ash storage following the coal-to-gas conversion of Keephills Unit 2. This three-year project will reshape the existing lagoon so that it is stable for the long term and is the first step towards delicensing the structure.

TransAlta is proud of its reputation in dam safety. We participate in the Canadian Dam Association, Dam Safety Interest Group of the Centre for Energy Advancement through Technological Innovation, United States Society on Dams, Canadian Geotechnical Society, and Association of State Dam Safety Officials.

For information on our corporate emergency management program, refer to Public Health and Safety in the Engaging with Our Stakeholders to Create Positive Relationships section of this MD&A.

Waste

The importance of environmental protection and waste management is outlined in our Environmental Policy as a corporate responsibility for TransAlta and its employees, and contractors working on TransAlta's behalf. Our waste data is reported annually to a number of different regulatory bodies.

Our waste reduction target is that by 2022 TransAlta will reduce total waste generation by 80 per cent over the 2019 baseline of 1.5 million tonnes equivalent of waste generation. In 2022, we achieved this target with a 86 per cent waste reduction over 2019 levels.

In 2022, our operations generated approximately 208,000 tonnes equivalent of waste (2021 – 515,000 tonnes). Of the total waste generated, 89 per cent was non-hazardous waste and one (1) per cent was directed to landfill (2021 – 0.2 per cent).

The following represents our total waste production over the last three years. Figures have been rounded to the nearest one thousand:

Year ended Dec. 31	2022	2021	2020
Total waste generation (tonnes equivalent)	**208,000**	515,000	1,135,000
Waste to landfill (tonne eq.)	**2,000**	1,000	11,000
Waste recycled (tonne eq.)	**27,000**	31,000	31,000
Waste reuse (tonne eq.)	**151,000**	176,000	533,000
% of total waste to landfill	**1**	0.2	1
% of total waste: hazardous	**11**	5	2
% hazardous waste to landfill	**0.6**	1.0	0.4

Our reuse waste or byproduct waste is generally sold to third parties. Our operating teams are diligent at not only minimizing waste, but also maximizing recoverable value from waste. We have invested in equipment to capture byproducts from the combustion of coal, such as fly ash, bottom ash, gypsum and cenospheres, for subsequent sale. These non-hazardous materials add value to products like cement and asphalt, wallboard, paints and plastics.

Coal Ash Management
Given our transition off coal, we ceased producing fly ash waste in Canada at the end of 2021 and will no longer produce it past the end of 2025 in the US. The Company is looking at recovering fly ash that was returned to its original source at Highvale mine to replace this supply, which is used extensively in the concrete industry. By turning the recovered product into something marketable, it will continue to aid in reducing the amount of cement produced and consequent emissions while offering new job and economic growth opportunities. This innovative technology contributes to a circular economy and will reduce reclamation liabilities for TransAlta.

Land Use

The largest land use associated with our operations is for surface mining of coal. Of the three mines we have operated, the Whitewood mine in Alberta is completely reclaimed and the land certification process is ongoing. Our Centralia mine in Washington State is currently in the reclamation phase and we have adopted a target to fully reclaim this mine by 2040.

Our Highvale mine in Alberta ceased operations on Dec. 31, 2021, as part of our target to discontinue coal-fired power generation in Canada at the end of 2021. The mine reclamation has been progressively executed as part of our regulatory approvals and our target is to have it fully reclaimed by 2046. In 2022, our reclamation team submitted our final reclamation plans. The updated plans align with community priorities for the reclaimed land. Our reclamation plans at Highvale are set out on a life-cycle basis and include contouring disturbed areas, re-establishing drainage, replacing topsoil and subsoil, re-vegetation and land management.

Our mining practice incorporates progressive reclamation where the final end use of the land is considered at all stages of planning and development. Across our mining operations, to date we have reclaimed approximately 12,000 acres (4,800 hectares), which is approximately 38 per cent of land disturbed.

Environmental Incidents and Spills

Minimizing our impact on the environment supports healthy ecosystems and mitigates our environmental compliance risk and reputational risk. We maintain corporate incident management procedures, as part of our Total Safety Management System, for appropriate initial response, investigation and lessons learned to minimize environmental incidents. With respect to biodiversity management (management of ecosystems, natural habitats and life in the areas we operate), we seek to establish robust environmental research and data collection to establish scientifically sound baselines of the natural environment around our facilities to ensure we can accurately evaluate the level of significance to biodiversity following an incident. We closely monitor the air, land, water and wildlife in these areas to identify and curtail potential impacts.

In 2022, we recorded one (1) regulatory non-compliance environmental incident (2021 – two incidents). The incident occurred at our Sarnia cogeneration facility and was a wastewater discharge exceedance from our neutralization sump during water treatment. The incident resulted in two environmental enforcement actions totalling $35,000.

Regulatory non-compliance environmental incidents follow:

Year ended Dec. 31	2022	2021	2020
Regulatory non-compliance environmental incidents	**1**	2	2

Regarding spills and releases, typical spills that could occur at our operation sites are hydrocarbon-based. Spills generally happen in low environmental impact areas and are almost always contained and fully recovered. It is extremely rare for large spills to occur. Efforts are placed on providing immediate response to all environmental spills to ensure assessment, containment and recovery of spilled materials result in minimal impact to the environment.

The estimated volume of spills in 2022 was 246 m^3 (2021 – 6 m^3). Spill volumes in 2022 were higher due to one environmental incident recorded at our Sarnia facility. The incident involved the release of low pH wastewater discharge during water treatment and had negligible environmental impacts.

Significant environmental incidents follow:

Year ended Dec. 31	2022	2021	2020
Significant environmental incidents	**0**	0	6

There is a potential that ash ponds associated with our remaining coal facilities could fail. The probability of this occurring is low, but the impact could be significant. We follow applicable environmental regulations with respect to our ash ponds and satisfy ourselves that management is adequate given the robust regulations in the jurisdictions where we operate. Management includes periodic inspections and appropriate mitigation if issues are uncovered.

Weather

Abnormal weather events can impact our operations and give rise to risks. Due to the nature of our business, our earnings are sensitive to seasonal weather variations. Variations in winter weather affect the demand for electrical heating requirements while variations in summer weather affect the demand for electrical cooling requirements. These variations in demand translate into spot market price volatility. Variations in precipitation also affect water supplies, which in turn affect our hydroelectric assets. Also, variations in sunlight conditions can have an effect on energy production levels from our solar facilities. Variations in weather may be impacted by climate change resulting in sustained higher temperatures and rising sea levels, which could have an impact on our generating assets. Ice can accumulate on wind turbine blades in the winter months. The accumulation of ice on wind turbine blades depends on a number of factors, including temperature and ambient humidity. Accumulated ice can have a significant impact on energy yields and could result in the wind turbine experiencing more downtime. Extreme cold temperatures can also impact the ability of wind turbines to operate effectively and this could result in more downtime and reduced production. In addition, climate change could result in increased variability to our water and wind resources.

Our generation facilities and their operations are exposed to potential damage and partial or complete loss resulting from environmental disasters (e.g., floods, strong winds, wildfires, earthquakes, tornados and cyclones), equipment failures and other events beyond our control. Climate change can increase the frequency and severity of these extreme weather events. The occurrence of a significant event that disrupts the operation or ability of the generation facilities to produce or sell power for an extended period, including events that preclude existing customers from purchasing electricity, could have a material adverse effect. In certain cases, there is the potential that some events may not excuse us from performing our obligations pursuant to agreements with third parties. The fact that several of our generation facilities are located in remote areas may make access for repair of damage difficult. Refer to the Governance and Risk Management section of this MD&A for further discussion on weather-related risks.

Delivering Reliable, Low-Cost and Sustainable Energy

TransAlta's goal is to be a leading customer-centred clean electricity company, one that is committed to a sustainable future. Our strategy is focused on meeting our customers' need for clean, low-cost and reliable electricity, operational excellence and continual improvement in everything that we do. This section covers manufactured, intellectual and social and relationship capital management as per guidance from the International Integrated Reporting Framework.

Energy Affordability

TransAlta focuses on assisting commercial and industrial customers in managing their cost of energy. TransAlta has a full suite of procurement strategies and products with various terms available to our customers to assist in understanding and reducing their energy costs.

For customers interested in making a long-term commitment to obtain predictable costs, TransAlta has the experience to develop renewable energy facilities, battery energy storage systems and hybrid solutions, or long-term offtake agreements from its existing and future renewable and gas-fired facilities.

End-Use Efficiency and Demand

TransAlta's commercial and industrial customers have access to an extensive set of monthly reports providing detailed tracking of customer usage, allowing for corrective action as required, as well as cost-saving recommendations.

Our Power Factor Report advises customers if their sites are operating at less than a 90 per cent power factor so they can consider installing energy-efficient equipment. By reducing the customer's power system demand charge through power factor correction, the customer's site puts less strain on the electricity grid and reduces its carbon footprint. TransAlta's Site Health Report advises customers of a site whose peak demand has been permanently reduced for a variety of reasons from its initial in-service date. The customer may be paying a higher demand charge each month to the distribution company based on the original peak demand expected at the site. TransAlta collaborates with the customer and determines the new peak demand based on the customer's operation. The customer, working with the distribution company, may find it economic to buy down the distribution contract to reduce the monthly distribution costs going forward.

Grid Resiliency

As a large electricity generator, TransAlta works diligently to ensure the power we provide our customers is reliable, affordable and has low environmental impact. We provide decentralized and customized power solutions to industrial customers. In 2021, TransAlta agreed to build the Northern Goldfields solar project in Western Australia to provide renewable solar electricity supported with a battery energy storage system to the Goldfields-based operations of BHP. We also supply power to centralized power systems and own and operate transmission grid infrastructure in Alberta that addresses system reliability needs.

In all jurisdictions where we operate, we work closely with the system operators to ensure overall supply adequacy and reliability of the grid. We consider a myriad of factors in our planning and operation decisions that could put grid resiliency at risk, including renewable energy intermittency, cyberattacks, extreme weather events and natural disasters. We are also committed to ensuring strong compliance with North American Electric Reliability Corporation standards and Alberta Reliability Standards for the power plant and transmission infrastructure that we own and operate.

As a Company, we are keenly focused on deploying clean power generation and new technology solutions to meet the emerging and future needs of the electric system that we operate in. For example, in Alberta, we brought online the first battery storage project, called WindCharger, in 2020 that is co-located with our Summerview II wind facility to create an emissions-free, peaking resource. This resource is participating in the AESO's pilot fast frequency response initiative to support intertie operations. Beyond the fast frequency response initiative, WindCharger introduces a resource with a response time that is unmatched by existing generation technologies and can be operated with a high level of reliability to support the growing need for primary frequency response and system inertial response and resiliency to support a decarbonized grid with a supply mix made up of intermittent renewable resources.

For more information on technologies to support grid resiliency, refer to the Enabling Innovation and Technology Adoption section of this MD&A. For more information on extreme weather events and natural disasters, refer to Weather in the Progressive Environmental Stewardship section of this MD&A.

Sustainability Governance

In order for an organization to truly integrate sustainability, it requires accountability at the Board and executive level. It requires an understanding of ESG issues and associated corporate actions to address these issues, while continuing to balance operations and growth.

Sustainability is overseen by TransAlta's GSSC of the Board. The GSSC assists the Board in fulfilling its oversight responsibilities with respect to the Company's monitoring of climate change, environmental, health and safety regulations, public policy changes and the development of strategies, policies and practices for climate change, environment, health and safety and social well-being, including human rights, working conditions and responsible sourcing.

The following policies help govern sustainability at TransAlta and are publicly available in the Governance section of the Investor Centre on our website:

- Corporate Code of Conduct
- Supplier Code of Conduct
- Whistleblower Policy
- Total Safety Management Policy
- Human Rights and Discrimination Policy
- Indigenous Relations Policy
- Board and Workforce Diversity Policy and Diversity and Inclusion Pledge
- Environmental Policy

Our sustainability memberships include key sustainability organizations and working groups such as the EXCEL Partnership, the Canadian Business for Social Responsibility and the Electricity Canada Sustainable Electricity Steering Committee, which all provide validation and support of our sustainability strategy and practices.

In 2022, we refreshed our material sustainability factors. They are presented below in alphabetical order.

- Air quality and emissions
- Asset integrity and grid resiliency
- Biodiversity and land management
- Climate change and greenhouse gas emissions
- Dam safety
- Energy use and conservation
- Equity, diversity and inclusion
- Ethics and business conduct
- Health, safety and well-being
- Human rights and labour practices
- Indigenous relationships and partnerships
- Information asset protection and cybersecurity
- Renewable energy and innovative technologies
- Security and emergency preparedness and response
- Stakeholder engagement and community investment
- Supply chain and sustainable sourcing
- Sustainability governance
- Sustainable finance
- Talent attraction, retention and development
- Waste management
- Water management

For additional details on governance, refer to the Governance and Risk Management section of this MD&A.

Governance and Risk Management

Our business activities expose us to a variety of risks and opportunities including, but not limited to, regulatory changes, rapidly changing market dynamics and increased volatility in our key commodity markets. Our goal is to manage these risks and opportunities so that we are in a position to develop our business and achieve our goals while remaining reasonably protected from an unacceptable level of risk or financial exposure. We use a multilevel risk management oversight structure to manage the risks and opportunities arising from our business activities, the markets in which we operate and the political environments and structures with which we interact.

During the year ended Dec. 31, 2022, the global economy continued to recover from the COVID-19 pandemic. On Feb. 24, 2022, the Russian Government's invasion of Ukraine set off historic policy actions and global coordination of sanctions and commitments to reduce dependency on Russian energy including natural gas. This has contributed to global supply chain disruptions, commodity price volatility and potential increases to cybersecurity risk. The Company continues to mitigate inflationary and supply chain risks pertaining to current development projects by locking in the prices of key materials where possible and employing other supply chain risk mitigation strategies. A prolonged conflict and recent inflationary and supply chain dynamics may impact future construction project costs with the risk of rising prices on key materials. Accordingly, as the Russia-Ukraine conflict continues to evolve and its indirect impacts along with rising inflation rates within the global markets remain uncertain at this time, management continues to monitor and assess the impacts.

Governance

The key elements of our governance practices are:

- Employees, management and the Board are committed to ethical business conduct, integrity and honesty;
- We have established key policies and standards to provide a framework for how we conduct our business;
- The Chair of our Board and all directors, other than our President and CEO, are independent within the meaning of National Instrument 58-101 — Disclosure of Corporate Governance Practices;
- The Board is comprised of individuals with a mix of skills, knowledge and experience that are critical for our business and our strategy;
- The effectiveness of the Board is achieved through robust annual evaluations and continuing education of our directors; and
- Our management and the Board facilitate and foster an open dialogue with shareholders and community stakeholders.

Commitment to ethical conduct is the foundation of our corporate governance model. We have adopted the following codes of conduct to guide our business decisions and everyday business activities:

- Corporate Code of Conduct, which applies to all employees and officers of TransAlta and its subsidiaries;
- Directors' Code of Conduct;
- Supplier's Code of Conduct;
- Finance Code of Ethics, which applies to all financial employees of the Company; and
- Energy Trading Code of Conduct, which applies to all of our employees engaged in energy marketing.

Our Corporate Code of Conduct outlines the standards and expectations we have for our employees, officers, directors, consultants and suppliers with respect to, among other things, the protection and proper use of our assets. The codes also provide guidelines with respect to securing our assets, avoiding conflicts of interest, respect in the workplace, social responsibility, privacy, compliance with laws, insider trading, environment, health and safety and our commitment to ethical and honest conduct. Our Corporate Code of Conduct and Directors' Code of Conduct each goes beyond the laws, rules and regulations that govern our business in the jurisdictions in which we operate; they outline the principal business practices with which all employees and directors must comply.

Our employees, officers and directors are reminded annually about the importance of ethics and professionalism in their daily work and must certify annually that they have reviewed and understand their responsibilities as set forth in the respective codes of conduct. This certification also requires our employees,

officers and directors to acknowledge that they have complied with the standards set out in the respective code during the last calendar year.

The Board provides stewardship of the Company and ensures that the Company establishes key policies and procedures for the identification, assessment and management of principal risks and strategic plans. The Board monitors and assesses the performance and progress of the Company's goals through candid and timely reports from the CEO and the senior management team. We have also established an annual evaluation process whereby our directors are provided with an opportunity to evaluate the Board, Board committees, individual directors and the Chair of the Board's performance.

In order to allow the Board to establish and manage the financial, environmental and social elements of our governance practices, the Board has established the AFRC, GSSC, the Human Resources Committee (the "HRC") and the IPC.

The AFRC, consisting of independent members of the Board, provides assistance to the Board in fulfilling its oversight responsibility relating to the integrity of our consolidated financial statements and the financial reporting process; the systems of internal accounting and financial controls; the internal audit function; the external auditors' qualifications and terms and conditions of appointment, including remuneration, independence, performance and reports; and the legal and risk compliance programs as established by management and the Board. The AFRC approves our Commodity and Financial Exposure Management policies and reviews quarterly ERM reporting.

The GSSC is responsible for developing and recommending to the Board a set of corporate governance principles applicable to the Company and for monitoring compliance with these principles. The GSSC is also responsible for Board recruitment, succession planning and for the nomination of directors to the Board and its committees. In addition, the GSSC assists the Board in fulfilling its oversight responsibilities with respect to the Company's monitoring of climate change, environmental, health and safety regulations, public policy changes and the development of strategies, policies and practices for climate change, environmental, health and safety and social well-being, including human rights, working conditions and responsible sourcing. The GSSC also receives an annual report on the annual codes of conduct certification process. For further information on the Board's oversight of climate-related factors, refer to the Climate Change Governance in ESG section of this MD&A.

In regards to overseeing and seeking to ensure that the Company consistently achieves strong environment, health and safety ("EH&S") performance, the GSSC undertakes a number of actions that include: (i) receiving regular reports from management regarding environmental compliance, trends and TransAlta's responses; (ii) receiving reports and briefings on management's initiatives with respect to changes in climate change legislation, policy developments as well as other draft initiatives and the potential impact such initiatives may have on our operations; (iii) assessing the impact of the GHG policies implementation and other legislative initiatives on the Company's business; (iv) reviewing with management the EH&S policies of the Company; (v) reviewing with management the health and safety practices implemented within the Company, as well as the evaluation and training processes put in place to address problem areas; (vi) discussing with management ways to improve the EH&S processes and practices; and (vii) reviewing the effectiveness of our response to EH&S issues and any new initiatives put in place to further improve the Company's EH&S culture.

The HRC is empowered by the Board to review and approve key compensation and human resources policies of the Company that are intended to attract, recruit, retain and motivate employees of the Company. The HRC also makes recommendations to the Board regarding the compensation of the CEO, including the review and adoption of equity-based incentive compensation plans, the adoption of human resources policies that support human rights and ethical conduct and the review and approval of executive management succession and development plans.

The IPC is empowered by the Board to oversee management's investment conclusions and the execution of major, Board-approved capital expenditure projects that further the Company's strategic plans. The IPC provides assistance to the Board in fulfilling its oversight responsibilities with respect to broadly reviewing and monitoring project management and control processes, financial profile, capital costs, procurement practices and project schedules in a more in-depth manner than time permits during regularly scheduled Board meetings.

The responsibilities of other stakeholders within our risk management oversight structure are described below:

The CEO and executive management review and report on key risks quarterly. Specific Trading Risk Management reviews are held monthly by the Commodity Risk and Compliance Committee and weekly by the commodity risk team, the commercial managers in Trading and Marketing and the Executive Vice-President, Finance and Chief Financial Officer.

The Investment Committee is a management committee chaired by our Senior Vice-President, M&A, Strategy and Treasurer and comprises the President and Chief Executive Officer; Executive Vice-President, Finance and Chief Financial Officer; Executive Vice President, Legal, Commercial and External Affairs; Executive Vice-President, Generation; Executive Vice-President, Alberta; and Vice-President, Strategic Finance and Investor Relations. It reviews and approves all major capital expenditures including growth, productivity, life extensions and major coal outages. Projects that are approved by the Investment Committee will then be put forward for approval by the Board, if required.

The Commodity Risk & Compliance Committee is chaired by our Executive Vice-President, Finance and Chief Financial Officer and comprises at least three members of senior management. It oversees the risk and compliance program in trading and ensures that this program is adequately resourced to monitor trading operations from a risk and compliance perspective. It also ensures the existence of appropriate controls, processes, systems and procedures to monitor adherence to policy.

The Hydro Operating Committee consists of two members who are Brookfield employees with expertise in hydro facility management and two TransAlta members. This committee was formed in 2019 for the purpose of collaborating on matters in connection with the operation and maximization of the value, of TransAlta's Alberta Hydro Assets. It is delivering on its objectives by reviewing the operating, maintenance, safety and environmental aspects of TransAlta's Alberta Hydro Assets and, following that review, providing expert advice and recommendations to TransAlta's hydro operational team. The Hydro Operating Committee has an initial term of six years, which can be extended for an additional two years.

TransAlta is listed on the Toronto Stock Exchange and the New York Stock Exchange and is subject to the governance regulations, rules and standards applicable under both exchanges. Our corporate governance practices meet the following governance rules and guidelines of the TSX and Canadian Securities Administrators: (i) Multilateral Instrument 52-109 — Certification of Disclosure in Issuers' Annual and Interim Filings; (ii) National Instrument 52-110 — Audit Committees; (iii) National Policy 58-201 — Corporate Governance Guidelines; and iv) National Instrument 58-101 — Disclosure of Corporate Governance Practices. As a "foreign private issuer" under US securities laws, we are generally permitted to comply with Canadian corporate governance requirements. Additional information regarding our governance practices can be found in our most recent management information circular.

Risk Controls

Our risk controls have several key components:

Enterprise Tone

We strive to foster beliefs and actions that are true to and respectful of, our many stakeholders. We do this by investing in communities where we live and work, operating and growing sustainably, putting safety first and being responsible to the many groups and individuals with whom we work.

Policies

We maintain a comprehensive set of enterprise-wide policies. These policies establish delegated authorities and limits for business transactions, as well as allow for an exception approval process. Periodic reviews and audits are performed to ensure compliance with these policies. All employees and directors are required to sign a Corporate Code of Conduct on an annual basis.

Reporting

On a regular basis, residual risk exposures are reported to key decision-makers including the Board, the AFRC, senior management and/or the Commodity Risk & Compliance Committee, as applicable. Reporting to this latter committee includes analysis of new risks, monitoring of status to risk limits, review of events that can affect these risks and discussion and review of the status of actions to minimize risks. This monthly reporting provides for effective and timely risk management and oversight.

Whistleblower System

We have a process in place where employees, contractors, shareholders or other stakeholders may confidentially or anonymously report any potential legal or ethical concerns, including concerns relating to accounting, internal control accounting, auditing or financial matters or relating to alleged violations of any laws or our Corporate Code of Conduct. These concerns can be submitted confidentially and anonymously, either directly to the AFRC or through TransAlta's toll-free telephone or online Ethics Helpline. The AFRC Chair is immediately notified of any material complaints and, otherwise, the AFRC receives a report at every quarterly committee meeting on all findings related to any material complaints or complaints relating to accounting or financial reporting or alleged breaches in internal controls over financial reporting.

Value at Risk and Trading Positions

Value at risk ("VaR") is one of the primary measures used to manage our exposure to market risk resulting from commodity risk management activities. VaR is calculated and reported on a daily basis. This metric describes the potential change in the value of our trading portfolio over a three-day period within a 95 per cent confidence level, resulting from normal market fluctuations.

VaR is a commonly used metric that is employed by industry to track the risk in commodity risk management positions and portfolios. Two common methodologies for estimating VaR are the historical variance/covariance and scenario analysis approaches. We estimate VaR using the historical variance/covariance approach. An inherent limitation of historical variance/covariance VaR is that historical information used in the estimate may not be indicative of future market risk. Stress tests are performed periodically to measure the financial impact to the trading portfolio resulting from potential market events, including fluctuations in market prices, volatilities of those prices and the relationships between those prices. We also employ additional risk mitigation measures. VaR at Dec. 31, 2022, associated with our proprietary commodity risk management activities was $4 million (2021 – $2 million). Refer to the Risk Factors – Commodity Price Risk section of this MD&A below for further discussion.

Risk Factors

Risk is an inherent factor of doing business. The following section addresses some, but not all, risk factors that could affect our future plans, performance, results or outcomes and our activities in mitigating those risks. These risks do not occur in isolation, but must be considered in conjunction with each other. Further information on the Company's risk factors can be found in the Risk Factors section of the AIF, which risk factors are hereby incorporated by reference and available on our website at www.transalta.com and under our profile on SEDAR at www.sedar.com and on EDGAR at www.edgar.gov.

A reference herein to a material adverse effect on the Company means such an effect on the Company or its business, operations, financial condition, results of operations and/or its cash flows, as the context requires.

For some risk factors, we show the after-tax effect on net earnings (loss) of changes in certain key variables. The analysis is based on business conditions and production volumes in 2022. Each item in the sensitivity analysis assumes all other potential variables are held constant. While these sensitivities are applicable to the period and the magnitude of changes on which they are based, they may not be applicable in other periods, under other economic circumstances or for a greater magnitude of changes. The changes in rates should also not be assumed to be proportionate to earnings in all instances.

Volume Risk

Volume risk relates to the variances from our expected production. The financial performance of our hydro, wind and solar operations is highly dependent upon the availability of their input resources in a given year. Shifts in weather or climate patterns, seasonal precipitation and the timing and rate of melting and runoff may impact the water flow to our facilities. The strength and consistency of the wind resource at our facilities impacts production. The operation of thermal facilities can also be impacted by ambient temperatures and the availability of water and fuel. Where we are unable to produce sufficient quantities of output in relation to contractually specified volumes, we may be required to pay penalties or purchase replacement power in the market.

We manage volume risk by:

- Actively managing our assets and their condition in order to be proactive in facility maintenance so that our facilities 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.

The sensitivity of volumes to our net earnings is shown below:

Factor	Increase or decrease (Per cent)	Approximate impact on net earnings (million)
Availability/production	1	$14

Generation Equipment and Technology Risk

There is a risk of equipment failure due to wear and tear, latent defect, design error or operator error, among other things, which could have a material adverse effect on the Company. Although our generation facilities have generally operated in accordance with expectations, there can be no assurance that they will continue to do so. Our facilities are exposed to operational risks such as failures due to cyclic, thermal and corrosion damage in boilers, generators and turbines, as well as other issues that can lead to outages and increased production risk. If facilities 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.

As well, we are exposed to procurement risk for specialized parts that may have long lead times. If we are unable to procure these parts when they are needed for maintenance activities, we could face an extended period where our equipment is unavailable to produce electricity.

We manage our generation equipment and technology risk by:

- Operating our facilities within defined industry standards that optimizes availability over their commercial operating life;
- Performing preventive maintenance in accordance with applicable industry practices, major equipment supplier recommendations and our operating experience;
- Adhering to comprehensive maintenance programs and regular turnaround schedules;
- Adjusting maintenance plans by facility to reflect equipment type, age and commercial risk;
- Having adequate business interruption insurance in place to cover extended forced outages;
- Having clauses in our PPAs and other long-term contracts that allow us to declare force majeure in the event of an unforeseen failure;
- Selecting and applying proven technology in our generating facilities, where practical;
- Where technology is newer, ensuring service agreements with equipment suppliers include appropriate availability and performance guarantees;
- Monitoring our fleet against industry performance to identify issues or advancements that may impact performance and adjusting our maintenance and investment programs accordingly;
- Negotiating strategic supply agreements with selected vendors to ensure key components are readily available in the event of a significant outage;
- Monitoring the condition of our assets and performing predictive analytics, and adjusting our maintenance programs to maintain availability;
- Entering into long-term arrangements with our strategic supply partners to ensure availability of critical spare parts; and
- Implementing long-term asset management strategies that optimize the life cycles of our existing facilities and/or identify replacement requirements for generating assets.

Commodity Price Risk

We have exposure to movements in certain commodity prices, including the market price of electricity and fuels used to produce electricity in both our electricity generation and proprietary trading businesses.

We manage the financial exposure associated with fluctuations in electricity price risk by:

- Entering into long-term contracts that specify the price at which electricity, steam and other services are provided;
- Maintaining a portfolio of short-, medium- and long-term contracts to mitigate our exposure to short-term fluctuations in commodity prices;
- Purchasing natural gas coincident with production for merchant facilities so spot market spark spreads are adequate to produce and sell electricity at a profit; and
- Ensuring limits and controls are in place for our proprietary trading activities.

In 2022, we had approximately 83 per cent (2021 – 78 per cent) of total production under short-term and long-term contracts and hedges. In the event of a planned or unplanned outage or other similar event, however, we are exposed to changes in electricity prices on purchases of electricity from the market to fulfil our supply obligations under these short- and long-term contracts.

We manage the financial exposure to fluctuations in the cost of fuels used in production by:

- Entering into long-term contracts that specify the price at which fuel is to be supplied to our facilities;
- Hedging emissions costs by entering into various emission trading arrangements; and
- Selectively using hedges, where available, to set prices for fuel.

In 2022, 82 per cent (2021 – 70 per cent) of our gas consumption used in generating electricity was contractually fixed or passed through to our customers and 100 per cent (2021 – 80 per cent) of our purchased coal was contractually fixed.

Actual variations in net earnings (loss) can vary from calculated sensitivities and may not be linear due to optimization opportunities, co-dependencies and cost mitigations, production, availability and other factors.

Natural Gas Supply and Price Risk

Having sufficient natural gas and natural gas transportation services available at our gas facilities is essential to maintaining the reliability and availability of those facilities. Ensuring adequate pipeline transportation service and natural gas supply for our gas units may be impacted by, among other things, the timing of receiving regulatory and other approvals for firm transportation commitments, weather-related events, work stoppages, system maintenance, variability in pipeline hydraulics pressure and flows and impacts due to other naturally caused events. Pricing of natural gas is driven by market supply and demand fundamentals for natural gas in North America and globally. We are exposed to changes in natural gas prices, which may impact the profitability of our facilities and how the facilities are dispatched into the market.

We manage gas supply and price risk by:

- Working to ensure that we have at least two pipelines supplying the gas used in electrical generation in Alberta;
- Contracting for firm gas delivery and supply;
- Monitoring the financial viability of gas producers and pipelines;
- Hedging gas price exposure; and
- Monitoring pipeline maintenance schedules and transportation availability.

Environmental Compliance Risk

Environmental compliance risks are risks to our business associated with existing and/or changes in environmental regulations. New emission reduction objectives for the power sector are being established by governments in Canada, Australia and the US. We anticipate continued and growing scrutiny by investors and other stakeholders relating to sustainability performance. These changes to regulations may affect our earnings by reducing the operating life of generating facilities and imposing additional costs on the generation of electricity through such measures as emission caps or taxes, requiring additional capital investments in emission abatement technology or requiring us to invest in offset credits. It is anticipated that these compliance costs will increase due to increased political and public attention to environmental concerns.

We manage environmental compliance risk by:

- Seeking continuous improvement in numerous performance metrics such as emissions, safety, land and water impacts and environmental incidents;
- Conducting environmental health and safety management system audits to assess conformance to our Total Safety Management System, which is designed to continuously improve performance;
- Committing significant experienced resources to work with regulators in Canada, Australia and the US to advocate that regulatory changes are well-designed and cost-effective;
- Developing compliance plans that address how to meet or surpass emission standards for GHG, mercury, SO_2 and NO_x, which will be adjusted as regulations are finalized;
- Purchasing carbon emissions reduction offsets or credits;
- Investing in renewable energy projects, such as wind, solar and hydro generation and storage technologies; and
- Incorporating change-in-law provisions in contracts that allow recovery of certain compliance costs from our customers.

We are committed to remaining in compliance with all environmental regulations relating to operations and facilities. Compliance with both regulatory requirements and management system standards is regularly audited through our performance assurance policy and results are reported to the GSSC.

Credit Risk

Credit risk is the risk to our business associated with changes in the creditworthiness of entities with which we have commercial exposures. This risk results from the ability of a counterparty to either fulfil its financial or performance obligations to us or where we have made a payment in advance of the delivery of a product or service. The inability to collect cash due to us or to receive products or services may have an adverse impact upon our net earnings (loss) and cash flows.

We manage our exposure to credit risk by:

- Establishing and adhering to policies that define credit limits based on the creditworthiness of counterparties, contract term limits and the credit concentration with any specific counterparty;
- Requiring formal sign-off on contracts that include commercial, financial, legal and operational reviews;
- Requiring security instruments, such as parental guarantees, letters of credit and cash collateral or third-party credit insurance if a counterparty goes over its limits. Such security instruments can be collected if a counterparty fails to fulfil its obligation; and
- Reporting our exposure using a variety of methods that allow key decision-makers to assess credit exposure by counterparty. This reporting allows us to assess credit limits for counterparties and the mix of counterparties based on their credit ratings.

If established credit exposure limits are exceeded, we take steps to reduce this exposure, such as by requesting collateral, if applicable, or by halting commercial activities with the affected counterparty. However, there can be no assurances that we will be successful in avoiding losses as a result of a contract counterparty not meeting its obligations.

As needed, additional risk mitigation tactics will be taken to reduce the risk to TransAlta. These risk mitigation tactics may include, but are not limited to, immediate follow-up on overdue amounts, adjusting payment terms to ensure a portion of funds are received sooner, requiring additional collateral, reducing transaction terms and working closely with impacted counterparties on negotiated solutions.

Our credit risk management profile and practices have not changed materially from Dec. 31, 2021. We had no material counterparty losses in 2022. We continue to keep a close watch on changes and trends in the market and the impact these changes could have on our energy trading business and hedging activities and will take appropriate actions as required, although no assurance can be given that we will always be successful.

The following table outlines our maximum exposure to credit risk without taking into account collateral held or right of set-off, including the distribution of credit ratings, as at Dec. 31, 2022:

	Investment grade (Per cent)	Non-investment grade (Per cent)	Total (Per cent)	Total amount
Trade and other receivables[1,2]	87	13	100	**1,585**
Long-term finance lease receivables	100	—	100	**129**
Risk management assets[1]	92	8	100	**870**
Loan receivable[2]	—	100	100	**37**
Total				**2,621**

(1) Letters of credit and cash and cash equivalents are the primary types of collateral held as security related to these amounts.
(2) Includes $37 million loan receivable included within other assets with a counterparty that has no external credit rating. The current portion of $4 million was excluded from trade and other receivables as it is included in loan receivable in the table above.

The maximum credit exposure to any one customer for commodity trading operations, including the fair value of open trading positions net of any collateral held, is $64 million (2021 – $37 million).

Counterparties enter into certain electricity and natural gas purchase and sale contracts for the purposes of asset-backed sales and proprietary trading. The terms and conditions of these contracts require the counterparties to provide collateral when the fair value of the obligation pursuant to these contracts is in excess of any credit limits granted. Downgrades in creditworthiness by certain credit rating agencies may impact our ability to enter into these contracts or any ordinary course contract, decrease the credit limits granted and increase the amount of collateral that may have to be provided. Certain existing contracts contain credit rating contingent clauses, that, when triggered, automatically increase costs under the contract or require additional collateral to be posted. Where the contingency is based on the lowest single rating, a one-level downgrade from a credit rating agency with an originally higher rating may not, however, trigger additional direct adverse impact.

Currency Rate Risk

We have exposure to various currencies as a result of our investments and operations in foreign jurisdictions, the earnings from those operations, the acquisition of equipment and services and foreign-denominated commodities from foreign suppliers and our US-denominated debt. Our exposures are primarily to the US and Australian currencies. Changes in the values of these currencies in relation to the Canadian dollar may affect our earnings, cash flows or the value of our foreign investments to the extent that these positions or cash flows are not hedged or the hedges are ineffective.

We manage our currency rate risk by establishing and adhering to policies that include:

- Hedging our net investments in US operations using US-denominated debt;
- Entering into forward foreign exchange contracts to hedge future foreign-denominated expenditures including our US-denominated senior debt that is outside the net investment portfolio; and
- Hedging our expected foreign operating cash flows. Our target is to hedge a minimum of 60 per cent of our forecasted foreign operating cash flows over a four-year period, with a minimum of 90 per cent in the current year, 70 per cent in the next year, 50 per cent in the third year and 30 per cent in the fourth year. The US and Australian exposure, net of debt service and sustaining capital expenditures, is managed with forward foreign exchange contracts.

The sensitivity of our net earnings to changes in foreign exchange rates has been prepared using management's assessment that an average $0.03 increase or decrease in the US or Australian currencies relative to the Canadian dollar is a reasonable potential change over the next quarter and is shown below:

Factor	Increase or decrease	Approximate impact on net earnings (million)
Exchange rate	$0.03	$14

Liquidity Risk

Liquidity risk relates to our ability to access capital to be used to fund capital projects, refinance debt and pay liabilities, engage in trading and hedging activities and general corporate purposes. Credit ratings facilitate these activities and changes in credit ratings may affect our ability and/or the cost of accessing capital markets, or establishing normal course derivative or hedging transactions, including those undertaken by our Energy Marketing segment.

We continue to focus on maintaining our financial position and flexibility. Credit ratings issued for TransAlta, as well as the corresponding rating agency outlooks, are set out in the Financial Capital section of this MD&A. Credit ratings are subject to revision or withdrawal at any time by the rating organization and there can be no assurance that TransAlta's credit ratings and the corresponding outlook will not be changed, resulting in the adverse possible impacts identified above.

As at Dec. 31, 2022, we had liquidity of $2.1 billion comprising amounts not drawn under our committed credit facilities and cash on hand net of bank overdraft.

We manage liquidity risk by:

- Preparing and revising longer-term financing plans to reflect changes in business plans and the market availability of capital;
- Reporting liquidity risk exposure and risk management activities on a regular basis to the Commodity Risk & Compliance Committee, senior management and the AFRC;
- Maintaining a strong balance sheet;
- Maintaining sufficient undrawn committed credit lines to support potential liquidity requirements; and
- Monitoring trading positions.

Interest Rate Risk

Changes in interest rates can impact our borrowing costs. Changes in our cost of capital may also affect the feasibility of new growth initiatives.

We manage interest rate risk by establishing and adhering to policies that include:

- Employing a combination of fixed and floating rate debt instruments;
- Monitoring the mixture of floating and fixed rate debt and adjusting to ensure efficiency; and
- Opportunistically hedging probable debt issuances and outstanding variable rate borrowings using interest rate swaps.

At Dec. 31, 2022, approximately nine per cent (2021 – three per cent) of our total long-term debt was subject to changes in floating interest rates through a combination of floating rate debt and interest rate swaps.

The sensitivity of changes in interest rates upon our net earnings is shown below:

Factor	Increase or decrease (Per cent)	Approximate impact on net earnings (million)
Interest rate	50 bps	$1

London Interbank Offered Rate reform could impact interest rate risk with respect to the Company's Canadian dollar credit facilities and the Poplar Creek non-recourse bond held by a TransAlta subsidiary. The facilities reference the Canadian Dollar Offer Rate ("CDOR") for Canadian-dollar drawings. In addition, the non-recourse bond references the three-month CDOR. Cessation of the three-month CDOR will occur on June 28, 2024, which will impact the facilities and the non-recourse bond.

Coal Supply Risk

Having sufficient fuel available when required for generation is essential to maintaining our ability to produce electricity under contracts and for merchant sale opportunities. At Centralia, interruptions at our supplier's mine, the availability of trains to deliver coal and the financial viability of our coal suppliers could affect our ability to generate electricity.

We manage coal supply risk by:

- Sourcing the coal used at Centralia from different mine sources to ensure sufficient coal is available at a competitive cost;
- Contracting sufficient trains to deliver the coal requirements at Centralia;
- Ensuring coal inventories on hand at Centralia are at appropriate levels for usage requirements;
- Ensuring efficient coal handling and storage facilities are in place so that the coal being delivered can be processed in a timely and efficient manner;
- Monitoring and maintaining coal specifications and carefully matching the specifications mined with the requirements of our facilities;
- Monitoring the financial viability of Centralia suppliers; and
- Hedging diesel exposure in mining and transportation costs.

Project Management Risk

On capital projects, we face risks associated with cost overruns, delays and performance.

We manage project risks by:

- Ensuring all projects follow established corporate processes and policies;
- Identifying key risks during every stage of project development and ensuring mitigation plans are factored into capital estimates and contingencies;
- Reviewing project plans, key assumptions and returns with senior management prior to Board of Director approvals;
- Consistently applying project management methodologies and processes;
- Determining contracting strategies that are consistent with the project scope and scale to ensure key risks, such as labour and technology, are managed by contractors and equipment suppliers;
- Ensuring contracts for construction and major equipment include key terms for performance, delays and quality backed by appropriate levels of liquidated damages;
- Reviewing projects after achieving commercial operation to ensure learnings are incorporated into the next project;
- Negotiating contracts for construction and major equipment to lock in key terms such as price, availability of long lead equipment, foreign currency rates and warranties as much as is economically feasible before proceeding with the project; and
- Entering into labour agreements to provide security around labour cost, supply and productivity.

Human Resource Risk

Human resource risk relates to the potential impact upon our business as a result of changes in the workplace. Human resource risk can occur in several ways:

- Potential disruption as a result of labour action at our generating facilities;
- Reduced productivity due to turnover in positions;
- Inability to complete critical work due to vacant positions;
- Failure to maintain fair compensation with respect to market rate changes; and
- Reduced competencies due to insufficient training, failure to transfer knowledge from existing employees or insufficient expertise within current employees.

We manage this risk by:

- Possessing a labour relations strategy;
- Applying a human-centric approach that emphasizes the employee experience, including actively improving our workplace culture, focusing on ED&I strategies and offering health and wellness programming and initiatives;
- Focusing on employee learning and development;
- Monitoring industry compensation and aligning salaries with those benchmarks;
- Using incentive pay to align employee goals with corporate goals;
- Monitoring and managing target levels of employee turnover; and
- Ensuring employees have the appropriate training and qualifications to perform their jobs.

In 2022, approximately 31 per cent (2021 – 33 per cent) of our labour force was covered by 11 collective bargaining agreements (2021 – 11). In 2022, we successfully renegotiated six (2021 – one) collective bargaining agreements. Of these six agreements, three agreements are for a five-year duration, one agreement is for a four-year duration, one agreement is for a three-year duration and one agreement is a one-year duration. We expect to renegotiate three collective bargaining agreements in 2023. Any problems in negotiating these collective bargaining agreements could lead to higher employee costs and a work stoppage or strike, which could have a material adverse effect on us.

Regulatory and Political Risk

Regulatory and political risk is the risk to our business associated with potential changes to the existing regulatory structures and the political influence upon those structures within each of the jurisdictions in which we operate. This risk can come from market regulation and re-regulation, increased oversight and control, structural or design changes in markets, or other unforeseen influences. Market rules are often dynamic and we are not able to predict whether there will be any material changes in the regulatory environment or the ultimate effect of changes in the regulatory environment on our business. This risk includes, among other things, uncertainties associated with the development of carbon pricing policies and funding.

We manage these risks systematically through our legal and regulatory groups and our compliance program, which is reviewed periodically to ensure its effectiveness. We also work with governments, regulators, electricity system operators and other stakeholders to resolve issues as they arise. We are actively monitoring changes to market rules and market design and we engage in industry and government-agency-led stakeholder engagement processes. Through these and other avenues, we engage in advocacy and policy discussions at a variety of levels. These stakeholder consultations have allowed us to engage in proactive discussions with governments and regulatory agencies over the longer term.

International investments are subject to unique risks and uncertainties relating to the political, social and economic structures of the respective country and such country's regulatory regime. We mitigate this risk through the use of non-recourse financing and insurance.

Transmission Risk

Access to transmission lines and transmission capacity for existing and new generation is key to our ability to deliver energy produced at our power facilities to our customers. The risks associated with the aging existing transmission infrastructure in markets in which we operate continue to increase because new connections to the power system are consuming transmission capacity faster than it is being added by new transmission developments.

Reputation Risk

Our reputation is one of our most valued assets. Reputation risk relates to the risk associated with our business because of changes in opinion from the general public, private stakeholders, governments and other entities.

We manage reputation risk by:

- Striving as a neighbour and business partner, in the regions where we operate, to build viable relationships based on mutual understanding leading to workable solutions with our neighbours and other community stakeholders;
- Clearly communicating our business objectives and priorities to a variety of stakeholders on a routine and transparent basis;
- Applying innovative technologies to improve our operations, work environment and environmental footprint;
- Maintaining positive relationships with various levels of government;
- Pursuing sustainable development as a longer-term corporate strategy;
- Ensuring that each business decision is made with integrity and in line with our corporate values;
- Communicating the impact and rationale of business decisions to stakeholders in a timely manner; and
- Maintaining strong corporate values that support reputation risk management initiatives, including the annual Code of Conduct sign-off.

Corporate Structure Risk

We conduct a significant amount of business through subsidiaries and partnerships. Our ability to meet and service debt obligations is dependent upon the results of operations of our subsidiaries and partnerships and the payment of funds by our subsidiaries and partnerships in the form of distributions, loans, dividends or otherwise. In addition, our subsidiaries and partnerships may be subject to statutory or contractual restrictions that limit their ability to distribute cash to us.

Cybersecurity Risk

We rely on our information technology to process, transmit and store electronic information and data used for the safe operation of our assets. Over the past few years, geopolitical tensions and the pandemic have significantly impacted the cybersecurity ecosystem, increasing the frequency and diversity of cyberattacks, including threats of war driven cyberattacks (i.e., terrorism) against critical infrastructure and threat actors taking advantage of the pandemic (e.g., charity scams) and hybrid working environments. We anticipate the cyber threat landscape to continue evolving, increasing threats of ransomware, compromised insider threats, supply chain attacks, advanced targeted phishing and artificial intelligence.

Cyber threats originate from various sources and vectors, from nation states, organized hacking groups or malware/ransomware. The cyber threat landscape continues to evolve, as we see cyber threats shift their focus from traditional attacks against perimeter information technology systems, to more effective attacks, such as phishing and ransomware.

TransAlta has established a comprehensive cybersecurity program, forming the foundation to implement effective security practices, comprising of structured and tailored plans to manage cybersecurity risks. As information technology /operation technology systems are integral to TransAlta's business operations, the risk of a cybersecurity incident threatens the safety of the public, TransAlta personnel and/or business functions, service delivery, reputation and profitability.

TransAlta maintains compliance to regulatory, legislative, and business requirements (e.g. NERC CIP, SOX, Privacy) by adopting industry endorsed standards and frameworks (e.g., National Institute of Standards and Technology ("NIST"), CIP/Reliability Standards) to implement a pragmatic fit-for-purpose cybersecurity program, implementing cybersecurity controls and processes under the following domains:

- Identify: TransAlta conducts comprehensive risk assessments to identify and document the organization's assets, systems and data, as well as potential risks and vulnerabilities.
- Protect: TransAlta implements security controls, policies and procedures to safeguard the organization's assets, systems and data from unauthorized access, use, disclosure, disruption, modification or destruction. This includes implementing access controls, encryption, firewalls and intrusion detection/prevention systems to protect the organization's networks and systems.
- Detect: TransAlta implements incident detection and response capabilities to detect and respond to cyber incidents. This includes monitoring systems, networks and data for suspicious activity.
- Respond: TransAlta has developed incident response plans, procedures and teams, as well as provided training and conducted exercises to ensure that these plans and procedures are operating effectively.
- Recover: TransAlta has developed disaster recovery and business continuity plans, and it conducts test exercises of these plans to ensure their effectiveness. This includes identifying critical systems, data and process to ensure the continuity of business operations, as well as implementing backup and recovery solutions to ensure that the organization's data can be restored in the event of a disaster.

Although complete cyber risk elimination is not achievable given the evolving cyber threat landscape, the security controls implemented to detect, prevent and respond to a cyber incident significantly reduce TransAlta's cyber risk and potential incident impact to acceptable levels. In addition, cyber insurance is utilized to further manage and transfer residual cyber risk to TransAlta's business. We continue to improve our overall security maturity and defense capabilities against cyber threats and align cybersecurity practices to industry standards, business objectives and regulatory compliance requirements.

General Economic Conditions

Changes in general economic conditions impact product demand, revenue, operating costs, the timing and extent of capital expenditures, the net recoverable value of PP&E, financing costs, credit and liquidity risk and counterparty risk.

Growth Risk

Our business plan includes growth by making suitable acquisitions or contracting new build opportunities. There can be no assurance that we will be able to identify attractive growth opportunities in the future, that we will be able to complete growth opportunities that increase the amount of cash available for distribution, or that growth opportunities will be successfully integrated into our existing operations. The successful execution of the growth strategy requires careful timing and business judgment, as well as the resources to complete the due diligence and evaluation of such opportunities and to acquire and successfully integrate those assets into our business.

Income Taxes

Our operations are complex and located in several countries. The computation of the provision for income taxes involves tax interpretations, regulations and legislation that are constantly evolving. Our tax filings are subject to audit by taxation authorities. Management believes that it has adequately provided for income taxes as required by the Income Tax Act and IFRS, based on all information currently available.

The Company is subject to changing laws, treaties and regulations in and between countries. Various tax proposals in the countries we operate in could result in changes to the basis on which deferred taxes are calculated or could result in changes to income or non-income tax expense. There has recently been an increased focus on issues related to the taxation of multinational corporations. A change in tax laws, treaties or regulations, or in the interpretation thereof, could result in a materially higher income or non-income tax expense that could have a material adverse impact on the Company.

The sensitivity of changes in income tax rates upon our net earnings is shown below:

Factor	Increase or decrease (Per cent)	Approximate impact on net earnings (million)
Tax rate	1	$4

Legal Contingencies

We are occasionally named as a party in various disputes, claims and legal or regulatory proceedings that arise during the normal course of our business. We review each of these claims, including the nature and merits of the claim, the amount in dispute or the remedy claimed and the availability of insurance coverage. There can be no assurance that any particular dispute, claim or proceeding will be resolved in our favour or our liabilities with respect to such claims will not have a material adverse effect on us or our business, operations or financial results. Refer to the Other Consolidated Analysis section of this MD&A for further details.

Other Contingencies

We maintain a level of insurance coverage deemed appropriate by management. During renewal of the insurance policies on Dec. 31, 2021, a coverage restriction was added for losses resulting from a foundation failure at the Kent Hills 1 and 2 wind facilities only. There were no other significant changes to our insurance coverage during renewal of the insurance policies on Dec. 31, 2022. Our insurance coverage may not be available in the future on commercially reasonable terms. There can be no assurance that our insurance coverage will be fully adequate to compensate for potential losses incurred. In the event of a significant economic event, the insurers may not be capable of fully paying all claims. All insurance policies are subject to standard exclusions.

Disclosure Controls and Procedures

Management is responsible for establishing and maintaining adequate internal control over financial reporting ("ICFR") and disclosure controls and procedures ("DC&P"). For the year ended Dec. 31, 2022, the majority of our workforce supporting and executing our ICFR and DC&P returned to work and continue to work remotely on a hybrid basis. The Company has implemented appropriate controls and oversight for both in-office and remote work. There has been minimal impact to the design and performance of our internal controls.

ICFR is a framework designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of the consolidated financial statements for external purposes in accordance with IFRS. Management has used the Internal Control – Integrated Framework issued by the Committee of Sponsoring Organizations of the Treadway Commission (2013 framework) in order to assess the effectiveness of the Company's ICFR.

DC&P refer to controls and other procedures designed to ensure that information required to be disclosed in the reports we file or submit under securities legislation is recorded, processed, summarized and reported within the time frame specified in applicable securities legislation. DC&P include, without limitation, controls and procedures designed to ensure that information required to be disclosed by us in our reports that we file or submit under applicable securities legislation is accumulated and communicated to management, including our Chief Executive Officer and Chief Financial Officer, as appropriate to allow timely decisions regarding our required disclosure.

Together, the ICFR and DC&P frameworks provide internal control over financial reporting and disclosure. In designing and evaluating our ICFR and DC&P, management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving the desired control objectives and as such may not prevent or detect all misstatements and management is required to apply its judgment in evaluating and implementing possible controls and procedures. Further, the effectiveness of ICFR is subject to the risk that controls may become inadequate because of changes in conditions or that the degree of compliance with policies or procedures may change.

Management has evaluated, with the participation of our Chief Executive Officer and Chief Financial Officer, the effectiveness of our ICFR and DC&P as of the end of the period covered by this MD&A. Based on the foregoing evaluation, our Chief Executive Officer and Chief Financial Officer have concluded that, as at Dec. 31, 2022, the end of the period covered by this MD&A, our ICFR and DC&P were effective.