The purpose of this section of the quarterly report is to provide stakeholders with an update on the Alberta Electric System Operator's (AESO) progress on the initiatives outlined in its 2021 Business Plan and Budget (Business Plan). The reader of this report should reference the Business Plan published on the AESO's website for additional information to fully understand the various progress updates provided.

Reporting on Business Plan Initiatives

Externally focused initiatives – stakeholder-participation related

Business Initiative	Update Q4 2021	Next Steps
Mandated – Top Priority Business Initiatives		
Red Tape Reduction ***Objective:*** To be in compliance with the Government of Alberta (GoA) Red Tape Reduction Initiative, the AESO is committed to reducing regulatory requirements by one-third by 2023 ***Interdependencies:*** • Tariff Modernization • Technology Integration • Distribution Coordination	**Update** A workplan was prepared in 2020 re: the sequence of documents to be reworked or removed in order to reduce regulatory requirements as per the GoA's schedule Implementation of the workplan has resulted in a reduction of requirements by 25% at Q4	**Implementation** Continue to advance the workplan with a reduction in requirements via AESO initiated changes to non-authoritative documents in addition to changes that will need to be filed with the Alberta Utilities Commission (AUC) for approval
General Tariff Application (GTA) ***Objective:*** Implement approved tariff provisions from 2018 GTA into Connection Process and AESO business File a 2021 tariff rates update in Q4 2020 for a Jan. 1, 2021 effective date ***Interdependencies:*** • Technology Integration • Distribution Coordination	**Update** After conducting a consultative process with DFOs and other market participants, the AESO filed the System Criteria Compliance filing with the AUC on Nov. 30, 2021. No SIP was received, and on Dec. 13, 2021 the AUC issued Decision 27015-D01-2021 to approve the AESO's application. In this Decision, the AUC deemed that the AESO's compliance with directions 13 and 14 from AUC Decision 22942-D02-2019 for the 2018 ISO GTA is approved On Dec. 10, 2021, the AESO filed with the AUC the AMP Compliance Filing and Proposed Amended	**Design** Several parties have filed SIP for the AMP Compliance Filing and Proposed Amended Section 502.10 application, and on Feb. 1, 2022, the AUC issued a process announcement. Will continue to monitor this development and participate in the regulatory process as required.

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Business Initiative	Update Q4 2021	Next Steps
	Section 502.10 of the ISO Rules, Revenue Metering System Technical and Operating Requirements On Dec. 17, 2021, the AUC approved the AESO's application for 2022 tariff update including the Rider J Amendment, which became effective Jan. 1, 2022	
Top Priority Business Initiatives		
Tariff Modernization ***Background:*** In Q2 2018, the AESO proposed to the AUC that a consultation process be initiated to review bulk and regional transmission rate design; the AUC approved the proposal, and the AESO initiated the consultation process in Q3 2018 ***Objective:*** To simplify the ISO tariff to be more accessible, clear and agile ***Interdependencies:*** • Red Tape Reduction • Distribution Coordination • Technology Integration	**Update** Bulk and Regional tariff application filed with the AUC Oct. 15, 2021, including Demand Opportunity Service (DOS) Modernization and a proposal for mitigating rate impacts for significantly impacted loads to support a minimally disruptive transition On Nov. 22, 2021, the AUC issued its Process Announcement that the AESO's Bulk and Regional Rate Design and Modernized DOS Rate Design application will be processed by way of a full hearing process including an oral hearing. On Nov. 24, 2021, the AUC issued its ruling granting the AESO's request for confidential treatment of six documents related to the NERA expert report On Dec. 6, 2021 the AESO received approximately 650 information requests (IRs) from the AUC and other interveners. On Jan. 12, 2022, the AESO filed responses to more than 2/3 of the IRs, and after being granted an extension by the AUC, filed the rest of the IR responses on Jan. 19, 2022	**Design, Implementation** AUC proceeding on Bulk and Regional tariff application including DOS modernization Additional information on the intent and proposed continued process for Tariff Modernization is also included on the AESO website
Optimizing the Grid ***Objective:*** Optimize use of existing grid and minimize need or extend	**Update** Using congestion analysis to identify the timing of the planned	**Design, Implementation** Seek enhanced flexibility to further optimize the network by engaging in the Department of Energy's Bulk

Business Initiative	Update Q4 2021	Next Steps
timing out for new infrastructure while ensuring reliability and market access ***Interdependencies:*** • Distribution Coordination • Technology Integration • OR Market Competitiveness Enhancement	transmission projects and maximize use of existing infrastructure Pursuing use of flow control devices and line rating upgrades as low-cost solutions to defer new infrastructure 2022 Long-term Transmission Plan (LTP), focused on risk-based scenarios and optimizing existing network, published to the AESO website Jan. 31, 2022 Improving system frequency response following a disturbance Cost saving for deferring system projects such as PENV (Provost to Edgerton and Nilrem to Vermilion Transmission Development), CETO (Central East Transfer-out Transmission Development) and CRPC (Chapel Rock-to-Pincher Creek Transmission Development)	System Planning engagement Create methodology to develop substation level transmission capability maps Stakeholder information session on 2022 LTP scheduled for Mar. 3, 2022
Distribution Coordination ***Objective:*** Ensure coordination across the distribution and transmission system as the transformation evolves, focused on optimizing transmission system while ensuring reliability and market access ***Interdependencies:*** • Red Tape Reduction • Technology Integration • Optimizing the Grid • Tariff Modernization • OR Market Competitiveness Enhancement • GTA	**Update** Published AESO's Decision-Making Framework for responding to DFO system access service request Launched DER locational static data portal Q1 published DER frequency and voltage ride-through performance requirements technical paper. Working with DFOs to adopt in DFO interconnection documents Realizing potential cost savings by deferring DFO projects through applying Decision-Making Framework Implementing DER technical interconnection requirements through existing DFO processes	**Design, Implementation** Pursue connection process improvements for DFO reliability and capability projects Develop approach to coordinate DFO capability hosting maps with AESO transmission capability assessments Engage in policy/regulatory related initiatives to share the AESO's principles and perspectives as it relates to mandate implications Facilitate DER access to AESO electricity markets by updating any ISO rules (if needed) to remove unnecessary market access limitations

Business Initiative	Update Q4 2021	Next Steps
Technology Integration ***Objective:*** Enable timely planned integration of new technologies onto the grid and into our markets Enable proactive awareness of future new technologies and the potential impacts to reliability, markets and tariffs ***Interdependencies:*** • Tariff Modernization • OR Market Competitiveness Enhancement • Optimizing the Grid • Distribution Coordination • Red Tape Reduction • Market Sustainability and Evolution • GTA	**Update** Launched the first Technology Summit and published the AESO's first Technology Forward report focused on the electricity value chain and future implications to the Electricity Value Chain Held the first Annual Industry Technology Summit on Dec.1, 2021 Engaged in Department of Energy's Energy Storage policy development Identifying and drafting Energy Storage (ES) rule changes and tariff treatment Held the Energy Storage Industry Learnings Forum (ESILF) session	**Design, Implementation** Finalize ES rule changes needed and prepare for stakeholder engagement, including changes to implement Adjustment for Load on the Margin (ALM)
Business Initiatives		
Settlement Audit ***Objective:*** Perform an audit of the AESO's financial settlement processes ***Interdependencies:*** • No interdependencies	**Update** Audit deferred to early 2022 due to COVID-19 and other priorities; however, readiness component is still in progress In the replies to stakeholder comments from the Aug. 26, 2021 BRP Session 1, the AESO provided some additional information and a diagram that is a conceptual overview of the AESO's settlement operations and the related control framework that will be considered in the Settlement Audit	**Implementation** Auditors conduct 6-month Settlement Audit testing over Q2 and Q3 (starting Apr. 1, 2022) Preparation and completion of Settlement Audit report Q4 2022 Upon completion, share a post-audit report with stakeholders upon request, subject to non-disclosure agreement

Business Initiative	Update Q4 2021	Next Steps
Market Sustainability and Evolution ***Objective:*** To maintain the long-term sustainability and competitiveness of the energy-only market structure and to enable the integration of new technologies with a long-term view of potential market changes needed to facilitate continued resource adequacy and increased flexibility with an ever-increasing variable system ***Interdependencies:*** • Technology Integration	**Update** Assessment performed on Adjustment to Load on Margin (ALM) and stakeholders were engaged as part of the Energy Storage consultation. Rule changes are being developed together with the rule changes for energy storage Conducted Operating Reserve (OR) Market Review stakeholder session 1 on Nov. 30, 2021. Received stakeholder feedback regarding design considerations and process. Internal analysis progressed On Nov. 4, 2021 the Mothball Outage Reporting Rule Amendment Options & Recommendations Paper was released following a review of the stakeholder feedback from the stakeholder session conducted in April. Stakeholder comments on the Options & Recommendations Paper received were posted on the AESO website on Dec. 3, 2021	**Design, Implementation** Continue the rule development process for ALM and initiate planning for implementation when appropriate Assess stakeholder feedback from OR Market Review stakeholder session 1 to inform design considerations and process. Plan to hold further stakeholder sessions in late Q1 and Q2 2022 Continue stakeholder engagement and rule development process on the proposed changes to ISO rule Section 306.7 Mothball Outage Reporting, and initiate planning for implementation when appropriate

Financial Update – As of December 31, 2021

Transmission Operating Costs ($ million)	2021 Actual	2021 Forecast	2020 Actual
Wires costs	1,713.6	1,933.8	1,872.1
Operating reserves	333.7	159.9	144.8
Transmission line losses	201.8	104.4	92.7
Other ancillary service costs	47.5	38.4	37.7
Total Transmission Operating Costs	**2,296.6**	**2,236.5**	**2,147.3**

Numbers may not add due to rounding

Wires costs – Wires costs represent the amounts paid primarily to transmission facility owners (TFOs) in accordance with their Alberta Utilities Commission (AUC) - approved tariffs and are not controllable costs of the AESO.

Wires costs in 2021 are $1,713.6 million, which is $158.5 million or 8.5 per cent lower than the 2020 costs of $1,872.1 million due primarily to an AltaLink (2021-2023) Tariff Refund of $223.5 million, partially offset by two one-time wires costs payments resulting from AUC decisions (AltaLink - $42.2 million and TransAlta - $2.2 million).

Operating reserves – Operating reserves are generating capacity or load that is held in reserve and made available to the System Controller to manage the transmission system supply-demand balance in real time. Operating reserves are procured through an online, day-ahead exchange, where offer prices are indexed to the pool price. While the prices of operating reserves procured through the online exchange are indexed to the pool price, changes to the average pool price do not result in proportional changes to the operating reserve costs; the pool price for each hour has a significant impact on the operating reserve costs for that hour.

Operating reserve costs in 2021 are $333.7 million, which is $188.9 million or 130.5 per cent higher than the 2020 costs of $144.8 million. The cost of operating reserves is impacted by actual volumes, hourly pool prices and operating reserve prices. The average hourly pool price is $102 per megawatt hour (MWh) in 2021 compared to $47 per MWh in 2020, representing an increase of 117.0 per cent. This increase is largely attributable to periods of extremely cold and hot weather conditions in 2021 and strong pricing in interconnected markets, as well as a change to the contingency reserve procurement methodology related to imports, resulting in a reduction in standby market costs offset by increased procurement of active reserves. Operating reserve volumes financially settled in 2021 are 6,934 gigawatt hours (GWh) compared to 7,795 GWh in 2020, representing a 11.0 per cent decrease.

Transmission line losses – Transmission line losses represent the volume of energy that is lost as a result of electrical resistance on the transmission lines. Volumes associated with line losses are determined through the energy market settlement process as the difference between generation and import volumes, less consumption and export volumes.

The hourly volumes of line losses vary based on load and export levels, generation (baseload, peaking units and imports) available to serve load, weather conditions, and changes in the transmission topology. System maintenance schedules, unexpected failures, dispatch decisions on the Alberta Interconnected

Electric System (AIES), and short-term system measures (such as demand response) may also affect the volume of losses. The value of line losses is calculated based on the hourly pool price.

The cost of transmission line losses in 2021 is $201.8 million, which is $109.1 million or 117.7 per cent higher than the 2020 cost of $92.7 million, mainly due to the impact of a 117.0 per cent higher average pool price in 2021. Line loss volumes financially settled in 2021 are 1,880 GWh compared to 1,947 GWh in 2020, representing a 3.4 per cent decrease.

Other ancillary services costs – The AESO procures other ancillary services for the secure and reliable operation of the AIES. These services are procured through a competitive procurement process where possible, or in instances where such procurement processes may not be feasible, through bilateral negotiations.

Other Ancillary Services Costs ($ million)

	2021 Actual	2021 Forecast	2020 Actual
Load shed service for imports	31.4	32.6	28.3
Transmission must-run			
Contracted	0.0	0.0	3.0
Conscripted	8.1	0.4	0.7
Reliability services	2.9	2.9	2.9
Black start	2.4	2.4	2.3
Transmission constraint rebalancing	2.7	0.1	0.5
Total Other Ancillary Services	**47.5**	**38.4**	**37.7**

Numbers may not add due to rounding

Load shed service for imports (LSSi) is interruptible load that can be armed to trip, either automatically or manually, on the loss of the Alberta-British Columbia intertie to allow for increased import available transfer capability (ATC). LSSi costs are impacted by volume availability, contract prices and AIES requirements for arming and tripping. The 2021 costs for LSSi are $31.4 million, which is $3.1 million or 11.0 per cent higher than the 2020 costs of $28.3 million due to increased active arming costs.

Transmission must-run (TMR) occurs when generation is required to mitigate the overloading of transmission lines associated with line outages, system conditions in real time or the loss of generation in an area.

The AESO had previously contracted with a generator in Northwest Alberta to provide TMR services which cost $3.0 million. This contract terminated in September 2020 and no new contracts were procured for 2021. In circumstances when TMR services are required for an unforeseeable event and there is no contracted TMR, non-contracted generators may be dispatched to provide this service (referred to as conscripted TMR). The 2021 costs for Conscripted TMR are $8.1 million, which is $7.4 million or 1,057.1 per cent higher than the 2020 costs of $0.7 million due to increased unforeseen events resulting from unexpected load growth in a region and an increased number of planned outages and transmission equipment constraints.

Reliability services are procured for grid restoration balancing support in the event of an Alberta blackout and emergency energy in the event of supply shortfall.

Black start services are provided by generators that are able to restart their generation facility with no outside source of power. In the event of a system-wide black-out, black start services are used to re-energize the transmission system and provide start-up power to generators who cannot self-start. Black start providers are required in specific areas of the AIES to ensure the entire system has adequate start-up power.

Transmission constraint rebalancing costs are incurred when the transmission system is unable to deliver electricity from a generator to a given electricity-consuming area without contravening reliability requirements. When this occurs, a market participant downstream of a constraint may be dispatched for purposes of transmission constraint rebalancing under the Independent System Operator (ISO) Rules and would receive a transmission constraint rebalancing payment for energy provided for that purpose.

The 2021 costs for transmission constraint rebalancing are $2.7 million, which is $2.2 million or 440.0 per cent higher than the 2020 costs of $0.5 million due primarily to abnormal situations requiring constrained down generation during islanded operations as well as constraints on generation due to transmission line upgrades and limits.

Other Industry Costs ($ million)

	2021 Actual	2021 Budget	2020 Actual
Alberta Utilities Commission (AUC) fee – Transmission	9.7	11.3	10.8
AUC fee – Energy Market	7.3	6.6	7.2
WECC/NWPP/NERC costs	2.3	2.2	2.5
Regulatory process costs	2.3	1.3	2.2
Total Other Industry Costs	**21.6**	**21.4**	**22.7**

Numbers may not add due to rounding

Other industry costs represent fees or costs paid based on regulatory requirements or membership fees for industry organizations, which are not under the direct control of the AESO. These costs relate to the annual administration fee for the AUC, the AESO's share of Western Electricity Coordinating Council (WECC), Northwest Power Pool (NWPP) and North American Electric Reliability Corporation (NERC) membership fees, regulatory process costs, and non-compliance penalties. Regulatory process costs are associated with the AESO's involvement in an AUC proceeding to hear objections and complaints to ISO Rules or a regulatory application and costs incurred to respond to specific agency-related directions or recommendations that are beyond the routine operations of the AESO; this does not include application preparation costs.

Other industry costs in 2021 are $21.6 million, which is $1.1 million or 4.8 per cent lower than 2020 costs of $22.7 million. The decrease is primarily attributable to a reduction in AUC fees for 2021 as compared to 2020.

General and Administrative Costs ($ million)	2021 Actual	2021 Budget	2020 Actual
Staff costs	68.3	64.3	65.7
Contract services and consultants	4.1	5.4	3.7
Facilities	4.1	4.8	4.1
Administration	3.3	4.4	3.0
Computer services and maintenance	10.6	11.3	10.2
Telecommunications	1.4	1.5	1.4
Total General and Administrative Costs	**91.8**	**91.7**	**88.1**

Numbers may not add due to rounding

In 2021, staff costs are $68.3 million, which is $2.6 million or 4.0 per cent higher than the 2020 costs of $65.7 million. The increase is primarily due to lower staff turnover than in previous years due to the ongoing impacts of the COVID-19 pandemic. Additionally, and to a lesser extent, was the impact of additional resources required for grid optimization and transmission development deferral activities, as well as for increased grid connection requirements from stakeholders.

In 2021, contract services and consultants are $4.1 million, which is $0.4 million or 10.8 per cent higher than the 2020 costs of $3.7 million. The increase is due to the timing of activities and initiatives requiring specialized resources. In 2020, activities requiring consulting services were delayed given the unexpected impact of COVID-19, resulting in reduced costs.

Administration costs include training, travel, insurance, corporate subscriptions, Board fees and office costs. In 2021, administration costs are $3.3 million, which is $0.3 million or 10.0 per cent higher than the 2020 costs of $3.0 million. The increase is primarily associated with an increase in insurance premiums due to increasing pressure in the market, offset by decreases in other administrative costs.

In 2021, computer services and maintenance costs are $10.6 million, which is $0.4 million or 3.9 per cent higher than the 2020 costs of $10.2 million. While the AESO has continued efforts to reduce and rationalize service levels with vendors; negotiate cost reductions; and implement innovative thinking and infrastructure redesign to avoid maintenance and licensing costs, the net increase is a result of growth in information technology systems and tool reliance, as well as the impact of price increases. A movement to cloud-based software solutions has also shifted some traditional capital costs related to internally developed systems and purchased software (recognized as amortization) to computer services costs.

Facilities and Telecommunications costs in 2021 are consistent with 2020.

Interest and Amortization ($ million)	2021 Actual	2021 Budget	2020 Actual
Amortization of right-of-use assets, intangible assets and depreciation of property, plant and equipment	**28.1**	**26.2**	**30.7**
Borrowing Costs	**47.1**	**3.5**	**38.0**

In 2021, amortization of intangible assets and depreciation of right-of-use assets and PP&E collectively total $28.1 million, which is $2.6 million or 8.5 per cent lower than the 2020 amortization of $30.7 million. The decrease is primarily due to changes in the asset base being amortized and depreciated year over year.

Borrowing costs in 2021 are $47.1 million, which is $9.1 million or 23.9 per cent higher than 2020 costs of $38.0 million. The increase is primarily due to interest expense of $45.8 million related to the Module C Loss Factor resettlements in 2021 compared to $33.6 million in 2020, for which offsetting interest income was recorded. Excluding this, interest costs in 2021 are $1.3 million, which is $3.1 million or 70.5 per cent lower than 2020 costs of $4.4 million due to reduced borrowing requirements in 2021.

Capital Expenditure Update – As of December 31, 2021

Capital Program ($ million)	Total Project Approved	Prior Year(s) Actual	Spent in 2021 to date	ETC in 2021	ETC Future Yr.(s)	Total Cost Est.	Variance Approved to Total Cost Est.
Key Capital Initiatives							
Business System Modernization	1.5	0.6	0.8	-	0.0	1.4	0.1
Cyber Security and Critical Infrastructure Protection (CIP)	1.3	0.2	0.8	-	0.1	1.1	0.2
EMS Sustainment	26.1	10.9	5.5	-	8.4	24.9	1.3
Optimizing the Grid	1.3	0.1	0.3	-	1.3	1.7	(0.4)
Technology Integration	0.2	-	0.0		-	0.0	0.2
Other Capital Initiatives	23.2	7.8	10.9	-	0.7	19.4	3.8
Life Cycle Funding	6.5	0.5	4.0	-	0.0	4.5	2.0
General / Total Capital	**60.2**	**20.1**	**22.4**	**-**	**10.4**	**52.9**	**7.2**

Numbers may not add due to rounding

General Capital Program ($ million)	
Spent to December 31, 2021	**22.4**
General Capital approved	**25.3**
Variance	**2.9**

Appendix I - Notes

The following tables provide information on the AESO's capital for 2021.

Key Capital Initiatives

These are the most critical capital projects over the planning period that the AESO believes must be completed within the identified timeframe.

Key Capital Initiatives		
Business System Modernization	**Description**	Includes providing a single, secure, standardized user experience for external stakeholders exchanging data with various departments across the AESO. This includes sharing data & information, receiving data and information with market participants, government agencies and the public.
	2021 Plan	Complete implementation of an external facing portal to provide a single platform to exchange data for ARS External Compliance Monitoring (ECM), FOIP requests and DER static data from DFOs. Initiate other opportunities for data exchange with external market participants.
Cyber Security and Critical Infrastructure Protection (CIP)	**Description**	Build on the existing cyber security foundation to protect the AESO from ever-expanding cyber threats. Deliver improvements in the way that cyber security threats and vulnerabilities are identified, providing better visibility of security events, improved responses and coordinated recovery.
	2021 Plan	Implementation of various cyber security and CIP-related projects.
EMS Sustainment	**Description**	The EMS is used by System Controllers in grid operations to monitor, control and optimize the performance of the power system. Upgrades relating to the sustainment and optimization requirements of the EMS evergreen strategy include vendor software upgrades and improved analysis and reporting capabilities.

Key Capital Initiatives		
	2021 Plan	Continue the capital investment via the "Grid Reliability Support" program to sustain and enhance the EMS, in order to support renewables integration and maintain the reliable operation of the Alberta grid and market. Deliver a sustainable long-term EMS required to monitor and control the grid at the lowest possible cost, while generating maximum value from the investment.
Technology Integration	**Description**	Related capital to help ensure coordination across the distribution and transmission system as the transformation evolves, focused on optimizing the transmission system while ensuring reliability and market access.
	2021 Plan	Includes projects related to energy storage long-term solution implementation and DER integration.
Optimizing the Grid	**Description**	Optimize use of existing grid and minimize need or extend timing out for new infrastructure while ensuring reliability and market access.
	2021 Plan	Includes online transient stability analysis (TSA) which is currently done offline due to the processing and time requirements. Online TSA would allow for real time analysis to occur and have the results fed back to the System Controllers.
Key Initiatives	**2021 Budget**	**$9.9 million**