

2021 **YEAR IN REVIEW**

Alberta Electric System Operator





NOTE FROM

The President and Chief Executive Officer

Looking back over the past year, I would like to acknowledge the professionalism and diligence of the AESO's dedicated workforce, who continued to advance many critical initiatives on behalf of all Albertans while working from home. Not only did our organization maintain its productivity and deliver on our business priorities amidst the second year of a global pandemic, but we have also retained our culture of open communication and collaboration, both internally and externally.

Throughout 2021, we continued to engage our stakeholders online. There are lessons and engagement approaches that the AESO will continue to leverage as we transition to our new work environment. We are committed to finding the right balance between the flexibility, accessibility and cost-effectiveness of virtual sessions, and the in-person formats that remain integral to building and maintaining relationships. We look forward to testing a new hybrid approach in 2022.

Over the past year, some of our most substantive engagements—and an area in which we have made extensive progress—is grid optimization. We have celebrated some big wins for Albertans and consumers in several different areas. These wins include the deferral and delay of major transmission system projects through advanced analytical approaches and grid management techniques, the procurement of new ancillary services, and the development of planning tools that will help to refine the timing of major investment decisions.

We also made consistent and meaningful advancements in the management of the connection process; specifically, supporting generation customers who are looking to develop energy resources in our province. Ultimately, the AESO's job is to encourage investment by facilitating connections in an efficient and timely manner.

While managing the surge of renewables generation was a significant undertaking, it provided us with an excellent opportunity to assess how we think about connecting customers to the grid in the most efficient way and at the lowest costs possible. 2022 will see continued beneficial changes and efficiencies driven from the learnings of the past year.

In 2021, we also focused on grid resiliency and reliability, ensuring we have a stronger understanding of risks and challenges. Gas dependency, cyber security, extreme weather, increasing levels of renewables integration, and the electrification of the transportation system and other sectors of the economy are some of the factors we're facing as a grid operator and a province. We established industry-level working groups to conduct assessments to position ourselves in anticipation of extremely hot summer and cold winter conditions. Our objective was to ensure that we were prepared to respond to extreme events that challenged energy infrastructure in other jurisdictions over the past year.

We didn't have long to wait to test our grid's resilience. Over the past year, Alberta experienced extended heat waves and cold snaps that resulted in new records for summer and winter seasonal peaks, including a new all-time electricity usage record.

“The biggest challenge for the electricity industry going forward is to find the path that has the lowest cost impact on consumers and maintains reliability.”

Maintaining reliable grid operations through these challenging conditions, while taking into consideration earlier-than-projected retirement of coal generation and increases in intermittent generation, was no small feat. Thanks and recognition should also go to our industry partners whose facilities, both generation and transmission, performed extremely well during a prolonged extreme weather environment.

The tariff initiative to ensure appropriate price signals for the use of the transmission system was also a major piece of work. We hope to maintain a balanced framework that ensures customers have optionality without inappropriately shifting costs to other consumers.

Looking to the future of electricity, the AESO must stay abreast of constantly evolving technologies while differentiating between valid trends and industry rhetoric. Our *AESO 2021 Technology Forward Publication* is the product of in-depth research and thinking within the organization, in conjunction with industry consultation. It provides clarity around the work that we're doing to understand various technologies, where they are going, and the implications to achieve a net-zero emissions electricity sector in Alberta.

The biggest challenge for the electricity industry going forward is to find the path that has the lowest cost impact on consumers and maintains reliability.

At this stage, it is not a single technology that will provide a solution; it will be a balanced portfolio of transmission, generation and operations tools, technologies and methodologies. Natural gas has a key role to play and understanding the time horizons of the transition to a net-zero environment will be critical.

In closing, I am extremely pleased with the value we delivered to Albertans in 2021, and looking to 2022 and beyond, we remain committed to fulfilling our purpose—to provide leadership to power Alberta today and into the future.

Sincerely,



Michael Law
President & Chief Executive Officer



LEADING AND LEVERAGING OUR INDUSTRY'S COLLECTIVE EXPERIENCE

ENABLING TRANSFORMATION AND
CREATING VALUE FOR ALBERTANS

OUR PURPOSE

Providing leadership to power Alberta today and into the future

The Alberta Electric System Operator (AESO) is committed to playing a leadership role in enabling the transformation of the province's electricity sector.

In 2021, it was anticipated that the global pandemic would be in the rear-view mirror and the economy would be on the road to recovery. Instead, stringent public health measures remained in place and the majority of AESO employees continued to work from home, progressing business priorities and engaging stakeholders virtually. While the move back into the office may have stalled, interest in Alberta's renewable energy resources continued to accelerate, along with the pace of transformation across the electricity industry.

In response to this increased pace of change, the AESO took action to update its strategic plan. The three pillars of the 2019-2023 Strategic Plan were refined to position us to better manage the profound changes now underway and on the horizon. Our 2022 Strategic Plan now has three strategic focus areas: energizing our people, optimizing the grid and enabling transformation. Work under each of these three strategic focus areas was well underway when the plan was formally rolled out at the end of 2021.

In addition to our leadership role in enabling the transformation, the AESO remains focused on strengthening core business functions: markets and competition, grid resiliency, data and digitalization and external engagement. Our focus on core business functions will ensure we have a strong foundation to support our areas of strategic change.

In early 2021, the AESO hosted roundtable discussions with industry CEOs, associations and agencies. These forums continue to provide industry leaders with an opportunity to discuss topics of strategic importance to Alberta's electricity system.

They are invaluable for the AESO and industry, as they help to create a collective understanding of the challenges and opportunities ahead and identify potential paths forward. Input from the 2021 roundtables helped to clarify the AESO's areas of focus through the end of the year and informed the development of the AESO's 2022 Strategic Plan.

The AESO recognizes and respects the breadth and depth of knowledge and experience that our stakeholders possess. In 2021, they helped to progress a broad range of important initiatives, including the AESO's tariff filing, market evolution, and transmission system development—just to name a few. The AESO remains committed to continuing to leverage our stakeholders' knowledge and experience.

By proactively managing the profound changes occurring today and those we see on the horizon, the AESO will ensure our transmission system continues to deliver value to Albertans by providing reliable, affordable electricity. We remain committed to working to create a favourable climate to attract future investment.

Our *2021 Year in Review* provides a snapshot of how the AESO delivered on our mandate and, with stakeholder input and support, continues to lead the industry in support of Alberta's future prosperity.



Developing Value through Grid Optimization

Optimizing the grid will always be a part of the AESO's ongoing core business; however, it is also a key strategic focus area for our organization. In 2021, we achieved between \$275 million and \$320 million in net present value savings to Alberta ratepayers. This was accomplished by enhancing methods to maximize the use of existing transmission infrastructure, more accurately timing the development of new infrastructure through a new risk-based modelling approach, seeking lower-cost solutions, deferring investment decisions, and optimizing ancillary services.

Enhancing transmission and distribution coordination with facility owners

Engaging with the distribution side of the power industry is critical as the electrification of transportation and other sectors continues to gain momentum. The AESO's *2021-2022 Transmission/Distribution Coordinated Planning Framework*, developed in consultation with stakeholders and formally published in 2021, will continue to evolve even as it guides ongoing work.

Over the past year, the AESO engaged with transmission facility owners, distribution facility owners and other industry and ratepayer groups through a series of collaborative technical sessions.

These sessions were held to foster alignment and understanding among different stakeholder groups, while seeking recommendations and feedback for the development of an efficient, transparent and balanced AESO Decision-Making Framework for responding to distribution facility owner (DFO) system access service requests (SASRs).

The AESO Distribution Deficiency Report Guideline, which ensures all required information is provided by the DFOs with their SASR applications, was also updated and standardized. These were significant accomplishments.

Integrating growing volumes of distributed energy resources

Following the publication of the *AESO Distributed Energy Resources Roadmap* (DER Roadmap) the previous year, the AESO implemented several DER Roadmap initiatives in 2021. Stakeholder input was integral to the design of key deliverables including DER technical interconnection requirements, scheduled for implementation in the first quarter of 2022; a DER locational static data portal that provides DER information and a single secure point of data and document exchange with DFOs; and updates to applicable ISO rules to remove unnecessary market-access limitations and facilitate DER integration and access to AESO electricity markets.

Enhancing transparency of the system planning process

In October 2021, the AESO hosted a Transmission System Projects Update session to share our criteria for the initiation of system projects and explain how the criteria are applied. The potential cost savings to ratepayers based on the deferral of major transmission projects while maintaining system reliability was also discussed.

The AESO developed a Transmission Capability map that illustrates the estimated additional generation capacity that could be connected at different locations on the existing transmission system. This tool is an online interactive platform that provides a visual geographic guide to support current and prospective market participants in making informed decisions for generation capacity and location siting in a way that facilitates transmission system optimization.

In late 2021, stakeholders were provided with an introduction to the assumptions and methodologies used in the development of the tool, as well as its vision and intended use. The initial version illustrates the capability in the AESO's South and Central East planning regions.



Enabling Transformation

Enabling electrification and integrating technological change

Over the next decade, it's anticipated there will be an exponential increase in electric vehicles on Alberta roads, while new technologies may also transform the operation of our grid. These changes will have a big impact on the future of Alberta—and the AESO is taking action now.

The *AESO 2021 Technology Forward Publication* (2021 Tech Forward) provides an overview and examination of existing technologies and the potential future implications of these technologies on Alberta's electricity system. Shortly after the report's publication in November 2021, the AESO hosted a Technology Summit, where a broad cross-section of electricity industry technology was highlighted. The theme of the event—Power Tomorrow—provided a forum for stakeholders and industry partners to share their views and understanding of new and emerging technologies.

Looking ahead, the AESO continues to explore opportunities to apply or adapt new technologies to maintain grid reliability. In 2021, the AESO launched a Fast Frequency Response (FFR) pilot to procure a new fast-acting transmission reliability service for the potential sudden loss of imports from intertie connections.

The pilot will assess the technical capability of new technology, such as batteries, to provide FFR services.

On the operations front, through the course of stakeholder discussions, the AESO received feedback that several market participants were having issues with the Energy Trading System (ETS), which was resulting in non-compliance with rules and standards. In response, the AESO established a Market Tools User Group (MTUG), which serves as a forum to raise issues and improve understanding and knowledge of the AESO's tools and rules.

In addition to providing valuable feedback on current tools, the MTUG—which includes users of ADaMS, ETS and other data interfaces—is now also involved in the ongoing evolution of critical systems. The group's feedback has been invaluable in helping the AESO decide on the scope of changes, investment planning, and understanding where the demand usability of tools resides within the market.

A formal framework for the user group has been established, and it will be formally engaged on a go-forward basis. The AESO looks forward to expanding topics and tools in 2022.

Protecting digital assets and enhancing cyber-protection standards

In 2021, the Western Electricity Coordinating Council conducted two separate compliance audits of the AESO: the first centered on seven Critical Infrastructure Protection (CIP) standards, and the second covered 11 Operations and Planning standards. The results of the audits—which are conducted on three-year cycles—were positive and demonstrated the robust nature of the cross-functional internal compliance program of the AESO.

Aligning price signals through tariff modernization

Following in-depth analysis and substantial engagement, we submitted our Bulk and Regional Rate Design and Modernized Demand Opportunity Service Rate Design application to the Alberta Utilities Commission in 2021. The AESO's objective with these proposals is to ensure that customers pay the costs that reflect their use of the transmission system, which is particularly important as the interconnected electric system evolves to encompass new uses and technologies.

This is the AESO's first modular tariff filing, and this agile and adaptable filing approach will continue to be used going forward.



Energizing People & Culture

Cultivating talent and expertise to lead transformative change

The AESO actively leverages the ideas, unique experiences and backgrounds of its employees. Our talented team of professionals has diverse skill sets with expertise in a broad range of disciplines. In 2021, educational and virtual networking opportunities—designed and implemented by AESO employees—ranged from sharing economic theories to exposing the challenges and skill sets needed to operate Alberta’s complex grid. A few examples of this cross-functional engagement and knowledge sharing include an Analytics Center of Excellence, Economic Efficiency Forum, and System Controller 101 virtual seminars.

These internal forums, and the dialogue and problem-solving they encourage within and across teams, are critical for addressing the complex issues facing our industry. They are fundamental to supporting our strategy and in 2021, they had the added benefit of helping employees maintain a sense of community while working virtually.

Enhancing the AESO’s reputation as an employer of choice

The AESO has been working to foster an inclusive workplace where employees feel they belong and can thrive. Our Inclusion, Equity & Diversity (IE&D) Program and Employee Resource Groups (ERGs) play a key role in advancing our workplace culture. In 2021, the AESO surveyed employees to better understand how the organization can continue to shape meaningful experiences, foster an inclusive culture, understand the diverse identities of the employee population, and strive to be an employer of choice.

Employee responses helped to identify areas of focus to integrate into IE&D initiatives, recognize ways to best address any systemic barriers that prevent equity and equality, and develop metrics and measure progress on IE&D initiatives.

Examples of IE&D initiatives launched in 2021 include the AESO’s first Pride at Work event, courses such as LGBTQS+ 101 and Indigenous awareness, and recognition of the National Day for Truth & Reconciliation.

The AESO also continues to support ERGs, such as Amp It Up, whose vision is “Amplifying Women’s careers at the AESO through the Power of Connection.” In 2021, in recognition of Women in Engineering Day, the group hosted a panel discussion with leaders, including their experiences and opinions on how women in science, technology, engineering and mathematics (STEM) fields can build highly successful careers in STEM disciplines.

LOOKING FORWARD

As the move to reduce global emissions across all sectors continues to gain momentum, the AESO recognizes the need to be at the forefront of understanding the potential pathways and implications of a net-zero grid on the future of Alberta. The move to decarbonize generation in conjunction with the electrification of transportation and other sectors is creating substantial and rapid change across the electricity value chain, from production to consumption.

The key to moving Alberta to a net-zero grid of the future—doing so in a structured manner that maintains reliability and has the lowest-cost impact on consumers—is to first understand the potential pathways and implications of this transition. The AESO is committed to working with industry and other stakeholders to conduct a timely and detailed analysis. It is anticipated the *AESO Net-Zero Emissions Electricity System Pathways* report will be published in June 2022.

In 2022, the AESO will continue to play a leadership role in enabling industry transformation. Key focus areas include reducing red tape and regulatory burden for industry, improving stakeholder engagement on the Budget Review Process, implementing Energy Storage and DER Roadmaps, increasing flexibility in the application of technology alternatives, and executing a modern data management platform for business intelligence and analytics.

Other priorities include continuing with the next phases of tariff modernization to ensure appropriate price signals for use of the transmission system and sustaining system reliability as the generation fleet and the industry more broadly transform.



2021 YEAR IN REVIEW

Electricity in Alberta

PROVINCIAL ELECTRICITY DEMAND



85,214 GWh

▲ 2.8% increase from 2020

QUALIFIED GENERATING ASSETS



426

▲ increase of 36 units from 2020

TOTAL GENERATION CAPACITY



17,224 MW

▲ 5.9% increase from 2020

AVERAGE POOL PRICE



\$101.93 MWh

▲ 118% increase from 2020



SUMMER PEAK DEMAND 11,721 MW



WINTER (NEW ALL-TIME) PEAK DEMAND 11,939 MW

INSTALLED CAPACITY 2021

