



Alberta
Innovates
Energy and
Environment Solutions

Annual Report

2015-16

Alberta 

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AI-EES Vision

Alberta leads the world in developing innovative energy and environmental technologies building on our natural advantages to achieve a socially responsible, diversified and prosperous economy.

Mission

To increase Alberta’s capacity to develop, adapt and commercialize innovative technologies that maximize the value of the province’s natural and renewable resources while protecting the environment and Alberta’s water resources.

Values

Innovation – Entrepreneurship – Leadership – Collaboration – Trust – Respect

EXECUTIVE SUMMARY

Alberta Innovates – Energy and Environment Solutions (AI-EES) aims to strengthen Alberta’s research and innovation capacity. Our core business is to position Alberta to achieve superior environmental performance while supporting the growth and diversification of the provincial economy. In 2015-16, our 2030 targets were focused on three areas:

- **Greenhouse gas (GHG) reductions:** to be achieved through energy efficiency improvements, deploying low cost CO₂ capture technologies, increasing renewable and low carbon emitting electrical generation options, and through our technical support of CCEMC activities
- **Production and value-added:** to be achieved through improved extraction and upgrading to increase the value of bitumen, and by concentrating on game-changing waste to bio-fuels initiatives
- **Water and land:** to be achieved through the restoration and reclamation of habitat disturbed by resource development, and by providing the knowledge and innovation to achieve the goals of Alberta’s *Water for Life* Strategy.

Positioning for the future

Technological innovation is critical to overcoming the market challenges, managing the risks and growing Alberta’s and Canada’s leadership in energy, climate change and environment. Significant dollars are being invested annually by industry and government on environmental monitoring, research, development, and technology deployment mostly associated with current technologies. There is a need, however, to accelerate the pace of development, and especially focus efforts on new transformational technologies.

As the lead agency for energy and environmental innovation in Alberta, the Corporation develops the right partnerships to deliver on its mandate. Over 90 per cent of AI-EES projects (including those in universities) have industry partners. AI-EES’ funding leverage is at least 2.9 to 1 (e.g. AI-EES’ \$87 million investment has led to \$340 million in project funding). The Corporation has a proven history of bringing together decision makers from government and industry, as well as research and technology organizations (including Campus Alberta) to identify and address technology and innovation gaps that can manage external risks and ‘change-the-game’ for Alberta.

It is AI-EES’ role to be steps ahead of emerging issues and it is through relationships and connections with stakeholders, as well as our international technology scouting network, that we are able to identify issues that could impact Alberta’s competitiveness and reputation. AI-EES’ unique business model allows us to partner to develop solutions for the biggest challenges facing Alberta’s energy and environment sectors.

Reporting on Outcomes

Each year, the Corporation evaluates its performance using the five-step ProGrid methodology¹ and reports on established outcomes and performance measures. This methodology provides a way to measure assets that do not necessarily show up on a balance sheet -- the Corporation’s strategic approach, the effectiveness of staff and the management systems, effectiveness of partnerships and our ability to influence directions, and the outcomes relative to the defined targets. The 2015-16 results show a small change from the prior year (R value moved from

¹ Bowman, C. W. (Clem), “Intangibles, Exploring the full Depth of Issues”, Chapter 23, 2005 published by Grafiks Marketing and Communications, Sarnia, Ontario, Canada

57.63 to 61.12). It is expected that as we come closer to our targets, new investments would be required to pilot and demonstrate technology at near commercial scale. The funds to invest in reducing the risk of deployment in large scale projects are not yet available.

In its three operating areas AI-EES fine-tuned its major and minor areas of focus based on the ever-changing challenges facing the province and Alberta Government priorities in energy and environment. Results across these areas continue to be solid:

- **Energy Technologies** held its position for the past several years. The small changes each year are due to factors such as the declining ability of companies in the energy sector to fund technology development and demonstration due to the low commodity price environment and severe cash constraints. This has resulted in challenges moving investments to commercialization, and reaching Energy Technologies' 2030 goals. With low oil prices over the last year, and continued low forecasts, companies and government will be challenged to find sufficient funds for the significant investments required to advance technology.
 - In 2015-16, the Corporation signed a Memorandum of Understanding with Natural Resources Canada to fund national programs in the areas of partial upgrading, non-aqueous extraction, and pipeline transportation.
- **Renewables and Emerging Technologies** strengthened its management capacity and its response to enable renewable energy through energy storage technologies. Its waste-to-value added program made the most impact in 2015-16. The change in government and the increased emphasis on renewable energy has resulted in additional financial resources for this group.
- **Water and Environmental Management** further established AI-EES as a leading agency in developing knowledge and innovation to support Alberta's *Water for Life* strategy. Investments in integrated Land Management and Tailings Management have led to advances in fundamental understanding, monitoring methods, and reclamation technologies, all of which contributed to informing policy development. In GHG management, novel technologies are advancing to the pilot stage to reduce carbon capture costs by 50 per cent.

2015-16 program investment by strategic area

- In 2015-16, AI-EES invested \$12.5 million in 81 research projects aligned to meet the goals for cleaner hydrocarbons and renewable energy, reduced greenhouse gas (GHG) emissions, and advancing the management of tailings and sustainable water initiatives.
 - **Energy Technologies:** \$4.8 million (39 per cent of total) in 25 projects
 - **Renewables and Emerging Technologies:** \$2.5 million (30 per cent of total) in 14 projects
 - **Water and Environmental Management:** \$5.2 million (41 per cent of total) in 42 projects (this includes projects from the Water and Tailings and Alberta Water Research Initiative restricted funds).
- The total value of these projects over their lifetime is approximately \$340 million, of which AI-EES provided \$87 million. This is an approximate leverage factor of 2.9.

Supporting CCEMC and the reduction of GHG emissions

AI-EES provided technical counsel, project adjudication and project management for the Climate Change and Emissions Management Corporation (CCEMC) within a portfolio of 85 projects (valued at over \$2.2 billion and a CCEMC commitment of \$332.5 million). The CCEMC projects cover the entire innovation chain with the greenhouse gas emission reduction conservatively estimated at over 11 megatonnes (Mt) by 2020.

Thought leadership

In 2015-16, AI-EES staff continued its contribution to global thought leadership – as they were called upon to deliver more than 50 presentations on topics ranging from reducing GHG's emissions in the oil sands to increasing the competitiveness of our energy resources to advancing environmental performance through our Water Innovation Program.

Communications

AI-EES' continues to raise awareness of its priorities and outcomes as part of Alberta's innovation system. Through communications efforts, AI-EES aims to be seen as the credible energy and environment expert when it comes to the development and implementation of innovation and technology strategies that will lead to maximizing Alberta's resource advantage, reducing GHG emissions and promoting exceptional water management practices. In 2015-16, AI-EES achieved 100 per cent satisfaction scores for several stakeholder outreach activities, with key audiences affirming outreach sparked ideas for collaboration and increased understanding of AI-EES' programs and impacts.

Internal communication efforts are focused on ensuring the AI-EES team is highly engaged in delivering on the vision and goals of the organization. In 2014-15, AI-EES' overall employee engagement score was over 90 per cent.

Knowledge transfer

Knowledge management practices ensure project outcomes achieve the maximum uptake and translate into changes in industry practice. In 2015-16, AI-EES realized knowledge transfer results that influenced policy and regulatory framework development and decisions. The Technology Informing Policy committee, hosted by AI-EES, has been an effective mechanism for knowledge transfer within the Government of Alberta. This collaboration with sector-related ministries has shared in over 56 project outcomes that either informed policy development or addressed barriers required for technology deployment.

ACCOUNTABILITY STATEMENT

Alberta Innovates – Energy and Environment Solutions’ annual report for the year ended March 31, 2016, was prepared under the Board’s direction in accordance with the Alberta Research and Innovation Regulation, and the ministerial guidelines established pursuant to the *Alberta Public Agencies Governance Act* (APAGA) – proclaimed June 12, 2013 and the *Fiscal Planning and Transparency Act* – proclaimed December 11, 2015. All material economic, environmental, or fiscal implications of which we are aware have been considered in the preparation of this report.

Original signed by

Judy Fairburn, Chair of the Board

May 31, 2016

MESSAGE FROM THE BOARD CHAIR

The gains made this year by the four Alberta Innovates corporations—Energy and Environment Solutions, Bio Solutions, Health Solutions, and Technology Futures—help lay the foundation for future evolution within Alberta’s research and innovation system, and will be carried forward and further refined as our system continues to mature.

A sampling of the past year’s successes among the four corporations showcases our existing strengths and the potential to build on those strengths through the integrated approach that a single organization will enable - not only with each other but with many partners in the broader research and innovation system.

- Alberta Innovates Technology Futures has begun staged implementation of measuring outcomes generated by the funding support it provides to technology-based entrepreneurs and small business owners. For every dollar AITF invests, business owners raised another \$9.50 from other investors, and grew net revenues by \$4.50. Of the 157 AITF supported companies, 53% exported their products, compared to 10 % of similarly sized Canadian companies.
- Alberta Innovates – Health Solutions and Alberta Innovates – Technology Futures, in partnership with Economic Development and Trade, launched a 4 million dollar funding initiative to build, test and validate innovative technologies from local entrepreneurs in real world settings in the province. Under the health portion of the initiative, Alberta Health Services’ Diabetes, Obesity and Nutrition Strategic Clinical Network was funded to test two products in the health system, a bandage to heal diabetic ulcers and a shoe insole to sense foot pressure to prevent diabetic ulcers from forming. Foot ulceration affects 15 to 20% of people with diabetes at some point in their lives and is a leading cause of amputations. Early detection and new treatment promises to improve their health and wellbeing.
- Alberta Innovates Bio Solutions and Alberta Innovates Technology Futures have a partnership to fund researchers who use wood-based cellulose nanocrystals to create advanced materials for the fields of energy, health, industrial coatings, electronics and the environment. These advanced materials are biodegradable, non-toxic and robust. A recent applied research funding program, Cellulose Nanocrystals (CNC) Challenge 2.0 competition, launched by the partners aims to develop applications for CNC with commercialization potential. One of the eight successful applicants will use the \$25,000 and 1 kilogram of material to explore CNC’s suitability in the manufacturing of artificial heart valves. Other funding recipients will investigate the use of CNC for the treatment of wounds.
- In October 2015, Edmonton’s Advanced Energy Research Facility (AERF) was named one of the Clean50 - Top15 Projects for 2016. Alberta Innovates -- Energy and Environment Solutions (AIEES) partnered with the City of Edmonton to introduce and manage this facility. In 2015, eight organizations were at AERF testing feedstocks for gasification and production of clean biofuels and value-added products. AERF is associated with the Enerkem Waste to Biofuels and Chemicals plant, established through an AIEES, City of Edmonton and Enerkem partnership, which aims to process 90% of Edmonton’s residential waste into clean biofuels such as methanol and ethanol by next year. This will help Edmonton become an energy sustainable city and contributes to Alberta’s Climate Leadership Plan.

I am honored to serve as the Chair of the Board of Directors that oversees all four of the Alberta Innovates corporations. The four corporations are entering a new era as we embark on consolidating into one entity. Guided by Alberta's priorities, we are committed to evolving Alberta's research and innovation system to be more focused on outcomes and responsive. We will build on Alberta's strengths, creating a more diversified economy and delivering value for money while advancing our environmental and social well-being. We are motivated to enable researchers and innovators to accelerate their good ideas into impactful application and job growth.

As Chair, my responsibility is to ensure a strong strategic direction and demonstrable outcomes. It will be critical to ensure that consolidation into the single Alberta Innovates corporation is successfully accomplished by Management - a catalyst for the future economic prosperity of Alberta. Transparent, accountable and effective governance of the corporations is also essential, as detailed in this Annual Report.

As a single, strengthened Alberta Innovates, we'll have the ability to capitalize on the knowledge, experience and brain power of our staff. We'll employ cross-sectoral approaches to big challenges, offer integrated services and supports that are easy to understand and access, forge increased partnerships and deploy a strengthened research base. Regular reporting on the outcomes achieved by the corporation will be a priority.

Thank you to the staff of all four corporations for their contributions over the past year. Their efforts in leveraging relationships with industry, entrepreneurs, academia and government have enabled us to continue to offer valuable services to advance a diverse and resilient economy. This will remain critical as we transition to the future.

I would also like to recognize and thank the outgoing board members of all four corporations. Their dedication and leadership have been invaluable in establishing a strong foundation for achieving the goals we set for the new Alberta Innovates.

Original signed by

Judy Fairburn, MSc, MBA
Chair, Board of Directors

PERFORMANCE MEASURES

REPORTING ON RESULTS

Long Term Tracking of AI-EES Performance

AI-EES uses the ProGrid™ method for measuring achievement of its long term targets. The table below and corresponding chart show that AI-EES is making steady progress toward reaching its 2030 targets, which are aligned to provincial priorities.

This methodology provides a way to measure assets that do not necessarily show up on a balance sheet—the Corporation’s strategic approach, the effectiveness of staff and management systems, effectiveness of partnerships, the Corporation’s ability to influence directions, and the outcomes relative to the defined targets. In 2015-16, AI-EES fine-tuned its major and minor areas of focus based on the shift in challenges facing the province. Results across these areas continued to be solid in 2015-16:

- **Energy Technologies** held its position for the past several years. The small changes each year are due to factors such as the declining ability of companies in the energy sector to fund technology development due to the low commodity price environment and severe cash constraints. This has resulted in challenges moving investments to commercialization, and reaching Energy Technologies’ 2030 goals. With low oil prices over the last year, and continued low forecasts, companies and government will be challenged to find sufficient funds for the significant investments required to advance technology.
- **Renewables and Emerging Technologies** strengthened its management capacity and its response to enable renewable energy through energy storage technologies. Its waste-to-value added program made the most impact in 2015-16. The change in government and the increased emphasis on renewable energy has resulted in additional financial resources for this group.
- **Water and Environmental Management** further established AI-EES as a leading agency in developing knowledge and innovation to support Alberta’s *Water for Life* strategy. Investments in integrated Land Management and Tailings Management have led to advances in fundamental understanding, monitoring methods, and reclamation technologies, all of which contributed to informing policy development. In GHG management, novel technologies are advancing to the pilot stage to reduce carbon capture costs by 50 per cent.

Level 0 Evaluation (evaluator average):

	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16 actual	2016-17 to 2018-19 Targets	2019-20 Target	2029-30 Target
R-Value ¹	38.09	46.26	47.59	56.86	57.63	61.12	62 ²	67.00	100.00
X	3.03	4.63	4.07	5.33	5.50	5.68		6.70	10
Y	4.45	4.62	5.55	6.07	6.04	6.60		6.70	10

1. The R value is derived from the input of senior management in assessing several criteria that affect AI-EES’ performance.
2. The Government’s 2016-17 funding reduction to AI-EES and continued low oil prices will significantly impact the pilot and field demonstrations required to advance the score.

Attaining an R Value of 67 would indicate that several of AI-EES' initiatives over the years have been demonstrated in the field and are close to widespread adoption and commercialization. AI-EES recognizes the difficulty in attaining this level without greater investments of time and money. For example, to reach the 2030 target of "20 per cent of in situ production is partially upgraded to improve quality and reduce the diluents required for transportation of bitumen products," AI-EES and its industry partners should be investing up to \$500 million over the next five years to demonstrate the technologies at commercial scale. Commercial plants will have to be built and produce approximately 500,000 bbls per day of partially upgraded bitumen by 2030.

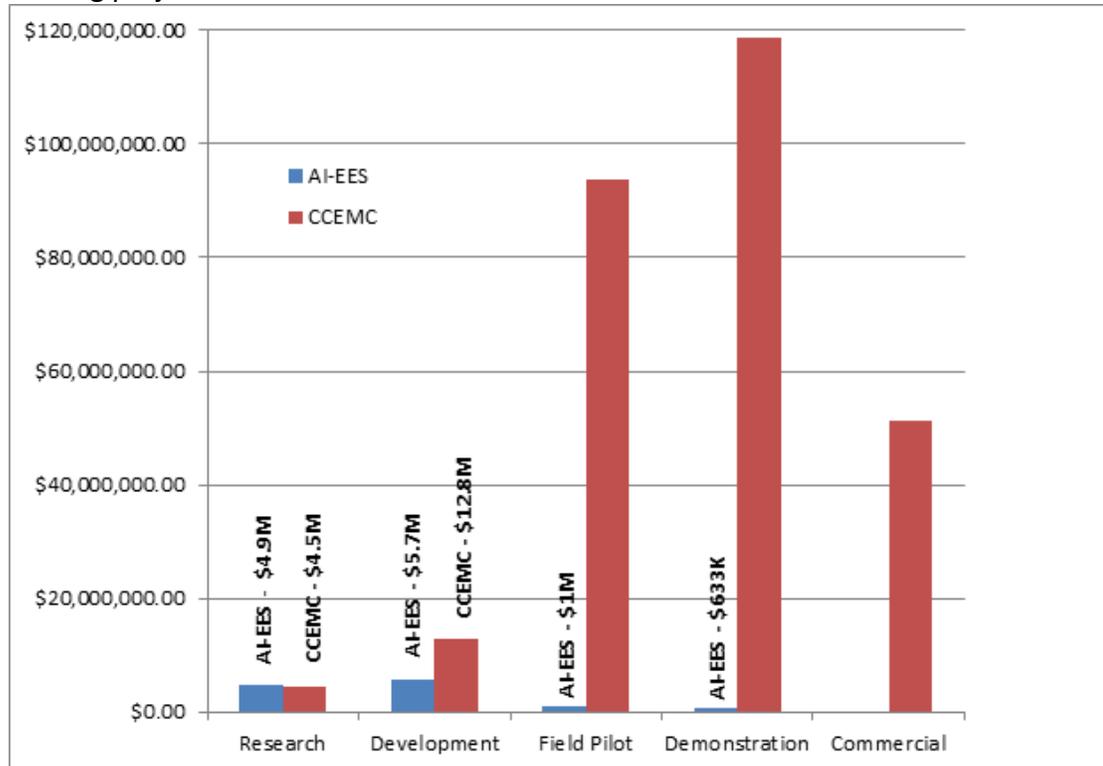
Technology development is a long-term process. In a paper presented to the Canadian Senate, AI-EES showed estimates that it takes over 20 years to go from idea to field test in the exploration and production industry.²

Accelerating commercialization | Technology Readiness Levels

Goal Statement: AI-EES invests in a portfolio of projects along the Technology Readiness Levels (TRL) scale.

Technology readiness levels are used to show that AI-EES is moving technologies towards commercial implementation. In terms of dollar value, in 2015-16, AI-EES invested more in the Development stage than last year, while the number of projects was consistent. In all other stages, AI-EES invested less in 2015-16 than in prior years. This is partly due to a decrease in overall research investments in 2015-16. In the low commodity price environment, our key industry partners—namely the oil sands industry—have severe cash constraints and a limited ability to fund technology development and demonstration.

Significant investments are required for field pilots and demonstration projects, especially in Energy Technologies. AI-EES continues to partner with CCEMC to ensure that the funds for pilots are available and moving projects toward commercialization.



This chart shows AI-EES financial 2015-16 investments in each stage of technology readiness.

² AI-EES submissions to Senate Dec 1, 2011. Graph and data were developed by McKinsey and provided to AI-EES by the Petroleum Technology Alliance of Canada

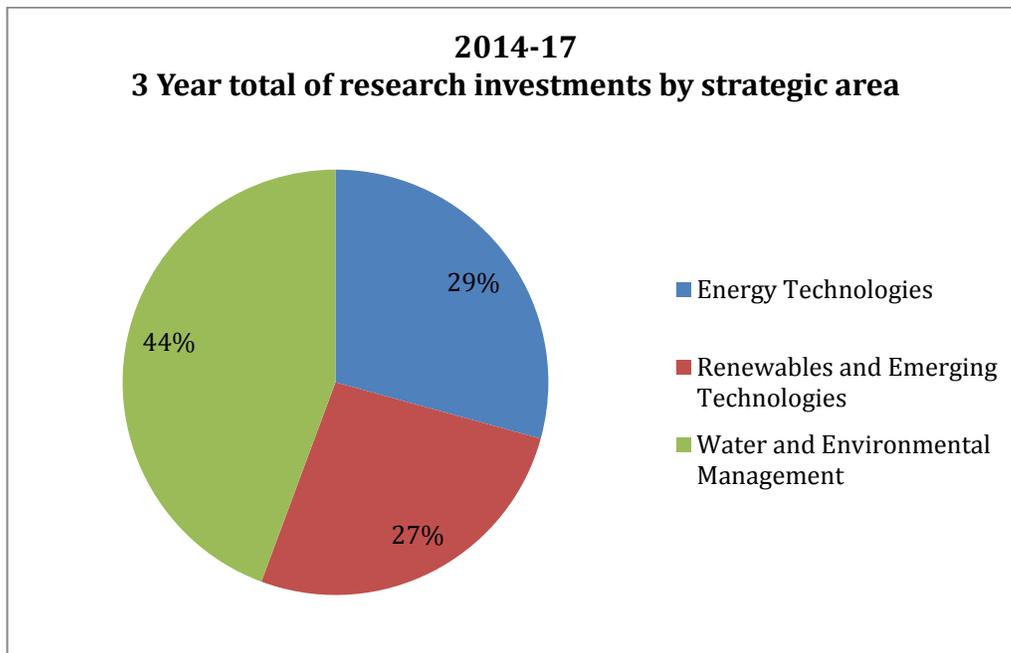
As of March 31, 2016, the 81 active projects in the AI-EES portfolio were analyzed and placed on the simplified TRL scale of research, development, pilot, demonstration, and commercialization. AI-EES, as the project manager for projects of the CCEMC, also tracks the 73 active projects in the CCEMC portfolio.

The chart shows a balanced portfolio with AI-EES projects mostly at the earlier stages of development and CCEMC projects toward the commercialization end. Some projects originally developed with AI-EES and that fit the CCEMC mandate, have transitioned to being funded by the CCEMC to see them through the more expensive stages of pilot and demonstration.

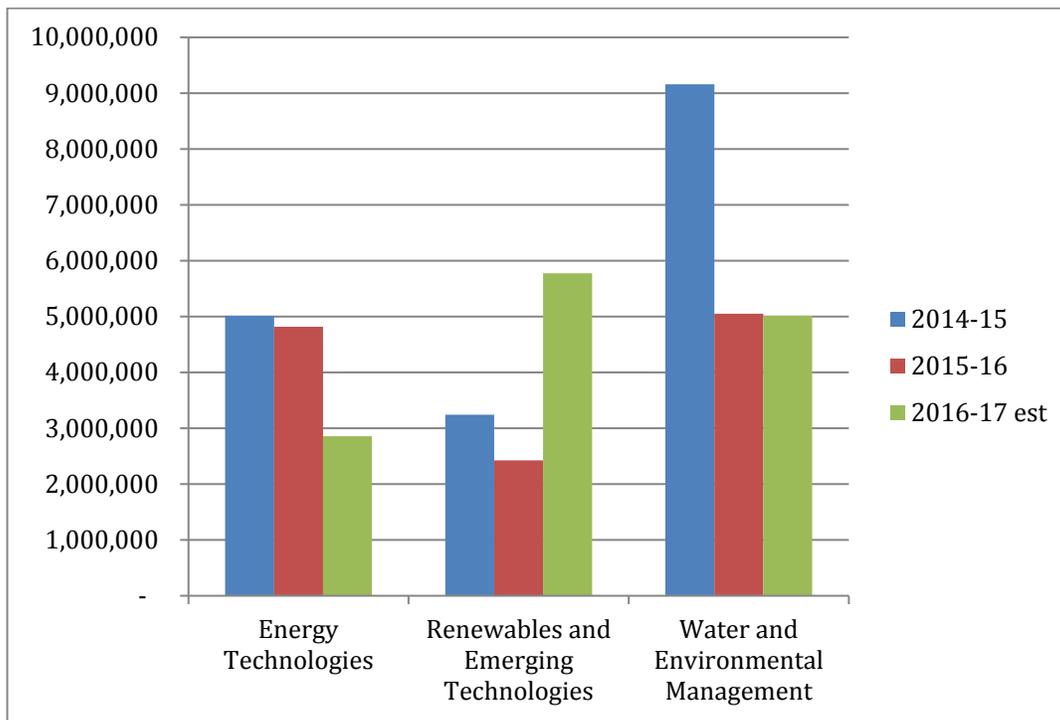
Maintaining a Balanced Portfolio

Goal Statement: AI-EES maintains a balanced portfolio of projects in its three strategic areas.

The pie chart below shows that AI-EES has maintained the balance in its portfolio compared to a year ago. More funds are spent in Energy Technologies and Renewables and Emerging Resources than in prior years.



The figure on the following page shows that investments in Energy Technologies will be reduced in future years, in part due to a reduced overall budget and to reflect government priorities in renewable energy and environmental issues.



2015-16 program investment by strategic area

- In 2015-16, AI-EES invested \$12.5 million in 81 research projects aligned to meet the goals for cleaner hydrocarbons and renewable energy, reduced greenhouse gas (GHG) emissions, and advancing the management of tailings and sustainable water initiatives.
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- The total value of these projects over their lifetime is approximately \$340 million, of which AI-EES provided \$87 million. This is an approximate leverage factor of 2.9.

Energy technologies | Highlights in 2015-16

Bitumen Value-Added

- Completed Phase 2 of the Oil Sands Competitiveness study with participation by the governments of Alberta and Saskatchewan and six companies. The study concluded that partially upgraded bitumen (PUB) will increase the overall value of Athabasca bitumen and that PUB products will be broadly accepted in the global crude oil markets. The most attractive markets are refineries in China, the U.S. Gulf Coast, and Europe. Partially upgraded bitumen mitigates pipeline access to North American markets by reducing diluent requirements, but the need for additional high-capacity access to tidewater is necessary to reach other valuable markets.
- Initiated two additional phases of the Oil Sands Competitiveness study:
 - Phase 3 will determine the market for partially upgraded bitumen in refineries in Eastern Canada.

- Phase 4 will estimate the GHG emission impact of refining partially upgraded bitumen.
- Signed a Letter of Understanding with Natural Resources Canada to establish the development and joint funding of a bilateral strategic environmental and energy research program. This collaborative program will address issues in a number of areas important to Alberta and Canada, including partial upgrading, Under the National Partial Upgrading Program (NPUP), AI-EES:
 - Completed a white paper that reviewed the state of partial upgrading to identify technology gaps that need to be addressed through research and development. The results have been used to provide strategic direction to the NPUP.
 - Conducted a workshop to engage industry participants in the direction and funding of the program. A core steering group of 6 companies has been established to advance partial upgrading technology. As a result of the workshop, additional companies are considering participation in the program and a second workshop with potential technology providers is scheduled.
- Supported research projects at CanmetENERGY and Alberta universities to build a platform for future partial upgrading technologies through industrial chairs in bitumen upgrading and petroleum thermodynamics.
- Continued to support the Institute for Oil Sands Innovation (IOSI) at the University of Alberta. IOSI conducts proof-of-concept research focused on bitumen upgrading and characterization, non-aqueous extraction technologies, tailings process fundamentals, and online instrumentation for oil sands.
- Managed, on behalf of CCEMC, two multimillion dollar/multiyear pilot projects of partial upgrading technology. Other projects managed on behalf of CCEMC included piloting a low cost oxy-fuel technology to capture CO₂ from a once-through steam generator for in situ oil sands extraction, and converting waste CO₂ into high value products such as Dimethyl Carbonate.
- Completed a project examining the efficacy of visbreaking of bitumen using acidic compounds to improve its quality. The project tested several acids but the results indicated little or no benefit for partial upgrading. This line of research has been discontinued.

Advanced Recovery

- Managed, on behalf of CCEMC, three multimillion dollar/multiyear demonstration projects involving pilots applying solvents and electrical heating to recover in-situ bitumen.
- Supported research projects at universities to build a platform for next generation recovery technologies through industrial research chairs in oil sands engineering, reservoir geomechanics, reservoir simulation, and petroleum microbiology. A novel process developed through the Oil Sands Engineering Chair, the Hybrid Bitumen Extraction Process (HBEP), is being piloted at CanmetENERGY in Devon.
- Initiated a project to determine the behavior of hydrocarbons in nanochannels and improve understanding of transport in shales.
- Continued to support enhancing oil sands operations through the AITF AACI program.

Natural Gas Value Add

- Completed the second phase of a study regarding new modular gas-to-liquid (GTL) technologies to convert low value natural gas to high value products. The Ministries of Energy and Economic Development and Trade also participated. Based on preliminary technical and economic feasibility, the study concluded that there are several promising technologies at or close to the demonstration stage.
- The CarbonSaver Technology pilot to produce hydrogen directly from natural gas was terminated due to financial difficulties for the developer.

Waste-to-Value-Added

- The Enerkem Alberta Biofuels commercial facility initiated the production of bio-methanol from municipal solid waste in Edmonton. A \$40 million ethanol module is being added and ethanol production is expected to begin in 2017. AI-EES' collaboration in this facility dates back to 2004.
- Hosted a biogas stakeholder workshop to identify barriers that hinder the development of biogas industry in Alberta. A key outcome was the development of a White Paper to identify an action plan to promote the biogas industry.
- To address information gaps for converting waste into valuable products:
 - Completed an Alberta Biowaste Inventory Study that identified opportunities for establishing waste-to-value-added facilities in rural communities.
 - In collaboration with the Tri-region (Parkland County, City of Spruce Grove and Town of Stony Plain), completed a front-end engineering design study working toward the construction of a showcase facility for converting municipal solid waste (MSW) into valuable products in small urban communities.
 - An assessment of the feasibility of establishing a waste conversion facility in the St. Paul region. This study also included the assessment of the amount of MSW generated in the province through the development of GIS maps. It will be used to identify optimal locations for building waste conversion facilities across Alberta.
 - Collaborated with the Town of St. Paul and its partners on a front-end engineering design study working toward the construction of a showcase facility for converting municipal solid waste (MSW) into valuable products in small rural communities.
 - Supported a University of Calgary feasibility study of using biogas to enhance liquid fuel production through advanced pyrolysis. This project addresses the technology gap for converting dry organic materials from MSW into valuable products.
- Collaborated with Alberta Environment and Parks to develop scientific information for the greenhouse gas (GHG) generation potential of landfilled wastes. This work will allow the Government to refine its landfill gas GHG quantification protocol.

Clean Power

- A CO₂-enhanced geothermal study was completed at the University of Alberta to investigate the feasibility of using carbon dioxide as a working fluid for recovering energy from our deep geothermal reservoirs.
- In collaboration with the University of Alberta, City of Hinton, Tri-council of Rocky Mountain House - City of Caroline - Clearwater County, Municipality of Grande Prairie, Municipality of Greenview and the City of Grand Prairie, a deep-dive geothermal reservoir analysis project was initiated to determine commercial development strategies for the top 10 potential geothermal generation reservoirs in Alberta.
- Collaborated with a University of Alberta spinoff company, AdvEn Solutions and Lockheed Martin to accelerate the commercialization of a breakthrough battery storage technology with improved performance and lower electronic devices such as mobile phones.
- Following a \$2 million Call for Proposals titled "Next-Generation Energy Storage Technologies for Accelerating the Deployment of Intermittent Renewable Electricity in Alberta," four novel energy storage projects were awarded and are currently underway.
- Partnered with the CCEMC and SOLAS Energy Consulting to undertake a study, Energy Storage and Renewable Energy in Alberta: An Analysis of Potential Greenhouse Gas Emissions Reductions.

Technology Intelligence & Systems Modelling

- Published a Technology Intelligence Study that identified biological and thermal-based technologies to convert solid organic waste into value-added products at a small rural municipality scale.
- Initiated a Plasma Gasification Technology Intelligence Study to evaluate the feasibility of converting municipal, industrial and hazardous waste into value-added products.
- Initiated a Small Modular Nuclear Reactor (SMNR) Technology Intelligence Study to identify existing and emerging SMNR technologies that are deployable by 2030, and capable of satisfying the needs of end-users in Alberta's oil sands (combined heat and power), electricity market (baseload and non-baseload operation) and remote communities (power, heat and desalinated water production).
- Completed modelling studies on the assessment of energy efficiency improvement options for Alberta's pulp and paper and chemical sectors.
- Completed a comprehensive study on the techno-economic and life cycle assessments of hydrogen production for the oil sands industry from wind power and hydro power.
- Completed a comprehensive study on the techno-economic and life cycle GHG assessments of the liquefied natural gas (LNG) supply chain from Canada to Asia-Pacific (China, Japan and India). Engineering based models were developed to calculate the production cost, transportation cost and GHG footprint of transporting Canadian LNG to these markets.
- Completed a comparative study on the techno-economic assessment of coal-to-liquids (CTL) and gas-to-liquids (GTL) technologies in Alberta.

Water and Environmental Management | Highlights in 2015-16:

Water Management

- Invested in studies in South Saskatchewan River Basin management, source water protection, and water supply as a function of climate variability to ensure a future water supply for a growing population and economy in Alberta.
- The Government of Alberta implements recommendations from the report on Climate Vulnerability and Sustainable Water Management in the South Saskatchewan River Basin, including the signing of a five-year agreement between TransAlta and the Government of Alberta to manage water in reservoirs on the Bow River to help flood mitigation efforts and along the Kananaskis River to help drought mitigation efforts.
- A multidisciplinary project investigating natural and anthropogenic sources of contaminants in the Lower Athabasca River has revealed interesting results that challenge currently held perceptions of water quality in the region. For example, heavy metals such as silver, cadmium and lead were found to be at concentrations far below U.S. EPA Guidelines for the Protection of Aquatic Life, both above-stream and down-stream of industrial development. These metals, along with antimony and thallium, were found at or below the levels normally reported for bottled waters. Concentrations of suspended solids, colloids and organics are currently being determined for surface water and groundwater.
- Improved understanding of urban and rural waste water treatment options, and the by-products of water disinfection processes.
- Research in aquatic ecosystems (rivers, lakes, and wetlands) is providing information for policy development to protect the health of aquatic ecosystems.

- Research on groundwater quality baselines, recharge rates, and contamination by arsenic, pesticides and pathogens research is leading to the protection of groundwater quality and sustainable use of groundwater resource.
- Investments in irrigation demand models, technologies to recycle water in SAGD oil sands facilities, and the treatment of process water from mining operations are placing water use conservation, efficiency, and productivity (CEP) improvements on track to achieve the target of 30 per cent increase in CEP.
- Three technologies are being demonstrated in the field aimed at reducing the energy requirements for water recycling at thermal in-situ oil sands facilities, while maintaining or increasing water recycle rates, in support of water use efficiency and GHG reduction targets. Invested in a number of water treatment projects.
- In 2015-16, AI-EES received a five-year \$25 million grant to support activities that address knowledge and technology gaps in support of the *Water for Life Strategy*. A funding opportunity was announced in 2015-16 that will support new projects in four key investment areas: water supply and watershed management; healthy aquatic ecosystems; water use and efficiency; and water quality protection. AI-EES also initiated a partnership with Sustainable Development Technology Canada (SDTC), that will lead to co-investment in water technology projects worth more than \$12 million in 2016-17.

Knowledge transfer and education initiatives

- Sponsored Navigate 2016, a youth water summit organized by Inside Education. Navigate brings together youth from across the province to learn about water issues. Students develop projects that they take back to their schools and communities to help improve water use and water quality.
- Sponsored EnviroAnalysis, which was held for the first time in western Canada. This semi-annual conference responds to a perceived lack of attention to the critical importance of chemical analysis and monitoring in environmental research. AITF and AI-EES received the EnviroAnalysis Founders' awards in recognition of their contributions and support of environmental education, communication and technology transfer activities at the 2015 event.
- Co-sponsored with COSIA a water conference in Calgary, in March 2016. Four-hundred delegates attended this event enabling industry, researchers, governments, and the service, supply and technology sectors to advance technology research, development and deployment aimed at environmental performance improvement for water management in the oil sands.

Land Restoration

- Built a portfolio of projects to enhance the scientific understanding and development of best practices in managing atmospheric deposition, wetlands, land disturbance, ecosystem health, biodiversity conservation, environmental monitoring, and restoration ecology.
- Supported new research that shows atmospheric deposition rates of metals and polycyclic aromatic hydrocarbons (potential carcinogen) in north-eastern Alberta seem to be comparable to levels detected in reference and rural settings elsewhere in the world, and are lower than previously reported for the Athabasca oil sands region, with the exception that deposition rates do increase with proximity to the oil sands mines and upgraders. This critical research has identified that dust is the major source of metals in the region and that stockpiles of delayed coke associated with two of the three upgraders are the major

source of PAHs. With this knowledge, mitigation efforts can now be identified to reduce potential contamination by metals (dust management) or PAHs (coke stockpile management).

- Supported the Alberta Biodiversity Conservation Chair research program, which continues to provide new insights into patterns and abundance of species in Alberta as well as their responses to industrial disturbance and restoration.
- Supported the University of Alberta's work on linear corridor restoration at multiple spatial scales, which has resulted in regional planning tools now in use by government to understand and prioritize footprints where restoration activities are most likely to result in meeting desired land use objectives (e.g., caribou habitat restoration).

Tailings Management

- Technologies such as in-line dewatering and electro kinetic settling are being demonstrated to reduce and minimize the generation of mature fine tailings. These studies were completed at the research pilot stage and will be moving to actual field demonstrations in the next two years. The electro kinetic tailings reclamation Phase 2 results were so successful, that the industry partner will sponsor a field demonstration on their oil sands lease in an actual tailings pond. AI-EES has approved participation in this Phase 3 field demonstration slated to begin in early 2016.
- Both AI-EES and the COSIA industry partners committed to support for another five-year term a NSERC industry research chair to treat tailings water for safe release into the environment. The extended program will take on a much more "applied" focus of the best treatment technologies with potential field trials on an oil sands lease.
- Initiated a project with an industry partner to test the performance of a new ceramic Titania membrane that is touted to better capture solids, organics and some salts in oil sands tailings, all in support of more effective tailings management.

GHG Management

- Through AI-EES and CCEMC, nine carbon capture technologies are being developed that offer the potential to reduce carbon capture costs. Five of the technologies are being tested at a field pilot stage and others at laboratory development stages.
- Through CCEMC funding, AI-EES assisted technology deployment to reduce fugitive emissions in natural gas production and improve energy efficiency. In total, emission reduction of more than 100,000 t/yr CO₂e were achieved.
- Since 2012, AI-EES, in partnership with COSIA and other oil sands companies, evaluated the feasibility of using molten carbonate fuel cells (MCFC) for carbon capture at oil sands facilities. Two feasibility studies were completed (2013 and 2015) that indicated MCFCs have the potential for low cost carbon capture and integrate well with thermal in-situ oil sand facilities. AI-EES has undertaken a major initiative for a megawatt-scale pre-FEED study to further understand the cost of using MCFC for carbon capture at oil sands facilities. Our leadership has brought seven oil sands companies to participate in the study at two oil sands facilities. Positive results will likely lead to a field demonstration of the technology.
- Continued to support the Canadian Centre for Clean Coal/Carbon and Mineral Processing Technology (C5MPT) located at the University of Alberta. The Centre conducts fundamental research in four theme areas: clean coal/carbon, CO₂ storage, mineral processing, and hydrocarbon processing.

MANAGEMENT'S DISCUSSION AND ANALYSIS

Revenue Variances

AI-EES actual revenue was \$4.7 million lower in 2015-16, partly due to a reduction in revenue recognized from grants from the government of Alberta, as well as reduced revenue from other sources such as license fees, CCEMC, and industry participation in research. The reduction in revenue recognized was due to reduced activity in the water programs.

Revenue received from the CCEMC for project management and adjudication services was lower than budgeted and lower than prior years. CCEMC reduced its activity in 2015-16, and as a result, our services were not required to the degree we anticipated.

Expenditure Variances

Technical Support Services:

Technical Support Services was lower in 2015-16, than in 2014-15, primarily due to the reduced demand from CCEMC. For the same reason, the actuals are lower than budgeted.

Research:

AI-EES' 2015-16, research budget includes all projects, whether they are fee for service contracts or research grants and contributions.

Expenditures in research were lower than budget in 2015-16. In Energy Technologies, one project budgeted for \$1.2 million was cancelled. There were five more active projects than were budgeted for, but the average cost of all projects was down. In Renewables and Emerging Technologies, the primary reason for the reduction from budget was due to a delay in final commissioning at the Edmonton Municipal Waste demonstration project. A new test facility for emerging technologies was also delayed by the industry partner partly due to the reduced oil prices and market downturn. Water and Environmental Management also had a reduction from budget. The \$5 million investment required for the Water Innovation Program was delayed due to timing of the competition launch. A major project in the Water Research Institute experienced delays as well.

Actual expenditures in research in 2015-16 were \$5.2 million lower than the prior year. This can be partially attributed to reduced activity in the oil sands and declining oil prices. In the water programs, there were some projects that had expenditures of greater than \$1 million in 2014-15; but those same projects had smaller payments in the current year. AI-EES makes payments on research projects based on the attainment of milestones. It is common for projects to be delayed, which delays payments, and it is common for payments to fluctuate year to year.

Both the University of Alberta and University of Calgary had reduced funding from AI-EES in 2015-16. Primarily this is due to the fluctuations within projects rather than a general reduction in all projects. The two centres at the University of Alberta had their funding reduced in 2015-16 and will be reduced again in 2016-17 due to an overall reduction the AI-EES budget.

Administration

Administration expenses were relatively stable year over year. AI-EES did reduce expenditures in travel, legal services and development costs for Showcase Innovation Service (SIS). SIS is nearing completion, so costs should continue to decline.

AI-EES exceeded its budget due to severance payments to three employees in anticipation of the alignment of the Alberta Innovates System.

Common Outlook

The recent announcement of the consolidation of the four Alberta Innovates corporations means significant changes will occur for each of the corporations in the coming year. In 2016-17, the single Alberta Innovates corporation will be developing its structure and operations to deliver on its mandate to generate economic, social and health benefits to Alberta. Centralized access to the new corporation's streamlined services, funding and supports will result in greater opportunities to enhance delivery of services, reduce redundancies and redirect resources to underserved areas of Alberta's innovation system.

The impact on our stakeholders, partners and clients of the combined 2016-17 base budget reduction of \$45M for the four Alberta Innovates corporations will be mitigated through various strategies specific to the programs of service, funding and support offered.

MANAGEMENT'S RESPONSIBILITY FOR REPORTING

Alberta Innovates – Energy and Environment Solutions' (AI-EES) management is responsible for the preparation, accuracy, objectivity and integrity of the information contained in the annual report including the financial statements, performance results and supporting management information. Systems of internal control are designed and maintained to produce reliable information that meet reporting requirements, and to ensure that transactions are executed in accordance with all relevant legislation, regulations and policies, reliable financial records are maintained, and assets are properly accounted for and safeguarded. The Annual Report has been approved by the Board of Directors and is prepared in accordance with ministerial guidelines.

The Auditor General of Alberta, the corporation's external auditor appointed under the *Auditor General Act*, performs an annual independent audit of AI-EES' financial statements in accordance with Canadian auditing standards.

Original signed by

John Zhou, Acting CEO

May 31, 2016

Original signed by

Howard Wong, Senior Financial Officer

May 31, 2016

CONSOLIDATED FINANCIAL STATEMENTS

March 31, 2016

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Independent Auditor's Report

To the Board of Directors of Alberta Innovates—Energy and Environment Solutions

Report on the Financial Statements

I have audited the accompanying financial statements of Alberta Innovates—Energy and Environment Solutions, which comprise the statement of financial position as at March 31, 2016, and the statements of operations, change in net financial assets, and cash flows for the year then ended, and a summary of significant accounting policies and other explanatory information.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with Canadian public sector accounting standards, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

My responsibility is to express an opinion on these financial statements based on my audit. I conducted my audit in accordance with Canadian generally accepted auditing standards. Those standards require that I comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

Opinion

In my opinion, the financial statements present fairly, in all material respects, the financial position of Alberta Innovates—Energy and Environment Solutions as at March 31, 2016, and the results of its operations, its remeasurement gains and losses, its changes in net financial assets, and its cash flows for the year then ended in accordance with Canadian public sector accounting standards.

[Original signed by Merwan N. Saher FCPA, FCA]

Auditor General

May 31, 2016

Edmonton, Alberta

ALBERTA INNOVATES - ENERGY AND ENVIRONMENT SOLUTIONS
STATEMENT OF OPERATIONS
FOR THE YEAR ENDED MARCH 31, 2016

	2016		2015
	Budget (Note 3)	Actual	Actual
	<i>(in thousands)</i>		
Revenues			
Government Transfers			
Government of Alberta Grants	\$ 29,468	\$ 20,755	\$ 23,494
Government of Canada Grants	-	40	145
Premiums, Fees, and Licences	-	-	260
Investment Income	447	525	705
Other Income	1,175	1,194	2,623
	<u>31,090</u>	<u>22,514</u>	<u>27,227</u>
Expenses - Directly Incurred (Note 2, Schedules 1 and 4)			
Energy Technologies	6,007	4,819	4,990
Renewable and Emerging Resources	5,764	2,473	3,236
Water and Environmental Management	3,544	1,729	2,618
Water and Tailings Research	3,859	2,797	4,964
Water Innovation Program	5,000	227	-
Alberta Water Research Institute	2,080	432	1,684
Program Administration (Note 9)	4,988	5,177	5,143
Technical Support Services (Note 9)	1,998	1,042	1,239
	<u>33,240</u>	<u>18,696</u>	<u>23,874</u>
Annual Surplus (Deficit)	<u>\$ (2,150)</u>	<u>\$ 3,818</u>	<u>\$ 3,353</u>
Accumulated Surplus, Beginning of year		32,878	29,525
Accumulated Surplus, End of year		<u>\$ 36,696</u>	<u>\$ 32,878</u>

The accompanying notes and schedules are part of these financial statements.

ALBERTA INNOVATES - ENERGY AND ENVIRONMENT SOLUTIONS
STATEMENT OF FINANCIAL POSITION
AS AT MARCH 31, 2016

	2016	2015
	<i>(in thousands)</i>	
Financial Assets		
Cash (Note 4)	\$ 59,089	\$ 55,934
Accounts Receivable	202	957
	59,291	56,891
Liabilities		
Accounts Payable and Accrued Liabilities	837	1,791
Deferred Revenue (Note 6)	21,775	22,252
	22,612	24,043
Net Financial Assets	36,679	32,848
Non-Financial Assets		
Tangible Capital Assets (Note 5)	17	30
Net Assets	36,696	32,878
Net Assets		
Accumulated Surplus	\$ 36,696	\$ 32,878

Contractual Obligations (Note 8)

The accompanying notes and schedules are part of these financial statements.

Approved by the Board of Directors

Original signed by Doug Gilpin

Director

May 31, 2016

Date

Original signed by Judy Fairburn

Director

May 31, 2016

Date

ALBERTA INNOVATES - ENERGY AND ENVIRONMENT SOLUTIONS
STATEMENT OF CHANGE IN NET FINANCIAL ASSETS
FOR THE YEAR ENDED MARCH 31, 2016

		2016	2015
	Budget	Actual	Actual
	<i>(In Thousands)</i>		
Annual Surplus (Deficit)	\$ (2,150)	\$ 3,818	\$ 3,353
Acquisition of Tangible Capital Assets		(5)	-
Amortization of Tangible Capital Assets (Note 5)	16	18	21
Increase in Net Financial Assets in the year		3,831	3,374
Net Financial Assets, Beginning of year		32,848	29,474
Net Financial Assets, End of year		<u>\$ 36,679</u>	<u>\$ 32,848</u>

The accompanying notes and schedules are part of these financial statements.

ALBERTA INNOVATES - ENERGY AND ENVIRONMENT SOLUTIONS
STATEMENT OF CASH FLOWS
FOR THE YEAR ENDED MARCH 31, 2016

	2016	2015
	<i>(in thousands)</i>	
Operating Transactions		
Annual Surplus	\$ 3,818	\$ 3,353
Non-Cash Item:		
Amortization of Tangible Capital Assets (Note 5)	18	21
Deferred Revenue recognized as revenue	(5,992)	(10,136)
	(2,156)	(6,762)
Decrease in Accounts Receivable	755	290
Decrease in Accounts Payable and Accrued Liabilities	(954)	(1,382)
Increase in Deferred Revenue	5,515	9,172
Cash Provided by Operating Transactions	3,160	1,318
Capital Transactions		
Acquisition of Tangible Capital Assets	(5)	-
Cash Applied to Capital Transactions	(5)	-
Increase in Cash	3,155	1,318
Cash, Beginning of Year	55,934	54,616
Cash, End of Year	\$ 59,089	\$ 55,934

The accompanying notes and schedules are part of these financial statements.

ALBERTA INNOVATES – ENERGY AND ENVIRONMENT SOLUTIONS

NOTES TO THE FINANCIAL STATEMENTS

MARCH 31, 2016

NOTE 1 AUTHORITY AND PURPOSE

Alberta Innovates – Energy and Environment Solutions (the Corporation) is a Provincial Corporation, as defined in the *Financial Administration Act*, that was established on January 1, 2010 and operates under the authority of the *Alberta Research and Innovation Act*. The objectives of the Corporation are to support, for the economic and social well-being of Albertans, energy and environment research and innovation activities aligned to meet Government of Alberta priorities, including, without limitation, activities directed at the development and growth of the energy and environment sectors, the discovery of new knowledge and the application of that knowledge.

The Corporation is exempt from income taxes under the *Income Tax Act*.

NOTE 2 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES AND REPORTING PRACTICES

These financial statements are prepared in accordance with Canadian Public Sector Accounting Standards.

a) Basis of Financial Reporting

Revenue

All revenues are reported on the accrual basis of accounting. Cash received for which goods or services have not been provided by year end is recorded as deferred revenue.

Government transfers

Transfers from the Government of Alberta, federal and other governments are referred to as government transfers.

Government transfers and the associated externally restricted investment income are recorded as deferred revenue if the eligibility criteria for use of the transfer, or the stipulations together with the Corporation's actions and communications as to the use of the transfer, create a liability. These transfers are recognized as revenue as the stipulations are met and, when applicable, the Corporation complies with its communicated use of these transfers.

All other government transfers, without stipulations for the use of the transfer, are recorded as revenue when the transfer is authorized and the Corporation meets the eligibility criteria (if any).

Other Revenue

Other revenue includes the reimbursement of expenses from other organizations.

NOTE 2 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES AND REPORTING PRACTICES (Cont'd)

Royalties and licensing fees are recognized as they accrue in accordance with the relevant agreements, when an amount can be reasonably estimated, and there is reasonable assurance of collection.

Investment Income

Investment income is recorded on the accrual basis where there is reasonable assurance as to its measurement and collection. Investment income earned from restricted sources is deferred and recognized when the terms imposed have been met.

Expenses

Expenses are reported on an accrual basis. The cost of all goods consumed and services received during the year are expensed.

Transfers include grants and transfers under shared cost agreements. Grants and transfers are recorded as expenses when the transfer is authorized and eligibility criteria have been met by the recipient.

Incurred by Others

Services contributed by other related entities in support of the Corporation's operations have not been recorded in the financial statements and are disclosed in Schedule 4.

Valuation of Financial Assets and Liabilities

The Corporation's financial assets and liabilities are generally measured as follows:

Financial Statement Component	Measurement
Cash	Cost
Accounts Receivable	Lower of cost or net recoverable value
Accounts Payable and Accrued Liabilities	Cost

The Corporation has no assets or liabilities in the fair value category, has not engaged in foreign currency transactions and has no remeasurement gains or losses. Consequently, no statement of remeasurement gains or loss has been provided.

Financial Assets

Financial assets are the Corporation's financial claims on external organizations and individuals, and inventories for resale at the year end.

Cash

Cash comprises of cash on hand and demand deposits.

SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES AND REPORTING PRACTICES (Cont'd)Accounts Receivable

Accounts receivable are recorded at the lower of costs or net recoverable value. A valuation allowance is recorded when recovery is uncertain

Liabilities

Liabilities represent present obligations of the Corporation to external organizations and individuals arising from transactions or events occurring before the year end. They are recorded when there is an appropriate basis of measurement and management can reasonably estimate the amount.

Non-Financial AssetsTangible Capital Assets

Tangible capital assets of the Corporation are recorded at historical cost and amortized on a straight-line basis over the estimated useful lives of the assets. The threshold for capitalizing new systems development is \$250,000 and the threshold for major systems enhancements is \$100,000. The threshold for all other tangible capital assets is \$5,000.

Tangible capital assets are written down when conditions indicate that they no longer contribute to Corporation's ability to provide goods and services, or when the value of future economic benefits associated with the tangible capital assets are less than their net book value. The net write-downs are accounted for as expenses in the Statement of Operations.

Financial Risk Management

The Corporation is exposed to a variety of financial risks. These financial risks include credit risk, market risk and liquidity risk. Credit risk relates to the possibility that a loss may occur from the failure of another party to perform according to the terms of a contract. Market risk is the risk of loss from unfavorable change in fair value or future cash flows of a financial instrument causing financial loss. Market risk is comprised of currency risk, interest rate risk and price risk, but the corporation is not exposed to any currency or price risk. Liquidity risk is the risk the fund will not be able to meet its obligations as they fall due

1) Credit Risk

Credit risk relates to the possibility that a loss may occur from the failure of another party to perform according to the terms of a contract. The Corporation's accounts receivable are exposed to credit risk. Management manages this risk by continually monitoring the creditworthiness of counterparties and by dealing with counterparties that it believes are creditworthy.

NOTE 2 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES AND REPORTING PRACTICES (Cont'd)

2) **Market Risk**

The Corporation is exposed to interest rate associated with the underlying interest-bearing securities held in the investment funds. Interest rate risk relates to the possibility that the fair value of investments will change due to future fluctuations in market interest rates. The Corporation's cash is exposed to interest rate risk. Management manages this risk by continually monitoring the Corporation's deposits in the Consolidated Cash Investment Trust Fund (CCITF) and their corresponding rate of return.

3) **Liquidity Risk**

Liquidity risk is the risk that the Corporation will not be able to meet its obligations as they fall due. The Corporation's accounts payable and accrued liabilities are exposed to liquidity risk. Management manages this risk by continually monitoring cash flows.

It is management's opinion that the Corporation is not exposed to significant credit risk, market risk and liquidity risk arising from its financial instruments.

Measurement Uncertainty

The measurement of certain assets and liabilities is contingent upon future events; therefore, the preparation of these consolidated financial statements requires the use of estimates, which may vary from actual results. Management uses judgment to determine such estimates. In management's opinion, the resulting estimates are within reasonable limits of materiality and are in accordance with the significant accounting policies.

b) Change in Accounting Policy

Adoption of the Net Debt Presentation

The net debt presentation (with reclassification of comparatives) has been adopted for the presentation of financial statements. Net debt or net financial assets is measured as the difference between the Corporation's financial assets and liabilities.

The effect of this change results in changing the presentation of the Statement of Financial Position and adding the Statement of Change in Net Financial Assets.

c) Future Accounting Changes

In June 2015 the Public Sector Accounting Board issued the following accounting standards:

- **PS2200 Related Party Disclosures and PS 3420 Inter-Entity Transactions (effective April 1, 2017)**

PS 2200 defines a related party and establishes disclosures required for related party transactions; PS 3420 establishes standards on how to account for and report transactions between public sector entities that comprise a government's reporting

NOTE 2 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES AND REPORTING PRACTICES (Cont'd)

entity from both a provider and recipient perspective. Management is currently assessing the impact of these standards on the financial statements.

- **PS 3210 Assets, PS 3320 Contingent Assets, and PS 3380 Contractual Rights (effective April 1, 2017)**

PS3210 provides guidance for applying the definition of assets set out in FINANCIAL STATEMENT CONCEPTS, Section PS 1000, and establishes general disclosure standards for assets; PS 3320 defines and establishes disclosure standards on contingent assets; PS 3380 defines and establishes disclosure standards on contractual rights. Management is currently assessing the impact of these standards on the financial statements.

- **PS 3430 Restructuring Transactions (effective April 1, 2018)**

This standard provides guidance on how to account for and report restructuring transactions by both transferors and recipients of assets and/or liabilities, together with related program or operating responsibilities. Management is currently assessing the impact of these standards on the financial statements.

NOTE 3 BUDGET

(in thousands)

A business plan with a budget deficit of \$2,150 was approved by the Board on March 5th, 2015 and the full financial plan was submitted to the Minister of Advanced Education, the Minister responsible for the Corporation. This responsibility was transferred to the Minister of Economic Development and Trade effective April 1st 2015 as announced on October 22nd, 2015.

NOTE 4 CASH

(in thousands)

Cash in the amount of \$59,089 (2015 - \$55,934) include deposits in the Consolidated Cash Investment Trust Fund (CCITF) of the Province of Alberta. The CCITF is administered by the Ministry of Treasury Board and Finance with the objective of providing competitive interest income to depositors while maintaining appropriate security and liquidity of depositors' capital. As at March 31, 2016, \$21,728 of the cash balance is restricted as it represents grants received that have restrictions on their use (2015 - \$22,212).

The portfolio is comprised of high-quality short-term and mid-term fixed-income securities with a maximum to maturity of three years. As at March 31, 2016, securities held by the Corporation had a time-weighted return of 0.8% per annum (2015: 1.2% per annum). Due to the short-term nature of CCITF investments, the carrying value approximates fair value.

NOTE 5 TANGIBLE CAPITAL ASSETS
(in thousands)

	Computer		Total
	Equipment ⁽¹⁾	Hardware and Software	
Estimated Useful Life	3-20 years	5 years	
Historical Cost			
Beginning of year	\$ 76	\$ 30	\$ 106
Additions	5	-	5
	<u>81</u>	<u>30</u>	<u>111</u>
Accumulated Amortization			
Beginning of year	64	12	76
Amortization expense	12	6	18
	<u>76</u>	<u>18</u>	<u>94</u>
Net Book Value at March 31, 2016	<u>\$ 5</u>	<u>\$ 12</u>	<u>\$ 17</u>
Net Book Value at March 31, 2015	<u>\$ 12</u>	<u>\$ 18</u>	<u>\$ 30</u>

⁽¹⁾ Equipment consists of office equipment

NOTE 6 DEFERRED REVENUE
(in thousands)

Deferred revenue represents unexpended, externally restricted funds.

	2016			2015	
	Water Research Fund	Waste Mgmt Tech	Other	Total	Total
Balance, Beginning of Year	\$ 12,397	\$ 9,600	\$ 255	\$ 22,252	\$ 23,216
Grants Received - Government of Alberta	5,000	-	-	5,000	7,570
Grants Received - Other	-	-	290	290	1,427
Interest Income	141	84	-	225	175
Recognized as Revenue:					
Interest Income	(141)	(84)	-	(225)	(175)
Government of Alberta Grants	(3,345)	(1,916)	-	(5,261)	(8,509)
Other Grants	-	-	(506)	(506)	(1,452)
Balance, End of Year	<u>\$ 14,052</u>	<u>\$ 7,684</u>	<u>\$ 39</u>	<u>\$ 21,775</u>	<u>\$ 22,252</u>

NOTE 7 BENEFIT PLANS
(in thousands)

The Corporation participates in the multi-employer pension plans: Management Employees Pension Plan (MEPP), the Public Service Pension Plan (PSPP), as well as, a Supplementary Pension Plan (SRP) for Public Service Managers. The Corporation does not have sufficient plan information on MEPP, PSPP or the SRP to follow the standards for defined benefit accounting and therefore follows the standard for defined contribution accounting. Accordingly, pension expense recorded for the PSPP/SRP/MEPP is comprised of employer contributions to the plan that are required for its employees

NOTE 7 BENEFIT PLANS (con't)

during the year, which are calculated based on actuarially pre-determined amounts that are expected to provide the plan's future benefits.

At December 31, 2015, the Management Employees Pension Plan reported a surplus of \$299,051 (2014 – surplus \$75,805), the Public Service Pension Plan reported a deficiency of \$133,188 (2014 – deficiency \$803,299) and the Supplementary Retirement Plan for Public Service Managers reported a deficiency of \$16,305 (2014 – deficiency \$17,203). The Corporation is not responsible for future funding of the plan deficit other than through contribution increases.

NOTE 8 CONTRACTUAL OBLIGATIONS

(in thousands)

Contractual obligations are obligations of the Corporation to others that will become liabilities in the future when the terms of those contracts or agreements are met.

	2016	2015 ⁽¹⁾
Obligations under contracts and grants	<u>\$ 26,196</u>	<u>\$ 33,037</u>

Estimated payment requirements for each of the next five years are as follows:

	Contracts	Grants	Total
2016-17	\$ 1,626	\$ 13,888	\$ 15,514
2017-18	36	10,351	10,387
2018-19	-	225	225
2019-20	-	70	70
2020-21	-	-	-
	<u>\$ 1,662</u>	<u>\$ 24,534</u>	<u>\$ 26,196</u>

⁽¹⁾ Restated to add \$1,596 in commitments outstanding at March 31, 2015.

NOTE 9 RESEARCH ADMINISTRATION

(in thousands)

The Corporation carries out activities on behalf of Climate Change and Emissions Management Corporation (CCEMC) and invoices CCEMC directly. Revenues are recorded in Other Income and expenses are recorded in Program Administration and Technical Support Services. Amounts for CCEMC are as follows:

NOTE 9 RESEARCH ADMINISTRATION (con't)

	<u>2016</u>	<u>2015</u>
Revenues		
Other Income	<u>\$ 510</u>	<u>\$ 872</u>
Expenses		
Program Administration	509	619
Technical Support Services	<u>1</u>	<u>253</u>
	<u>\$ 510</u>	<u>\$ 872</u>

NOTE 10 SUBSEQUENT EVENT

On April 14, 2016, the Government of Alberta announced the amalgamation of the four Alberta Innovates corporations, BIO Solutions, Technology Futures, Energy and Environment Solutions, and Health Solutions into one, along with a wholly owned subsidiary corporation to provide specialized applied research services. Government will introduce legislation later in 2016 to legally create the new entity. Until then, each of the four existing corporations will retain their legal identity.

As the four Alberta Innovates corporations are still legal entities until legislation to create the new corporation is passed and in force in fiscal year 2016 - 2017, the Lieutenant Governor in Council has appointed a new Board of Directors to serve for all four of the Alberta Innovates corporations.

This amalgamation will have a significant financial impact on future operations of the four Corporations but an estimate of the financial impact cannot be made at this time.

NOTE 11 APPROVAL OF FINANCIAL STATEMENTS

These financial statements were approved by the Board of Directors of Alberta Innovates – Energy and Environment Solutions.

ALBERTA INNOVATES - ENERGY AND ENVIRONMENT SOLUTIONS
SCHEDULES TO THE FINANCIAL STATEMENTS
YEAR ENDED MARCH 31, 2016

Schedule 1 - Expenses Directly Incurred by Object

	2016		2015
	Budget	Actual	Actual
Grants	\$ 26,254	\$ 11,516	\$ 16,733
Supplies and Services	3,490	3,238	3,429
Salaries, Wages and Employee Benefits	3,480	3,874	3,679
Financial Transactions and Other	-	50	12
Amortization of Tangible Capital Assets	16	18	21
	\$ 33,240	\$ 18,696	\$ 23,874

Schedule 2 - Salary & Benefits Disclosure

Year ended March 31, 2016

	2016			2015	
	Base Salary ⁽¹⁾	Other Cash Benefits ⁽²⁾	Other Non- Cash Benefits ⁽³⁾	Total	Total
	(in thousands)				
Chairman of the Board	\$ -	\$ 7	\$ -	\$ 7	\$ 5
Board Members	-	36	1	37	38
Chief Executive Officer	276	74	13	363	360
Executives:					
Executive Director, Energy Technologies ⁽⁴⁾	128	160	43	331	223
Executive Director, Water and Environmental Management ⁽⁵⁾	14	-	4	18	-
Executive Director, Renewable and Emerging	182	-	50	232	220
Executive Director, Water Resources and Environmental Management	200	-	57	257	247
Director, Strategic Planning and Operations	142	-	44	186	174

(1) Base salary includes regular salary.

(2) Other cash benefits include honoraria for Board Members, car allowance and direct payments in lieu of pension payments for the Chief Executive Officer, and severance and vacation pay for Executive Director Energy Technologies. No bonuses were paid in 2015 or 2016. Included in other cash benefits is \$142 of severance benefits paid as a result of the termination agreement.

(3) Other non-cash benefits include employee benefits and contributions or payments made on behalf of employees including pension and supplementary retirement plan, health care, dental coverage, group life insurance, short and long term disability plans, Workers Compensation Board premiums, accommodations, learning account items, health spending account items and professional memberships.

(4) This position was vacant from June 1st 2015 to September 20th 2015.

(5) This position was effective March 1st 2016.

Schedule 3 - Related Party Transactions

Year ended March 31, 2016

Related parties are those entities consolidated or accounted for on a modified equity basis in the Government of Alberta's financial statements.

As a result of government reorganization on October 22, 2015, responsibility for the Corporation was transferred from the Ministry of Advanced Education to the Ministry of Economic Development and Trade. Comparatives for 2015 have been restated as if the Ministry had always been assigned its current responsibilities.

Alberta Innovates - Energy and Environment Solutions had the following transactions with related parties which are recorded on the Statements of Operations and the Statements of Financial Position at the amount of consideration agreed upon between the related parties:

	Entities in the Ministry		Other Entities Outside of the Ministry	
	2016	2015 (Restated)	2016	2015 (Restated)
	<i>(in thousands)</i>			
Revenues				
Grants	\$ 18,839	\$ 23,454	\$ 1,916	\$ 40
Other	-	-	2	-
	<u>\$ 18,839</u>	<u>\$ 23,454</u>	<u>\$ 1,918</u>	<u>\$ 40</u>
Expenses – Directly Incurred				
Grants	\$ 167	\$ 155	\$ 5,671	\$ 7,562
Other Services	2	175	99	189
	<u>\$ 169</u>	<u>\$ 330</u>	<u>\$ 5,770</u>	<u>\$ 7,751</u>
Payables to	<u>\$ 4</u>	<u>\$ -</u>	<u>\$ 130</u>	<u>\$ 581</u>
Deferred Revenue	<u>\$ 14,052</u>	<u>\$ 12,397</u>	<u>\$ 7,684</u>	<u>\$ 9,600</u>
Contractual Obligations	<u>\$ 225</u>	<u>\$ 183</u>	<u>\$ 4,891</u>	<u>\$ 8,098</u>

The above transactions do not include support service arrangement transactions disclosed below.

The Corporation also had the following transactions with related parties for which no consideration was exchanged. The amounts for these related party transactions are estimated based on the costs incurred by the service provider to provide the service. These amounts are not recorded in the financial statements.

Accommodation expenses incurred by others are disclosed in Schedule 4.

	Other Entities Outside of the Ministry	
	2016	2015
	<i>(in thousands)</i>	
Expenses – Incurred by Others		
Accommodation ⁽¹⁾	<u>\$ 277</u>	<u>\$ 318</u>

(1) The Corporation's share of accommodation costs is based on the proportion of space occupied compared to the total space occupied by all Ministries.

Schedule 4 - Allocated Costs

Year ended March 31, 2016

(In Thousands)

Program	2016		2015	
	Expenses ⁽¹⁾	Expenses incurred by others ⁽²⁾	Total Expenses	Total Expenses
	<i>(in thousands)</i>			
Energy Technologies	\$ 4,819	\$ -	\$ 4,819	\$ 4,990
Renewable and Emerging Resources	2,473	-	2,473	3,236
Water and Environmental Management	1,729	-	1,729	2,618
Water and Tailings Research	2,797	-	2,797	4,964
Water Innovation Program	227	-	227	-
Alberta Water Research Institute	432	-	432	1,684
Program Administration	5,177	277	5,454	5,461
Technical Support	1,042	-	1,042	1,239
	<u>\$ 18,696</u>	<u>\$ 277</u>	<u>\$ \$ 18,973</u>	<u>24,192</u>

⁽¹⁾ Expenses – Directly Incurred as per Statements of Operations.

⁽²⁾ During the year, the Corporation received financial processing and reporting services from the Department of Economic Development and Trade and the Department of Advanced Education at no cost. The dollar value of these services cannot be accurately determined.

OPERATIONAL OVERVIEW

Thought leadership

In 2015-16, AI-EES staff continued its contribution to global thought leadership. They were called upon to deliver more than 50 presentations on topics ranging from technologies for reducing GHG's emissions in the oil sands to increasing the competitiveness of our energy resources to advancing environmental performance through our Water Innovation Program. Staff are frequently called on by media as experts on innovation and new technology development across our strategic areas

Core Programs and Support Services

Operations staff's primary work is the support and sharing of research and development through AI-EES' three strategic areas. AI-EES also hires consultants in three areas: communications, legal and HR.

AI-EES gratefully acknowledges Advanced Education as they provide immeasurable services in accommodation, finance, accounting, and computer support.

Communications

AI-EES' continues to raise awareness of its priorities and outcomes as part of Alberta's innovation system. Through communications efforts, AI-EES aims to be seen as the credible energy and environment expert when it comes to the development and implementation of innovation and technology strategies that will lead to maximizing Alberta's resource advantage, reducing GHG emissions and promoting exceptional water management practices.

In addition to supporting awareness through thought leadership (highlighted above), the Corporation:

- Hosted its sixth annual Technology Talks innovation event aimed at decision makers and potential partners (more than 225 targeted attendees). Achieved 100 per cent participant agreement that format is effective and that event is a valuable use of time. 89 per cent say the event sparked ideas for collaboration (71 per cent in 2014).
- Hosted a Water Innovation Program Forum attracting 100 water experts, a biogas stakeholder workshop to identify barriers that hinder the development of biogas industry in Alberta, workshops on the theme of adding value to Alberta's resources, and sessions to help establish 2050 targets for energy technologies.
- Hosted our third annual Government of Alberta Learning session targeting more 100 staff who wanted to better understand how AI-EES is supporting provincial priorities with the aim of building stronger partnerships to achieve these goals (attendees moved from a 2.8 to a 4.2 out of 5 on "mandate knowledge" following this activity).
- Increased its profile through earned media in a range of publications, including the Edmonton Journal, the Economist, the Globe and Mail as well as hundreds of mentions in technology trade publications.
- Launched an electronic and print newsletter to share the stories of energy and environment innovation across Alberta.
- Earned profile through participation in a series of industry-focused, sponsored events.
- Grew its social media presence through an expanded twitter following.

Internal communication efforts are focused on ensuring the AI-EES team is highly engaged in delivering on the vision and goals of the organization. In 2014, AI-EES' overall employee engagement score was over 90 per cent. This will be re-assessed in our 2016 employee engagement survey.

Knowledge transfer

Knowledge management systems and practices have been embedded into AI-EES business processes from technology scouting through to impact reporting. We can now track our investments through transformation of concepts to outcomes that achieve impact. The ability to quickly mine through existing data, combined with technology intelligence, has allowed us to create knowledge maps for strategic areas that identify gaps and guide investment decisions and planning.

In 2015-16, AI-EES realized knowledge transfer results that influenced policy and regulatory framework development and decisions. The Technology Informing Policy committee, hosted by AI-EES, shared in over 56 project outcomes that either informed policy development or implementation or addressed barriers required for technology deployment. For example, the South Saskatchewan River Basin collaborative water management project resulted in a series of recommendations that were shared with that community of practice, including levels of government, university and sector associations.

AI-EES did not receive any requests under the Freedom of Information and Privacy (FOIP) act in 2015-16, which we believe to be a direct result of providing digital research outcomes in an open and transparent manner. We encourage open innovation and knowledge sharing in an effective manner while respecting sensitive and confidential information required in a competitive marketplace.

Collective Measures

In 2016, work on collective measures was deferred to the new Alberta Innovates Corporation.

Collaboratories

AI-EES participates in five key focus area "collaboratories" for energy, environment, health, food, and fibre (established in 2014). The collaboratories were established to ensure greater alignment between the Alberta Innovates Corporations and government departments, and are guided by the priorities established in the Alberta Research and Innovation Framework. AI-EES co-chairs two collaboratories: Energy and Environment. The concept of establishing 2030 Targets for innovation that AI-EES developed has now been accepted and applied to all five collaboratories.

Public Interest Disclosure Act

Section 32 of the *Public Interest Disclosure Act* requires Alberta Innovates – Energy and Environment Solutions, an agency of the Government of Alberta, to report annually on the following parts of the Act:

- a) The number of disclosures received by the designated officer of the Public Interest Disclosure Office, the number of disclosures acted on and the number of disclosures not acted on by the designated officer
- b) The number of investigations commenced by the designated officer as a result of disclosures

- c) In the case of an investigation that results in a finding of wrongdoing, a description of the wrongdoing and any recommendations made or corrective measures taken in relation to the wrongdoing or the reasons why no corrective measure was taken.

In 2015-16 for Alberta Innovates – Energy and Environment Solutions, there were no disclosures of wrongdoing filed with the Public Interest Disclosure Office.

Restricted Funding

Alberta’s Ministry of Innovation and Advanced Education provided a \$30 million grant initiated in 2006, in support of the Alberta Water Research Initiative (AWRI). In 2012, Advanced Education awarded AI-EES an additional \$15 million in the area of water and tailings research. In 2015-16, another grant for water research was announced with \$5 million per year over five years. Per the grant agreements, separate annual reports will be submitted to Advanced Education detailing the progress of the projects financed under these funds.

Highlights for Water Research Initiative Grant:

Work under this grant is winding down. The original grant has been extended to allow completion of three remaining projects by March 2017. Future work in water is continuing under the Water and Tailings grant and a new Water Innovation Program that AI-EES has developed.

Highlights for Water and Tailings:

In 2012, a grant competition was held by AI-EES to support the development of relevant and scientific knowledge and technologies needed to achieve safe drinking water, healthy aquatic ecosystems, and reliable, quality water supplies for a sustainable economy. This competition resulted in 18 new water research projects with a total investment over their lifetime of \$9.2 million.

Two additional tailings projects were funded as a result of recommendations from the Tailings Roadmap and Action Plan that AI-EES completed in 2012-13. These projects have successfully advanced from development to pilot stages and are now being considered for field scale demonstration projects with oil sands industry partners. All AI-EES tailings projects look for solutions to reduce the amount of unreclaimed tailings and to enable safe return of treated process water to the natural environment. When commercially demonstrated, the economic impact from such tailings treatment innovations could be measured in billions of dollar. Of the initial \$15.2 million grant, all of the money has been allocated to 32 projects, 15 of which will continue into 2016-17.

A major project titled “Climate Vulnerability and Sustainable Water Management in the SSRB” was completed. The project explored practical options for adapting to climate variability and change and developed increased capacity for water resource management in the SSRB. An integrated river modeling tool was developed, which can assist in informing key policy and capital decisions. Several practical and implementable solutions were developed as a result of this collaborative process to improve resilience and adapt to current and future water management challenges.

Alberta’s water research and innovation strategy has three desired system outcomes:

- Health community and quality of life
- Healthy environmental and ecosystem, and

- Economic prosperity

AWRIS expects the impact of investment in water research and innovation to have major impacts on these system outcomes in a time frame of 10 years. AI-EES strives to generate significant impacts on the system outcomes from Water and Tailings Grant in shorter time frame. For example, through AI-EES and AWRI, GoA's investment in water use conservation and efficiency has contributed to the significant improvement in water productivity in oil sands industry. Water use intensity in in-situ recovery has been steadily declining over the last decade. Even with exponential increase in bitumen production, total water use has been stabilized and fresh water use has declined.

Highlights for Water Innovation Program:

In 2015-16, AI-EES received a five-year \$25 million grant to support activities that address knowledge and technology gaps in support of the Water for Life Strategy. These funds form the basis for the newly branded Water Innovation Program. A major grant competition was announced in 2015-16, which will support new projects in four key investment areas: water supply and watershed management; healthy aquatic ecosystems; water use and efficiency; and water quality protection. More than 100 proposals were received as part of this competition. Final decisions on successful projects to be funded will be made in early 2016-17.

AI-EES also initiated a partnership with Sustainable Development Technology Canada (SDTC), which will lead to co-investment in water technology projects worth more than \$12 million in 2016. This program is an example of greater Alberta-Canada collaboration in clean technology development. Eligible projects for this competition must come from small and medium enterprise business in Canada and focus on water technology advancements associated with: municipal water treatment; advanced steam assisted gravity drainage (SAGD) water treatment; oil sands mine water treatment; flow-back and produced water from hydraulic fracturing; agriculture and irrigation; water distribution rehabilitation and repair.

Workshops were held in 2015-16 to support development of strategic plans to guide investments in knowledge and technology gaps associated with wetland restoration and hydraulic fracturing.

APPENDIX 1

Performance Measures Methodology

Accelerate Commercialization

To arrive at the number and value of AI-EES investments in projects according to the Technology Readiness Levels, the Executive Directors and their staff who understand the projects review the definitions and provide a best fit analysis for each project. These are then grouped and graphed. The CCEMC projects, which are managed by AI-EES staff, are analyzed in the same manner.

Overall Achievement of Long Term Targets - Business Tracking: the ProGrid Methodology

This method requires the licensing of ProGrid Software to complete the analysis. AI-EES (and its predecessors) has been using this methodology since 2003. It is a method that helps measure intangibles, whether those are research projects, business plans, commercialization potential or overall organizational performance.

In 2003, AI-EES created 2020 and 2030 targets for the organization (then known as AERI). This was done by knowledgeable staff reading and reviewing relevant government documents, strategies and policies, undertaking feasibility studies, adding external knowledge and working to create some stretch targets.

Working with ProGrid consultants, AI-EES translated those targets into an Evaluation Matrix and Language Ladders, both of which are key components of the ProGrid methodology.

The Evaluation Matrix establishes the criteria to review organizational performance. This is divided into inputs, outputs and some connecting enablers. For AI-EES, the inputs for the organization are the Management Capacity, Partnerships and Finances. The outputs are our three strategic areas of Energy Technologies, Water and Environmental Management and Renewables and Emerging Technologies. Tying these together are the enablers: the method by which AI-EES is able to implement the relevant sections of various government strategies on Energy, Water and Environment.

APPENDIX 2

Titles of research projects by 2030 Target

PROJECT

50 per cent of total production in bitumen and heavy oil is produced sustainably (reduced GHG emissions and water use)

- NSERC/AERI Industrial Research Chair in Petroleum Thermodynamics
- Oil Sands Engineering Chair
- AACI program
- NSERC Industrial Chair in Petroleum Microbiology
- Simulation of multiphase flow in SAGD Wells and Production Systems
- NSERC Foundation CMG IRC in Reservoir Geomechanics for Unconventional Resources Chair
- NSERC Industrial Research Chair in Oil Sands Engineering
- Oxy-Fired Pressurized Fluidized Bed Combustor Technology Development (P2)
- NSERC CMG Foundation Chair Reservoir Simulation
- US Oil Sands Athabasca Bitumen Processing Test
- Testing Hybrid Bitumen Extraction Process
- Economic Analysis and GHG benefits of cogeneration at a SAGD facility
- Comparative Test on Oil Drainage Behaviour under in situ vapor Solvent Extraction

One or more coal-fired power plants in Alberta at a natural gas equivalent emissions

- Canadian Clean Power Coalition
- Modelling and simulation Study of Underground Coal Gasification

20 per cent of Alberta's electrical generation will come from renewable sources; energy storage capacity equivalent to 2.5 per cent of total generation

- NSERC/Cenovus/Alberta Innovates Associate Industrial Research Chair in Energy and Environmental Systems Engineering
- Spray on Nanoparticle Solar
- Feasibility analysis of a geothermal based steam/electricity generation application in Alberta
- Developing Alberta's geothermal reservoirs with EGS-CO₂ method
- Electrochemical Engineering Innovation by Combining iF Cathode Technology with Porous Silicon Anode Technology for Advanced Battery Commercialization
- Liverpool Wind and Regenerative Air Energy Storage Project
- Zinc-Air Fuel Cell for Renewable Energy Storage
- Redox Flow Battery Innovation for Large Scale Electrical Energy Storage
- Distributed Lithium-Ion Storage for Demand Charge Reduction
- Energy Storage in Alberta and Renewable Energy Generation
- Deep-Dive Analysis of the Best Geothermal Reservoirs for Commercial Development in Alberta
- Identification of Best Energy Efficiency Opportunities in Alberta's Industrial and Agricultural Sector - Phase III
- Identification of best Energy Efficiency Opportunities in Alberta's Chemical Sector Phase 4
- Energy and Environment Modelling Projects

Production of oil and gas from challenging reservoirs is 15 per cent of total production

- Tight Oil Consortium
- Technology Opportunities in the Unconventional Duvernay Play
- Hydrocarbons in Nanochannels: Understanding Transport in Shale
- Unconventional Oil and Gas Innovation Roadmap

Improve the overall efficiency and productivity of water use in Alberta by 30 per cent from a 2010 baseline

- Water Reuse In Alberta: Case Studies and Policy Development to Support Continuing Economic Development
- Redevelopment and enhancement of the Irrigation Demand Model as a tool for basin water management
- Water Reuse and Management of SAGD Processed Waters

50 per cent intensity reduction in Alberta's GHG emissions

- Canadian Center for Clean Carbon and Mineral Processing Technology (C5MPT)
- Energy Efficiency Field Study; Application of Best Operating Practices in AB O&G Sector
- High Pressure De-Oiling of SAGD Produced Water
- Test Facility to Demonstrate Emerging Energy Efficiency Technologies Applicable to Oil and Gas Operations
- Membranes for CO₂ capture: FSC-PVAm Membrane
- Development of a high efficiency mechanical vapour compression (MVC) evaporator for SAGD application
- Ceramic Membrane Deoiling and Desilication
- Pre-FEED to test post combustion CO₂ using MCFC
- Conceptual Engineering Study of Technologies for Reducing Solution Gas Venting in Cold Heavy Oil Production
- Evaluation of Integrating a MCFC with SAGD Facility
- Development of a high efficiency mechanical vapour compression (MVC) evaporator for SAGD application

Development of technologies to add value to gas, including at least one gas-to-liquid demonstration plant

- Field Demonstration of Advanced Membranes for Syngas Cleanup and CO₂ Capture
- Application of New Gas to Liquids Technologies to Reduce Emissions Phase 2

Habitat restoration rates that meet or exceed disturbance on lands affected by resource development

- LiDAR/Wet areas mapping linear corridors forest recovery project
- Atmospheric metal deposition in NE Alberta
- Nutrient status and retention in reconstructed sandy soils
- Oil Sands Alberta Campus Project (OSCAP)
- Atmospheric organics deposition in NE Alberta
- Advanced Air LiDAR
- Alberta Applied Biodiversity Conservation Chairs
- Creating a Predictive Eco-site Classification Platform for Alberta P1 Feasibility Assessment, Technology Development & Piloting
- Web-Based Monitoring System – Enhancing the Provincial Mapping and Monitoring Capability
- Experimental Comparisons of site preparation and planting treatments to reclaim linear corridors in boreal forests

20 per cent of in situ bitumen production is partially upgraded to improve quality and reduce the diluents required for transportation

- NSERC NEXEN Chair in Bitumen Upgrading
- Field Pilot of High Yield Cross Flow Fluid Bed Upgrading Process
- Opportunities to Improve the Competitiveness of Alberta's Oil Sands Products for U.S. Refineries Phase 1
- Opportunities to Improve the Competitiveness of Alberta's Oil Sands Products for U.S. Refineries Phase 2
- Acid enhanced bitumen visbreaking
- Catalytic Light Olefin Upgrading- Using Natural Gas for Gasoline Quality Improvement
- Review of Partial Upgrading Projects
- Institute for Oil Sands Innovation (IOSI)
- Partial Upgrading Background Review
- Assessment of Partially Upgraded Bitumen Emissions at Refineries
- Eastern Canadian and European Market Access
- Technology Development for Viscosity Reduction of Bitumen for Pipeline Transportation – H-donor Assisted Visbreaking

Alberta will have safe, secure and reliable water resources for 6 million people while maintaining or enhancing the health of aquatic ecosystems

- The Effect of Weathering on Dilbit and Conventional Crude in Fresh Water Systems
- Biological impacts of dilbit spills in freshwater aquatic and riparian ecosystems – A knowledge synthesis and gap analysis
- A comparative toxicity assessment of diluted bitumen (dilbit) to sour and sweet crude oils
- Study on current state of research into maritime spills
- Evaluation of Existing Legal Instruments to Promote Integrated Water Management Decision Making
- Investigation of the occurrence of pesticides in groundwater of Southern Alberta
- Climate Vulnerability and Sustainable Water Management in the SSRB - Part of the Watershed Stewardship and Ecosystem Management Focus Area
- Functional Flows: A Practical Strategy for Healthy Rivers
- Sustainable urban water management in the context of climate variability and change
- Perceptions of water quality among rural Albertans and association with livestock
- Quantifying groundwater recharge for sustainable water resource management
- Advanced approaches to dealing with water disinfection by-products
- Predicting Alberta's Water Future
- Enhancing accessibility and use of Alberta's natural water recreation areas through prevention of swimmer's itch transmission
- Assessing the ecological impacts of water extraction on stream hydrology and Alberta's fish community structure and function
- Arsenic in Rural Alberta's Ground Water
- Baseline Isotope Geochemistry of Alberta Groundwater
- Resolving natural and anthropogenic influences to groundwater and surface water environments in the Lower Athabasca region
- Sustainable Wetland Habitat: Reclamation Targets, Design Criteria and Wetland Policy Implementation
- Towards Integrated Source Water Management in Alberta
- Mammalian and Zebrafish Toxicity of Raw and Physico-Chemically-Treated Oil sands processed water
- Assessing Water Quality, Microbial Risks and Waterborne Pathogens in Rural Alberta using a One Health Framework

- Sustainable Water Management in the Athabasca River Basin Initiative (The ARB Initiative) - Phase 2
- Alberta Land Institute - Wetlands Research Strategy for Alberta
- Canadian Water Network 2015-16 Hydraulic Fracturing Program
- Oil and Water: Stakeholders' Framing of Resources in Alberta's Oil Sands
- South Saskatchewan River Basin (SSRB) adaptation to Climate Variability
- Economics of Adaptation to Extreme Hydrological Events
- Expanding Wastewater Reuse in Alberta Through Application of a Quantitative Microbial Risk Assessment Framework
- SSRB Flood Mitigation Assessment – Bow River Basin
- Flood Indicators: Improving Forecasting in Alberta

100 million m³ reduction from legacy mature fine tailings over and above government directives

- Chair Advanced Oxidation of Oil Sands process-Affected Water - Process Fundamentals
- Oil Sands Tailings Geotechnique Chair
- Titania Membrane De-Risking Project
- InLine Dewatering of Oil Sands Tailings
- Field Scale Demonstration of EKS
- EKS Phase II Electro Kinetic Remediation Work Program
- NSERC Industrial Research Chair in Water Quality Management for oil Sands Extraction

50 per cent reduction in organic waste to landfill

- Edmonton Municipal Waste (Enerkem) P3 Biowaste Demo
- Determine Heating Value of Wastes
- An Integrated Process to Simultaneously Convert Natural Gas and Low-Cost carbon resources to Liquid Fuels
- An Organic Waste Inventory for Alberta
- Conversion of Tri-Municipal Region Organic Waste to Bio-Energy
- Lethbridge Landfill Drill Sample Methane Potential Measurements and Molecular Characterization
- Advanced Energy Research Facility - conversion from methanol to ethanol
- Development of a Waste to Energy Decision Analysis Model for a Municipality in the Province of Alberta
- Assessment of Municipal Solid Waste Utilization for the Town of St. Paul
- Feasibility of Converting Municipal Solid Wastes (MSW) into Liquid Fuel using a Novel Methanolysis Process

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