Proceeding 24116

July 17, 2019

Alberta Utilities Commission
Eau Claire Tower
1400, 600 Third Avenue SW
Calgary, Alberta T2P 0G5
Attention: Mr. Randy Lucas, Lead Application Officer

Re: Distribution System Inquiry - AUC Proceeding 24116
Energy Efficiency Alberta (EEA) Submission for Module One

Dear Commission Staff and Counsel:

Energy Efficiency Alberta is pleased to present our submission to the Alberta Utilities Commission Distribution System Inquiry - Proceeding 24116. This submission is in response to the Commission's letter, dated March 29, 2019, outlining scope and process for the Distribution System Inquiry. Specifically, the Commission requested that written submissions in response to Module One of the Distribution System Inquiry be submitted by July 17th, 2019 and outlines questions for consideration.

If you have any questions regarding this submission, please contact myself or:

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Best regards,

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Submission to the Alberta Utilities Commission

Distribution System Inquiry Submission

Module 1, Proceeding 24116

Submission of Energy Efficiency Alberta (EEA)

July 17th, 2019

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Contents

1 Introduction

Energy Efficiency Alberta (EEA) welcomes the opportunity to provide input at the AUC's Distribution System Inquiry. This submission is focused on how energy efficiency (EE) programming can contribute to the evolution of the distribution systems and the related regulatory framework (related to the AUC's Question 1 (f): Technology that enables demand-side elements such as energy efficiency, net-zero buildings, consumer choice aggregators, responsive load, demand responses, and peak reduction). Section 2 of this submission outlines context on EEA as an organization, EEA's results for 2017-2019 fiscal years, how energy efficiency programming functions, and how it benefits Alberta and the distribution systems. Section 3 responds to the Commission's "Questions to Consider" with a focus on energy efficiency. Section 4 outlines concluding comments. Definitions to inform and provide context to this submission can be found in the Appendix (Section 5).

2 Background

2.1 Information on EEA

- EEA is a provincial government agency with a three-part mandate to deliver energy efficiency awareness, programming and industry development for Albertans. The agency was created through legislation in late 2016 and its initial programming launched in Spring 2017.
- EEA delivers energy efficiency and distributed generation[1] programming for the Alberta marketplace: industrial, commercial, institutional, residential mass market, residential limited income and non-profit.[2]
- Programs cover technologies and behaviours that reduce consumption of both electricity and natural gas as well as other fuels in the commercial and industrial sectors.

[1] This submission focuses on the energy efficiency aspect of EEA's work as we expect other stakeholders to present information related to distributed generation – for example, the Community Generation Working Group submission.
[2] To date, Large Final Emitters have only been eligible for select programs and services (e.g. Strategic Energy Management program). Large Final Emitters are classified in Alberta as facilities that produce more than 100,000 tonnes of CO_2e annually.

- Program results are verified using utility industry-standard, third-party program evaluation processes.[3]

For more details on Energy Efficiency Alberta please see the Appendix.

2.1.1 EEA Results to Date

EEA's third-party verified savings between April 1, 2017, and March 31, 2019, include:

- Over 7,400 gigawatt hours of net[4] lifetime[5] electricity savings,
- Nearly 2.2 million GJ of net lifetime natural gas savings,
- Over 530 GWh of gross electricity generation through solar arrays over the lifetime of these units, and
- A reduction of almost 5.7 million tonnes of CO_2e of lifetime greenhouse gas emissions or the equivalent to taking 1.2 million cars off the road for one year.

The resulting value to Albertans is:

- Over $690 million in energy savings and emission reductions – a 3.2 times return on investment, and
- An average cost of saved electricity at 2.7 cents per kWh saved.[6]

For economic and environmental impacts, and information on who has participated in EEA's programs for fiscal year 2017/2018 and 2018/2019, see the Appendix.

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[3] EEA uses a third-party evaluator to perform an independent evaluation of each program. Evaluated results consider the energy savings for each product relative to a standard efficiency product, the number of participants that would have purchased the product even without the program (free riders) and benefits that are generated in addition to direct program savings (spillover).
[4] Gross savings are the results of program participant actions regardless of the nature of influence on their actions. Net savings are the gross savings excluding what would have happened in the absence of a program, as well as program impacts beyond the direct impacts of a financial incentive.
[5] Average product lifetime is 13 years.
[6] This calculation includes both the program cost and the participant cost.

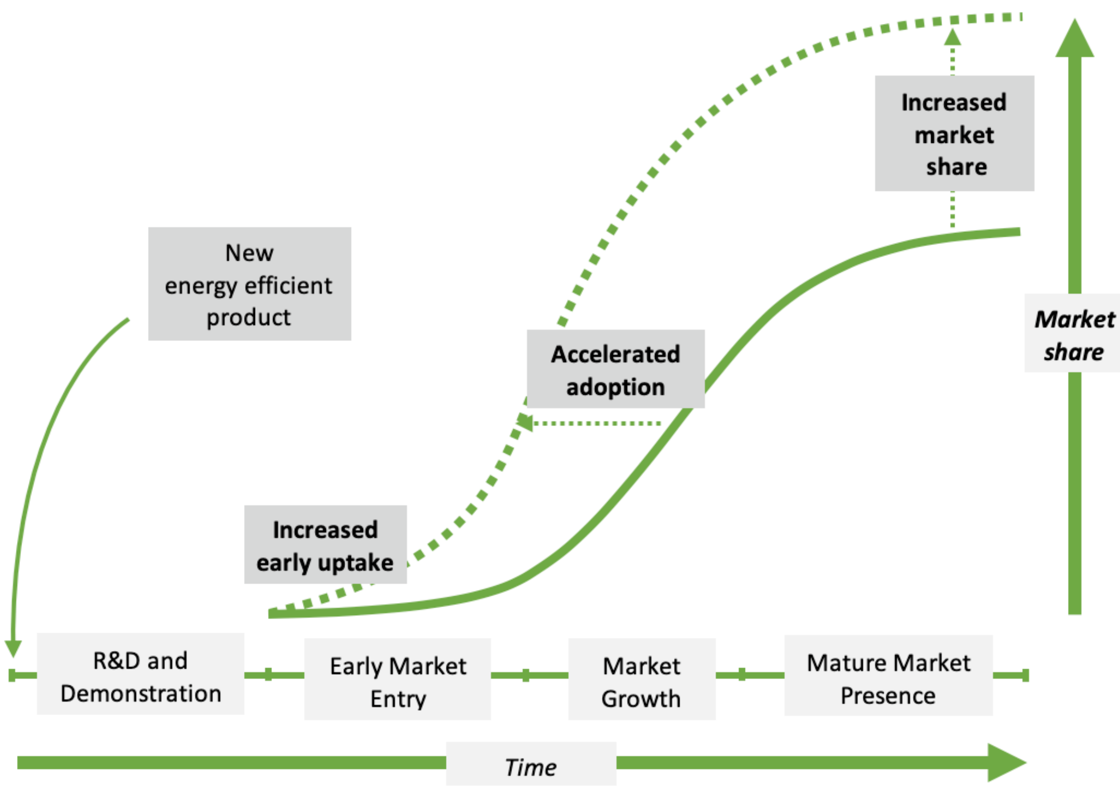
2.2 How do Energy Efficiency and Distributed Generation Programs Work?

Before responding to the Commission's questions, it merits outlining how and why energy efficiency programs function and why they achieve results. This information provides essential context when considering the role energy efficiency can play in the distribution system.

- Energy efficiency programming motivates increased uptake of measures, both technology (i.e. products, equipment, design) and behavior-based changes (practices, services or strategies), to reduce the total amount of energy demand compared to business as usual.[7]
- In the absence of energy efficiency programming and policies, there is a natural level of energy efficiency uptake over time as technology changes, costs decrease, and consumers become more aware of and confident with new technology, equipment, design, practices, behaviours, etc. (collectively known as measures).
- EE programming increases the level of energy efficiency uptake beyond business as usual, accelerating the adoption of energy efficient measures increasing their market share. In the absence of the program, many consumers would not have adopted these energy efficient measures (see Figure 1 below).
- Programming increases the speed at which an energy efficiency measure moves from early market entry to market growth and eventually mature market presence (see Figure 1 below). Programming support is withdrawn before or at the point which a measure reaches the mature market stage and efforts are focused on other measures to continuously improve overall energy efficiency in the market.

[7] Formally, the broad category of conservation includes technology and behavior change that reduces energy demand. While energy efficiency is focused exclusively on technology "to do the same with less energy input", or "to do more with the same energy input". In practice, the term energy efficiency is used in a manner that includes both technology and behavior changes.

Figure 1: How Energy Efficiency Programming Increases Technology Adoption



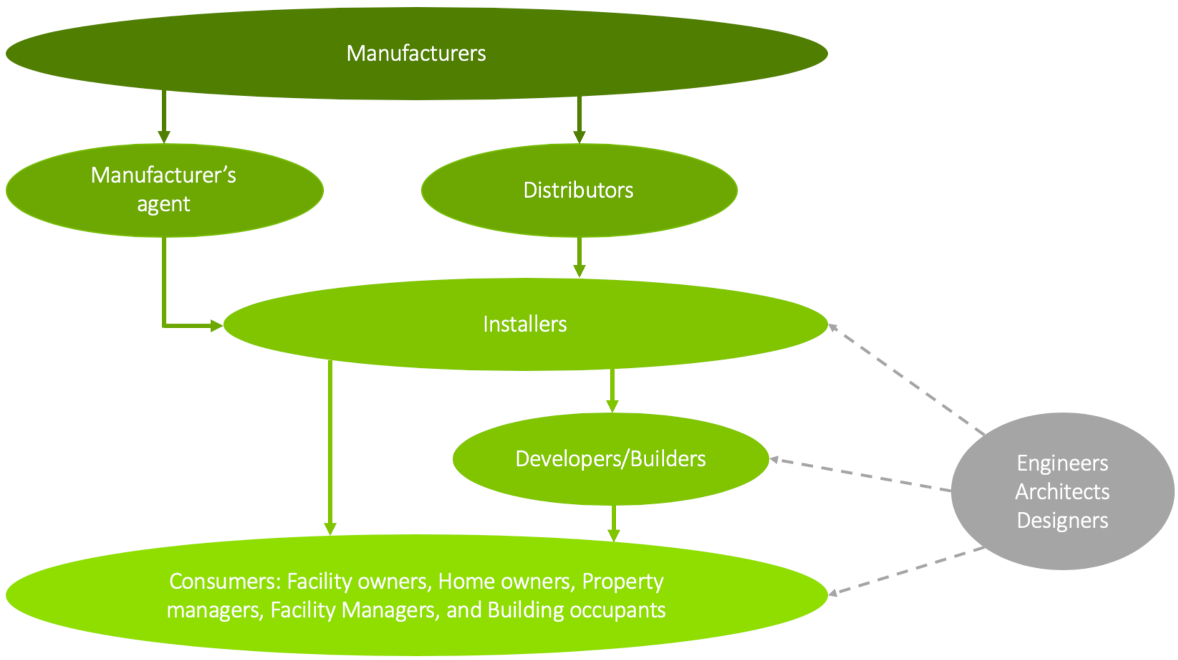
- Energy prices alone have proven unable to overcome well-documented, substantial and persistent barriers to cost-effective energy efficiency uptake.[8,9]
- These market barriers significantly limit the uptake of energy efficiency. This leads to sub-optimal choices and higher utility costs for both households and businesses – resulting in a less competitive economy. Barriers can be distilled down to a few broad categories including:
  - *Cost* – higher upfront cost, competing priorities, access to capital;
  - *Expertise/Information* – lack of knowledge of available products/equipment, how to install them, the savings, and installation and other related costs;
  - *Time* – busy people and organizations;

[8] EPA, (2009). *Customer Incentives for Energy Efficiency Through Electric and Natural Gas Rate Design*.
[9] Price signals can also be blunted by other forces such as income elasticity, cross-elasticity, and lack of transparency in billing.

- *Price signal* – energy supply cost at the time of consumption not visible or in line with true cost, limited price signal at the time of capital decisions;
- *Split Incentives (including Builder/Owner/Tenant Relationships)* – those making design/installation/capital budget decisions are not directly paying the utility bills; and
- *Product/Installation availability* – limited access to products or contractors to install equipment.

- Market transformation energy efficiency programming is designed to change market behavior by removing barriers preventing the uptake of energy efficient technologies. The removal of barriers accelerates the adoption of cost-effective energy efficiency and distributed generation until it becomes standard practice.
- Through market research and a careful program design process, tactics/strategies are chosen to overcome identified barriers facing market actors (see examples in Figure 2 below) in influencing the uptake of energy efficient measures. These strategies include (often used in combination):
  - Financial incentives including rebates or payments, discounts, and/or financing to temporarily motivate changes in behaviour that can become self-sustaining standard practices;
    - Incentives are often set at a level that reflects the value of saved energy and/or emissions reduction.
  - Technical services to provide the expertise to design and evaluate a project (e.g. audits, engineering studies), including training to build capacity in the industry; and
  - Information services on energy efficient options, benefits, and how to implement them.
- These strategies may be applied to any market actor along the supply chain (see Figure 2 below) wherever it will be most effective. When incentives are applied further up the supply chain they are referred to as upstream and midstream incentives. Once a new product becomes common practice, incentives are then shifted to even higher efficiency products that are new to the market.

Figure 2: Market Actors Along the Energy Efficiency Supply Chain



- Energy efficiency programming cost-effectively reduces energy demand because:
  - Incentives, information or technical services make the value proposition more enticing for consumers,
  - Increased uptake of these energy efficiency measures from consumers pull the market to supply more energy efficiency offerings,
  - Competition between providers further improves the energy efficiency offer by reducing prices and/or offering further value,
  - In the long term, this pull further reduces the price of the energy efficiency measure, and
  - At the mature market stage, programming efforts are shifted to new offerings repeating the previous steps with other energy efficiency measures.
- Cost-effectiveness tests are applied before program approval to ensure it meets pre-established cost-effectiveness criteria such as ensuring energy efficiency programming will save energy at a reasonable cost. These tests are essential to ensure the programming is worth pursuing and will meet cost-effectiveness related goals. Depending on the funding source and the oversight processes, cost-effectiveness need not be the only driver that guides where programs are focused. GHG reductions, programs in all sectors, low-income

support, economic development are all drivers that may impact how the program portfolio is structured.

- Third-party verification occurs during and after the program is complete to report on program performance, improve future programs, and hold a program administrator accountable to their commitments.
- Every state and province in the United States and Canada implement energy efficiency programs to reduce system-wide costs. The average spent on these programs is around $32 CAD per person annually – see Figure 5 on page 11.

2.3 Energy Efficiency Benefits

Energy efficiency contributes multiple benefits to the utility system such as:

- Avoiding the costs of *electricity generation*,
- Deferring or avoiding the *costs of expanding power plant peak capacity* to meet peak demand,
- Deferring or delaying maintenance, replacement, and expansions to *transmission and distribution (T&D)* infrastructure (more information included in Section 3 below),
- Avoiding *T&D line losses* for every unit of energy reduced,
- Decreasing the magnitude of required *electric ancillary services* if energy efficiency and distributed energy resources are located close to where electricity is used and supports the smooth operation of the electricity grid,[10]
- Providing better reliability and power quality by reducing stress to the system during hours of peak demand,[11] and
- Lowering wholesale market clearing prices.

All of these above cost savings can lead to lower costs on all Albertans' utility bills.

Energy efficiency also produces multiple societal benefits as outlined in the Appendix.

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[10] U.S. Environmental Protection Agency (EPA), (2018). *Quantifying the Multiple Benefits of Energy Efficiency and Renewable Energy – Part One*.
[11] *Ibid.*

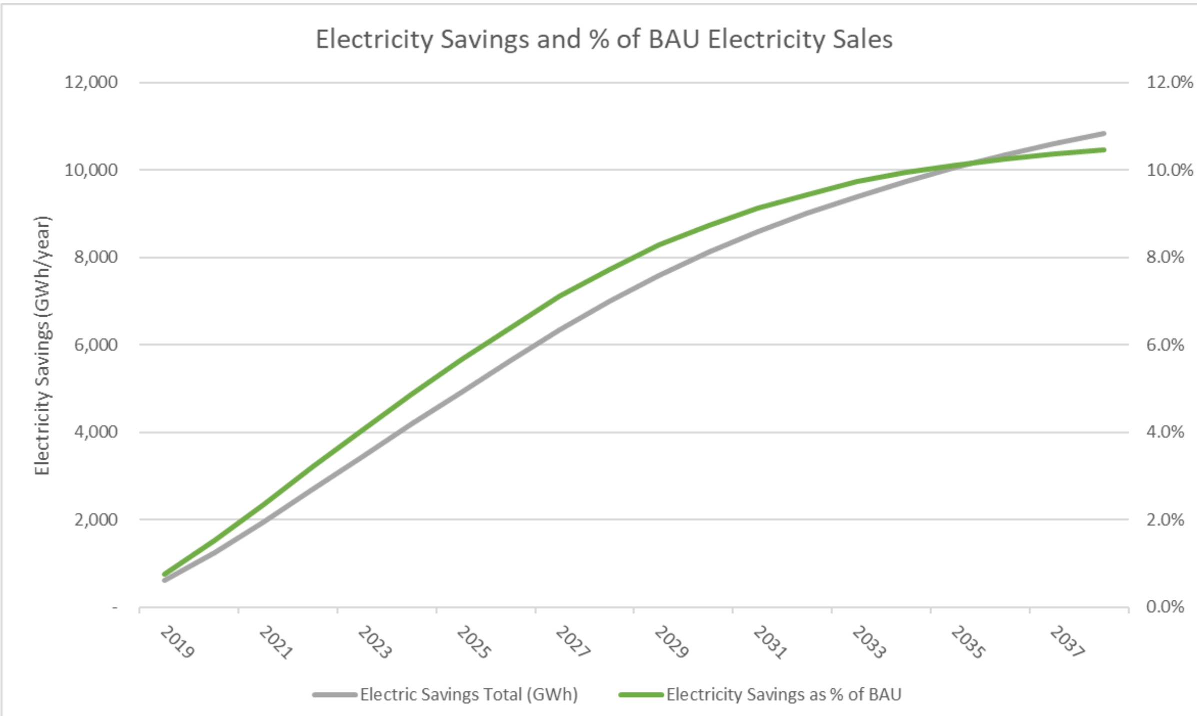
3 Responses to Inquiry Questions

2 (a) How stable are the trends associated with a certain technology or innovation and when is it expected that [a certain technology or innovation] will be economically viable?

- *Energy Efficiency Alberta 2019-2038 Energy Efficiency and Small-Scale Renewables Potential Study* provides the Commission with various scenarios for future trends in energy efficiency in Alberta.
- The total achievable potential considers energy savings with full market penetration of the measures, where cost-effective, and considers barriers, costs, and program capacity.
- The report indicates Alberta has a significant opportunity to reduce energy use through energy efficiency programming.[12]
  - After 20 years, cumulative annual electricity savings reach almost 11,000 GWh (see Figure 3 below). Albertans would be consuming electricity almost 11% less than business-as-usual energy consumption. Winter peak electricity demand would also decrease by 1,300 MW from a business-as-usual level.
  - Cumulative natural gas savings reach 150,000 GJ of natural gas saved (see Figure 4 on page 10) which represents 7% less than business-as-usual gas consumption.[13,14]

[12] EEA's Potential Study used conservative assumptions regarding technology innovation over time. While it does assume technology cost decreases over time, it does not assume new energy efficiency technology will be introduced to the market. Advances in energy efficient technologies are expected to further increase this potential.
[13] Navigant (October 17, 2018). *Energy Efficiency Alberta 2019-2038 Energy Efficiency and Small-Scale Renewables Potential Study.*
[14] This scenario includes the oil and gas sector but excludes solar PV potential.

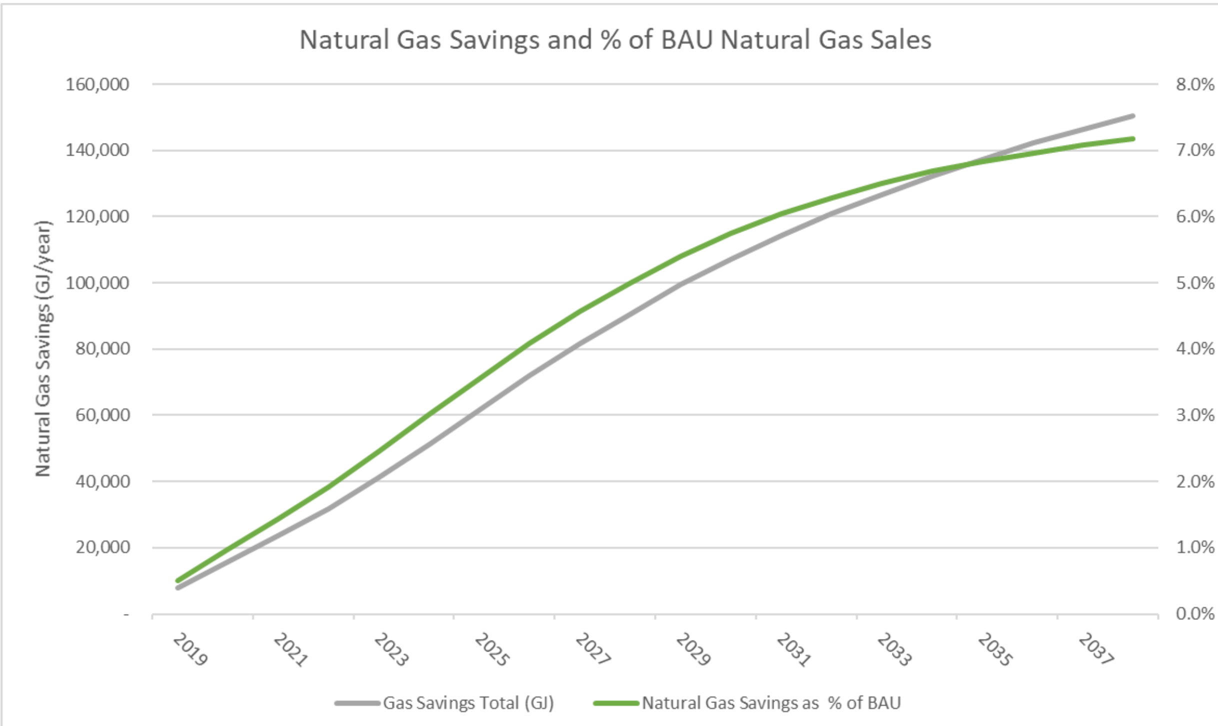
Figure 3: Cumulative Achievable Potential Annual Gross Savings and Savings as a Percentage of Business-as-Usual Consumption for Electricity over 20 years[15,16]



Source: Navigant (2018). *Energy Efficiency Alberta 2019-2038 Energy Efficiency and Small-Scale Renewables Potential Study.*

[15] This scenario includes the oil and gas sector but excludes solar PV potential. The savings are calculated as a percent of sector/customer segment sales is relative to the defined reference case (or business-as-usual).
[16] The study period for the report is 2019-2038.

Figure 4: Cumulative Achievable Potential Annual Gross Savings and Savings as a % of Business-as-Usual Consumption for Natural Gas over 20 years[17,18]



Source: Navigant (2018). *Energy Efficiency Alberta 2019-2038 Energy Efficiency and Small-Scale Renewables Potential Study*.

- The energy savings outlined in the study have the potential to generate $1 billion in benefits for every year of programming.[19] The cost of saved energy in this scenario is $0.024/kWh of electricity and $3.88/GJ of natural gas.[20] If the oil and gas sector is included, savings increase to $1.6 billion for every year of programming.

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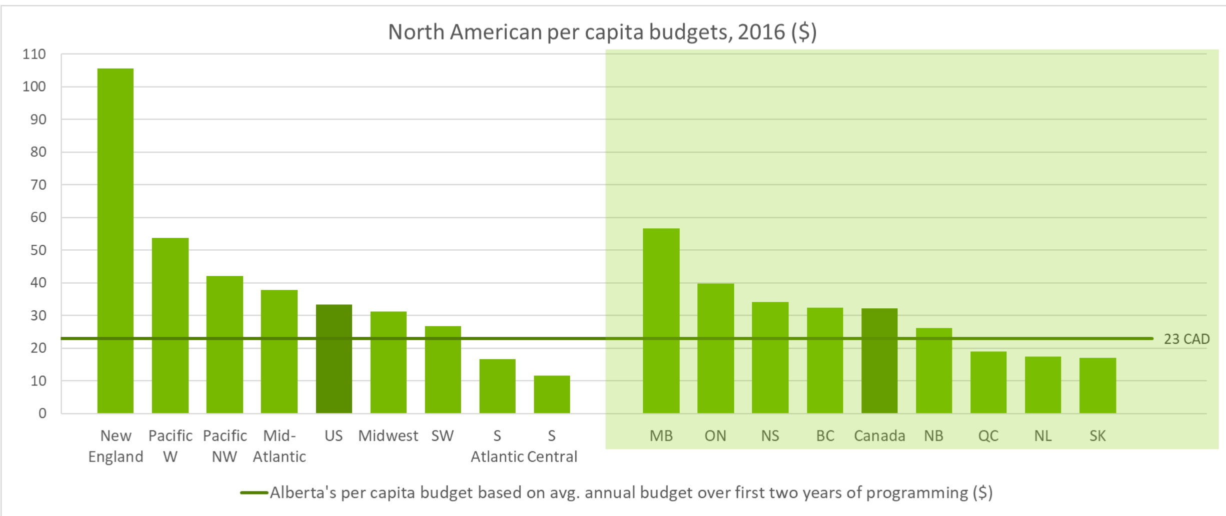
[17] This scenario includes the oil and gas sector. The savings are calculated as a percent of sector/customer segment sales is relative to the defined reference case (or business-as-usual).
[18] The study period for the report is 2019-2038.
[19] Navigant (2018). *Energy Efficiency Alberta 2019-2038 Energy Efficiency and Small-Scale Renewables Potential Study*.
[20] The expected delivered costs of energy over the 20-year study period are 8.5 cents per kWh for electricity and $5 per GJ of natural gas. These figures are primarily based on forecasts published by AESO and AER.

- To achieve results outlined in the Potential Study, an average program budget of $150 million/year or $35 per capita would be required.[21] This level of expenditure would align Alberta with the average Canadian ($32 CAD) and U.S. ($33 CAD) energy efficiency program budget for 2016.[22,23,24] See Figure 5 below for details. EEA's average budget for the first 2 years of programming is $23 CAD per capita.

Figure 5: Energy Efficiency Budget per North American Jurisdiction, per capita, 2016



2 (b) How might distribution facility owners need to respond at a technical level to the adoption of a certain technology or innovation? What modifications to their existing distribution systems may be required, and what are the expected costs?

- With decreased demand from jurisdiction-wide energy efficiency programs, distribution facility owners (DFOs) may, in the long term, be able to build less distribution infrastructure.

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[21] Without oil and gas. If oil and gas were included, another $270 million/year in program funding would be required for a total of $380 million/year.

[22] Consortium for Energy Efficiency, (2018). *2017 State of the Efficiency Program Industry*. Population figures were obtained from: Statistics Canada, (2016), Table: 17-10-0005-01 (formerly CANSIM 051-0001; and United States Census Bureau, (2018). Population, population change, and estimated components of population change: April 1, 2010, to July 1, 2018 (NST-EST2018-alldata).

[23] 1 USD = 1.3325 CAD

[24] North American jurisdictions with deregulated markets allocated almost $36 CAD per capita to energy efficiency program budgets. Over its first 2 years, EEA program budgets averaged approximately $23 CAD per capita.

This is often called a "**passive deferral**" as jurisdiction-wide energy savings are the primary goal of the programs and T&D savings are considered a co-benefit.

- The presence and extent of passive deferrals are partly dependent on the scale and longevity of energy efficiency programming in a region. The longer the region has been implementing energy efficiency programs, the greater the opportunity for passive deferrals.
- Through load reduction, energy efficiency programs can also reduce stress on feeders, substations, transmission lines or other elements of the T&D system. This can potentially reduce maintenance frequency and increase the life of some equipment because recurrent peak loads at or near design capacity can put strain on the system. This delay in maintenance and increased equipment life also avoids and/or delays some costs.[25]
- Consolidated Edison, a utility in New York, found that it would save $1 billion in projected T&D capital expenditures after adjusting its load forecasts to reflect its jurisdiction-wide energy efficiency programs – simply through passive deferrals.[26]
- The potential cost savings from these passive deferrals are often reflected in energy efficiency programming cost-effectiveness tests as avoided T&D.
  - A survey of 35 utilities found average avoided distribution costs of $48.37/kW-year (range $0 to $171/kW-year) and avoided transmission costs of $20.21/kW-year (range $0 to $88.64/kW-year).[27] The value of demand reductions is a function of the amount, timing, and location of the energy savings as well as the utility system's physical and operational characteristics (e.g. peak demand, load factor, and reserve margin).
  - EEA's Potential Study did not include any T&D cost savings or the benefits from decreased capacity requirements at this time. Cost-effective achievable potential is expected to increase with these taken into account.
- Energy efficiency programming does not require physical modifications to the existing distribution system.
- There may be infrastructure improvements that could increase the uptake of and/or enable energy efficiency measures. Smart meters in combination with communication systems that would allow instantaneous feedback of electricity consumption (e.g. an energy monitor or web-based customer energy consumption interface) have been shown to enable some

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[25] Neme, C., & Grevatt, J., (2015). *Energy Efficiency as a T&D Resource: Lessons from Recent U.S. Efforts to Use Geographically Targeted Efficiency Programs to Defer T&D Investments*.
[26] Neme, C. & Sedano, R., (2012). *US Experience with Efficiency as a Transmission and Distribution System Resource*, Regulatory Assistance Project, and Energy Futures Group.
[27] The Mendota Group, (2014*). Benchmarking Transmission and Distribution Costs Avoided by Energy Efficiency Investments*.

consumers to decrease energy consumption in the long term, especially when linked to time-of-use or other pricing structures that link consumption and cost.

- Active deferrals, or non-wires alternatives, are addressed in Question (d) below.

2 (c) Are there any expected effects on other entities that operate on the Alberta Interconnected Electric System, including the transmission system, the Independent System Operator, transmission-connected generators and/or retailers, as a result of the adoption of a certain technology or innovation? If so, how might these entities need to respond?

- Other jurisdictions have found that energy efficiency's projected annual system-wide impact is modest and predictable if stable funding is provisioned. Some examples of energy savings over time in jurisdictions with consistent energy efficiency programming include[28]:
  - Colorado had net incremental electricity savings of between 0.88% and 0.90% per year as a percentage of retail sales between 2013 and 2017.
  - Oregon had net incremental electricity savings of between 1.09% and 1.27% per year as a percentage of retail sales between 2014 and 2017.
  - New Mexico had net incremental electricity savings of between 0.52% and 0.59% per year as a percentage of retail sales between 2014 and 2017.
  - Connecticut had net incremental natural gas savings of between 0.69% and 0.52% per year as a percentage of commercial and residential retail sales between 2014 and 2017.
- Long-term energy efficiency planning ensures impacts on demand will be relatively predictable. This allows generators and the ISO to more easily adjust their capital planning accordingly.
- EEA's Potential Study estimates a decrease in consumption at an average of 0.7% per year for electricity (13% in 20 years) and 0.3% for natural gas (5.6% in 20 years). These Potential Study results are in line with actual results, as states in the U.S. reported an average of 0.7% electricity savings in 2017 (as a percentage of total electricity sales) due to energy efficiency programming.[29]

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[28] Data on U.S. state net incremental electricity savings as a percentage of retail sales were pulled from the American Council for an Energy-Efficient Economy (ACEEE)'s annual *State Energy Efficiency Scorecard*.
[29] Incremental annual electric energy efficiency savings as a percent of total sales were calculated using the U.S. Energy Information Administration's (EIA) Form EIA-861 datasets by dividing reporting year incremental annual savings by total sales across all US states. Total electricity sales data were pulled from the Sales to Ultimate Customers file while reporting year incremental annual savings were taken from the Energy Efficiency file.

- Ideally, energy efficiency program administrators follow a 3 to 5-year planning cycle to enable effective program planning guided by a Potential Study that is updated every 3 to 5 years.
- Policy and regulatory changes to integrate energy efficiency into the utility system will help ensure energy efficiency programming is predictable for the benefit of all entities that operate on the Alberta Interconnected Electric System, as well as distribution and retail utilities and consumers. Possible policy and regulatory changes will be addressed in Modules 2 and 3.

2 (d) How might a certain technology or innovation aid distribution utilities in managing and/or reducing future capital costs, including creating opportunities for non-wire alternatives and traditional utility planning approaches?

- As already discussed, energy efficiency enables the passive deferral of T&D infrastructure and a possible extension of the lifetime of some equipment. In addition, it enables the deferral of maintenance costs (see Section 3 Question 2(b)).
- Energy efficiency programs, as well as other distributed energy resources (DERs), are also increasingly being used in "**active deferrals**" or as "**non-wires alternatives.**"[30] These are geographically targeted efforts to promote alternatives, such as energy efficiency programs, demand response, and/or distributed generation, to defer or delay building T&D infrastructure.[31]
- Program administrator/utility/regulator interest in NWAs is increasing. Navigant Research estimates that global NWA spending is expected to grow from $63 million in 2017 to $580 million in 2026.[32]
- NWAs can lower system costs and ultimately consumer rates in the long-term. A study on the rate and bill impacts of Vermont's long-term energy efficiency scenarios found that the greatest downward pressure on rates over the long-term (30 year study period) was from

[30] Other terms for NWAs include distribution deferral opportunities, non-wires solutions, grid reliability resources, etc.
[31] Based on definitions in: Neme, C., & Grevatt, J., (2015). *Energy Efficiency as a T&D Resource: Lessons from Recent U.S. Efforts to Use Geographically Targeted Efficiency Programs to Defer T&D Investments*.
[32] Navigant, (2017), *Non-Traditional Transmission and Distribution Solutions: Market Drivers and Barriers, Business Models, and Global Market Forecasts*.

avoided capacity, transmission and distribution costs – they each made up 39%, 41% and 18% (respectively) of the decrease in rates.[33,34]

- Case studies can provide some perspective on cost savings from NWAs realized in other regions.
    - Tiverton NWA Pilot provided enhanced existing statewide energy efficiency offerings and new energy efficiency programming effectively saving 316 kW of peak consumption. Over the 5 years of the project, for every $1 spent $1.40 of benefits was generated. Total benefits were $5,074,600 and total costs were $3,617,400.[35]
    - Maine Boothbay Project saved 1.8 kW between 2013 and 2015. The objective was a deferral of transmission system upgrades costing an estimated $18 million. Cumulative expected costs were approximately $5 million.[36]
    - ATCO deferred the construction of a new transmission line or an expansion of the existing power plant through an energy efficiency program. The program, which reduced demand by 490 kW, ran between 1991 and 1992 in Jasper, Alberta.[37,38] After doubling in the previous 10 years, demand went from 11.90 to 10.80 MW in 5 years (1990-1994) during and after program implementation compared to a projected 13 MW. The program had high administration and marketing costs (roughly $1.8 million); however, it was still the most cost-effective solution at $519/kW ($0.038/kWh of energy saved) compared to a $8.4-million transmission line or $978/kW for a new $2.4-million generating unit.[39,40]
- When implementing NWAs that include energy efficiency programs, experience has found that it makes sense to first ramp up existing energy efficiency programs to allow longer lead times for more complex NWAs, such as uptake of distributed energy resources (DERs), to become established.[41]

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[33] Woolf, T., Malone, E., & Kallay, J. (2014). *Rate and Bill Impacts of Vermont Energy Efficiency Programs*, Synapse Energy Economics Inc.
[34] Energy efficiency programs also create a net reduction in total bill charges due to reduced electricity consumption.
[35] The Narragansett Electric Company. (2019). *National Grid 2019 System Reliability Procurement Report*.
[36] GridSolar, LLC. (2016). *The Boothbay Pilot – Final Report*.
[37] At the time of the program, the program was led by Alberta Power Limited.
[38] ATCO. (2016). Submission to the Energy Efficiency Advisory Panel.
[39] The Results IRT Center. (2019) Alberta Power *Limited*, Jasper Energy Efficiency Project (community-based DSM), Profile #107, EEGlobal Energy Efficiency Global Forum 2019.
[40] All dollar values are in 1990 US dollars.
[41] Chew, B., Myers, E.H., Adolf, T., & Thomas, E., (2018). *Non-Wires Alternatives – Case Studies from Leading U.S. Projects,* E4TheFuture, Peak Load Management Alliance, and Smart Electric Power Alliance.

- One case study highlights the efficacy of using an expert third-party (in this case, the existing energy efficiency program administrator, Efficiency Maine) to market and recruit customers.
- Case studies also found that NWAs can reduce stranded costs that can result from unnecessary infrastructure upgrades if forecasted growth does not materialize.

- Regions that use energy efficiency NWAs have had a long history of running jurisdiction-wide energy efficiency programs.[42] Consequently, pursuing energy efficiency NWAs effectively also involves ensuring the longevity of jurisdiction-wide energy efficiency programs. This would not only enable active deferrals or NWAs but passive deferrals as outlined under Question (b).
- To ensure enough lead time for NWAs, utilities would need to understand distribution upgrades sufficiently in advance to allow for planning and implementation of alternatives (i.e. the cost and load requirements of system upgrades). In Module 2, we will further discuss forecasting requirements and screening requirements that exist in other jurisdictions to enable NWAs.
- "Non-pipe alternatives" (NPAs) is the NWA equivalent for natural gas infrastructure.[43] While using natural gas geo-targeted energy efficiency programs are not nearly as prevalent, they merit further exploration in Alberta.
  - Ontario has already begun to focus attention on NPAs. The Ontario Energy Board (OEB), "expects the gas utilities to consider the role of DSM (demand-side management) in reducing and/or deferring future infrastructure investments far enough in advance of the infrastructure replacement or upgrade so that DSM can reasonably be considered as a possible alternative."[44]
  - ICF (on behalf of Enbridge) concluded that "additional research is necessary before the Gas Utilities would be able to rely on DSM to reduce new infrastructure investments as part of the standard utility facilities planning process." They recommended pilot studies to determine the cost-effectiveness of natural gas geo-targeted programs as well as metered hourly data to determine the potential impacts of DSM on new facilities requirements.

[42] Based on a literature review of NWA case studies.
[43] For ease, this submission will use NWA for shorthand, although NPAs should also be considered in the discussion regarding NWAs.
[44] OEB, (2014). Report of the Board: *Demand Side Management Framework for Natural Gas Distributors (2015-2020)*, page 2.

2 (e) How does a certain technology or innovation create the opportunity for market entry within a monopoly franchise? How might a certain technology or innovation introduce and/or increase competition within the distribution system?

- [No response provided at this time.]

4 Conclusions

As a government agency with a mandate to deliver energy efficiency awareness, programming and industry development for Albertans, EEA's focus for Module One of the AUC's Distribution System Inquiry is to highlight the potential uptake for energy efficiency in Alberta and its benefits and role in the distribution system.

This submission highlights:

- There are barriers to the uptake of cost-effective energy efficiency and energy efficiency programs are effective at overcoming these barriers.
- Energy efficiency has an established and widely accepted process to provide cost-effective energy savings that benefit the distribution systems, consumers, and wider society.
- In other jurisdictions, energy efficiency programming has offered a significant reduction in demand and cost savings to the T&D system through jurisdiction-wide programs (passive deferrals) and geographically-targeted programs (active deferrals).
- To take advantage of these cost savings, energy efficiency programming requires long planning horizons and stable funding to provide predictable energy savings over time.

5 Appendix

5.1 Definitions

Definitions for some key terms will help ensure clarity throughout the Distribution System Inquiry. In practice, EEA uses the following definitions:

- **Energy efficiency** – involves the increased uptake of measures, both technology (i.e. products, equipment, design) and behavior-based changes (practices, services or strategies), to reduce the total amount of energy demanded.

  Examples of EE include, but are not limited to, the installation of more energy efficient lighting, motors, refrigeration, HVAC equipment and control systems, building envelope measures, operations and maintenance procedures, and industrial process equipment.

- **Demand Side Management** – The planning, implementation, and monitoring of activities designed to modify patterns of energy usage, including timing and level of demand.

- **Distributed energy resources (DERs)** – energy efficiency, electricity-producing resources or controllable loads that are directly connected to the local distribution system (or connected to a host facility within the local distribution system).

- **Distributed generation or distribution system-connected generation** – small-scale technologies to produce electricity at, or close to, the end-users of power and often by the end-users of power; electricity generation connected to the electricity distribution system.

- **Demand response** – reduction of customer energy usage at times of peak usage to help address system reliability, reflect market conditions, and pricing and support infrastructure optimization or deferral.[45]

[45] ACEEE glossary, https://aceee.org/glossary_data

- **Non-wires alternatives** – investing in a range of alternatives, such as energy efficiency programs, demand response and/or distributed generation, to defer or delay investment in the transmission and/or distribution system.

- **Active deferrals** – geographically-targeted efforts to promote alternatives, such as energy efficiency programs, demand response and/or distributed generation, that defer or delay building T&D infrastructure.[46]

- **Passive deferrals** –when system-wide efficiency programs, implemented for broad-based economic and/or other reasons rather than with an intent to defer specific T&D projects, nevertheless produce enough impact to defer specific T&D investments.[47]

5.2 Details on Energy Efficiency Alberta

- As a provincial agency, EEA operates as a stand-alone organization with oversight from a Board of Directors. The agency is located in Calgary with a small office in Edmonton.
- In its first 24 months of program delivery, EEA has supported upgrades that will create over $690 million of energy savings and emission reductions. These upgrades have been delivered by a network of 1,600 service providers – engineering firms, electrical and HVAC contractors, insulation and solar installers, oil and gas service contractors, and equipment distributors – resulting in local job creation and over $850 million in economic growth.
- EEA's initial suite of programs was designed to build awareness of energy efficiency and the agency, and enable installation of low-cost, high-efficient equipment that delivered savings quickly to residential, businesses, and non-profits with relatively short project timelines.
- EEA's programs are evolving as the Alberta marketplace becomes more familiar with energy efficient alternatives and EEA builds out a network of service providers – local engineering firms, contractors, retailers, and distributors – to deliver project design, installation and commissioning, and operations and maintenance for a variety of larger industrial, commercial, and residential projects.

[46] Based on definitions in: Neme, C., & Grevatt, J., (2015). *Energy Efficiency as a T&D Resource: Lessons from Recent U.S. Efforts to Use Geographically Targeted Efficiency Programs to Defer T&D Investments*, 2015.
[47] From: Neme, C., & Grevatt, J., (2015). *Energy Efficiency as a T&D Resource: Lessons from Recent U.S. Efforts to Use Geographically Targeted Efficiency Programs to Defer T&D Investments*.

- Programs are now designed to support more complex projects with the opportunity for deeper energy savings. The primary focus has shifted from the residential sector to commercial and industrial markets.
- Financing initiatives being developed and deployed include the Green Loan Guarantee Program and the Clean Energy Improvement Program (Alberta's version of a Property Assessed Clean Energy Program).
- All program results are reviewed and verified by a qualified third-party evaluator, similar to verification undertaken in other jurisdictions for reporting into a utility regulator.
- EEA coordinates service delivery with related government programs, including the Municipal Climate Change Action Center (MCCAC); individual municipalities; the Government of Alberta Departments of Agriculture (Farm Energy and Agri-Processing Program), Seniors and Housing (Affordable Housing Program), Municipal Affairs (Clean Energy Improvement Program), Treasury Board and Finance (Green Loan Guarantee Program), Economic Development and Trade, Energy, and Indigenous Relations, as well as Environment Canada and Natural Resources Canada.

5.1 Societal Benefits from Energy Efficiency

Energy efficiency programs and services support a wide range of policy priorities including:

- *Economic growth and local job creation* – stimulating demand for the purchase and installation of energy efficient and distributed generation technologies and creating additional jobs when energy cost savings are reinvested in the economy. Energy efficiency investments drive jobs in local, labour-intensive industries – such as construction, engineering, maintenance, and contracting.[48]
- *Industry competitiveness* – supporting investment in projects that reduce utility and operating costs and build Alberta's reputation for environmental leadership in local and international markets.
- *Emission reduction* objectives – contributing to meeting Alberta's obligations under national, international, and industry agreements.

[48] Bell, C., (2014). *Understanding the True Benefits of both Energy Efficiency and Job Creation*, Community Development Innovation Review.

- *Innovation* – accelerating the uptake of new technologies in the marketplace, picking up where research, development and commercialization support ends.
- *Expanding Alberta's financial services* sector – building innovative financing structures.
- *Delivering programs and services to support disadvantaged communities* – including affordable housing and limited-income households, non-profit organizations, rural and Indigenous communities.

5.2 More EEA Results – 2017-2019

5.2.1 Economic Impact

From 2017-2019 (fiscal years), EEA's programs:

- Saved Albertans $84 for every tonne of carbon dioxide equivalent (CO_2e) reduced.
- Generated $849 million GDP in economic activity, creating almost 4,300 jobs years.
- EEA programs are provided a three-to-one return on investment for Albertans, i.e., for every $1 invested through EEA programs, Albertans are receiving over $3 in return. Benefits include participant's utility bill and operating cost savings, and the value of the emission reductions.

5.2.2 Market Participation

Albertans are actively participating in EEA's programs. As of March 31, 2019, the following have participated in EEA programs:

- 1,974 commercial, institutional, and industrial facilities,
- Nearly 50 of Alberta's largest employers in key industry sectors (oil and gas companies, midstream operators, sawmills and forest products companies, manufacturers, healthcare facilities, and hospitality businesses),
  - With close to 60 projects from over 30 oil and gas companies,
  - 589 non-profits, and
  - Over 210,000 individual households.
- EEA programs are delivered through Alberta trade allies, municipalities, and utilities.

- EEA utilizes a market-based program delivery method, meaning that the facility owner/manager participating in an EEA program selects the organization that installs their project.
- Over 1,600 Alberta engineering firms, solar installers, and electrical and heating, ventilation and air conditioning (HVAC) contractors have installed $306 million in projects.
- Over 500 retail locations across the Province have sold more than $100 million worth of energy efficient products.