



Energy Efficiency and Community Energy in Alberta:

DISCUSSION DOCUMENT





Contents

- Minister’s Message 1
- Message from the Advisory Panel Chair 2
- Overview and Context: Energy Efficiency and Community Energy in Alberta 3
- Energy Efficiency Advisory Panel 4
- Opportunities for Energy Efficiency and Community Energy 6
- Barriers to Implementing Energy Efficiency and Community Energy 7
- How do we overcome these barriers to promote energy efficiency and community energy? 8
- Programming Tools and Options 9
- What programming tools best promote energy efficiency and community energy? 10
- Defining Success 10
- What measures of success best demonstrate energy efficiency and community energy? 11
- Technologies 11
- Getting Involved 14



Minister's Message

From the outset of announcing Alberta's Climate Leadership Plan in November 2015, the provincial government has focused on developing and implementing energy efficiency and community energy systems as the easiest and most economical way to reduce greenhouse gas emissions. The new *Climate Leadership Implementation Act* brings Albertans one step closer to saving on their energy bills and helping to lower greenhouse gas levels throughout the province.

The Act establishes Energy Efficiency Alberta, the public agency that will put provincial-scale energy efficiency and community energy system programs in place in early 2017. The Energy Efficiency Advisory Panel will ensure this timeframe is met.

The Energy Efficiency Advisory Panel will engage with a cross-section of Albertans, including individuals, Indigenous communities, and municipal and industry stakeholders, to determine the types of energy savings and community energy programs that Energy Efficiency Alberta can deliver in the short- and medium-term. Alberta's approach to energy efficiency and community energy systems will ensure the largest reduction of greenhouse gas emissions at the lowest possible cost to the economy.

This discussion document is meant to help guide the engagement process. Throughout the document a number of questions will provide a starting point for conversations. These conversations will provide the information the panel needs to develop its recommended approach, programming options and general advice to government.

We invite you to share your perspective.

Energy efficiency and community energy systems program development is another leadership step Alberta is taking on its fight on climate change. It adds to efforts to protect the health of Albertans, our environment and our economy.

Shannon Phillips, Minister of Environment and Parks, Minister Responsible for the Climate Change Office

June 2016



Message from the Advisory Panel Chair

I am delighted the Government of Alberta invited me to chair its Energy Efficiency Advisory Panel. Experience around the world and evidence from many independent international agencies confirms that energy efficiency is *the most cost effective* energy investment that any jurisdiction can make. Energy efficiency, combined with targeted investments in community-level renewable energy, creates reliable green jobs, delivers regional economic development, reduces fuel poverty for those on low incomes and reduces carbon pollution at least cost.

Through this initiative, the Alberta economy will benefit from deploying the smartest new technologies emerging in the fields of energy efficiency and small scale renewables and Albertans will know that every single dollar invested will generate social, economic and environmental pay offs. Those benefits will be experienced both in the short term and in the long term.

The work of our panel will ensure that the benefits are maximized in line with international best practices and that accountability for performance is hardwired into the design of the independent agency that will be charged with responsibility for developing and executing programs.

The agency needs to be high performing and effective, measuring and reporting on performance in real time. In addition the agency needs to enthuse Albertans with the possibilities: for transformation of the provincial economy; for the creation of opportunity for Indigenous communities and other key sectors of Alberta's municipal and civil society sectors; for reductions in energy costs for all consumers; and for social and environmental leadership in Canada.

It is the job of our panel – working closely with all stakeholders and communities – to design and deliver that vision.

Dr. David Wheeler, Chair, Energy Efficiency Advisory Panel

June 2016

Overview and Context: Energy Efficiency and Community Energy in Alberta

Alberta's Climate Leadership Plan was launched in November 2015, based on recommendations from the Climate Change Advisory Panel. This panel, chaired by Dr. Andrew Leach, based on public, Indigenous and stakeholder engagement, delivered a report with specific recommendations on energy efficiency and community energy:

- An energy efficiency strategy is a key complementary program to the proposed economy-wide carbon levy.
- A dedicated Energy Efficiency Alberta entity would address the unique structure of the Alberta electricity market.
- Energy efficiency programming should be broadened to include the deployment of community-scale energy systems.
- Performance accountabilities are foundational to the programming and least cost incremental reductions should be pursued as a priority.
- Integrating services for audits, incentives, financing and installation for the full range of best new building energy technologies can reduce barriers to adoption.

Demand-side management and community energy systems will help reduce greenhouse gas emission in households, communities and businesses, help Albertans reduce their energy use and lower their energy costs.

In Budget 2016, Alberta estimated that, over the next five years, carbon pricing is expected to raise \$9.6 billion, all of which will be reinvested in the economy and a rebate program for Albertans:

- \$6.2 billion will help diversify our energy industry and create new jobs:
 - \$3.4 billion for large-scale renewable energy, bioenergy and technology;
 - \$2.2 billion for green infrastructure such as transit; and
 - \$645 million for Energy Efficiency Alberta, a new provincial agency that will support energy efficiency programs and services for homes and businesses.
- \$3.4 billion will help households, businesses and communities adjust to the carbon levy.

The Government of Alberta, through the *Climate Leadership Implementation Act*, established Energy Efficiency Alberta, a public agency to deliver energy efficiency and community energy system programs. The agency will be established and operational by the end of 2016, with the expectation that energy efficiency and community energy system programs will be launched in early 2017. The agency will:

- Raise awareness among energy consumers of energy use and the associated economic and environmental consequences;

- Promote, design and deliver energy efficiency and conservation programs, and develop community energy systems (including community energy systems, and micro- and small-scale generation); and
- Promote the development of an energy efficiency and community energy services industry.

The agency will ensure programs are relevant to a broad range of Albertans, organizations and industries, including rural, remote and Indigenous communities, the agricultural sector, businesses and small industrial consumers, and not-for-profits¹.

Energy Efficiency Advisory Panel

The Energy Efficiency Advisory Panel will help launch Energy Efficiency Alberta. The panel will engage with Albertans and produce a report to the Minister of Environment and Parks, Responsible for the Climate Change Office, on the path forward. The report will include:

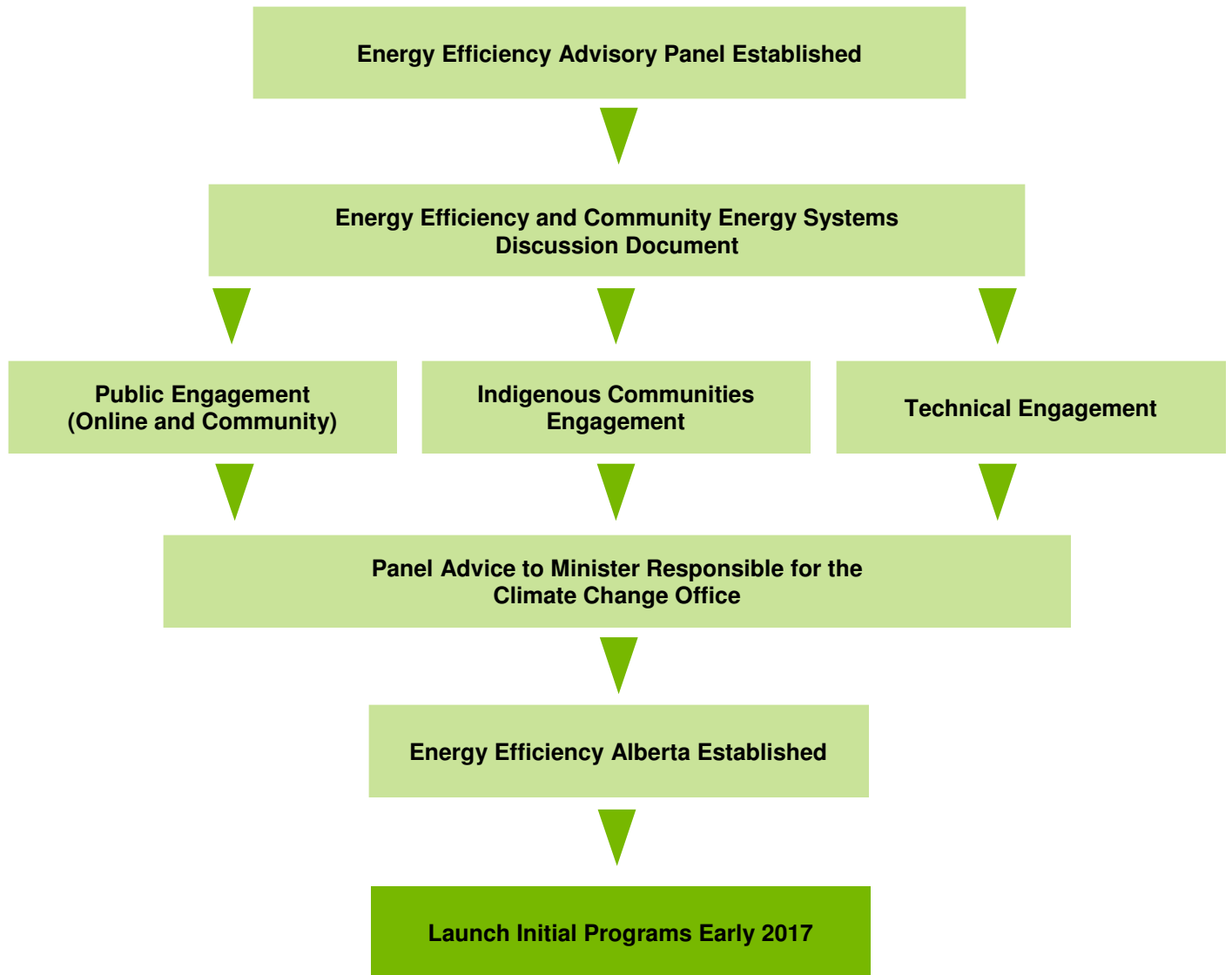
- Advice on programs the agency could undertake that would be lowest cost and highest impact in terms of maximizing economic and social benefits, while significantly reducing greenhouse gas emissions.
- Recommendations for education and outreach initiatives to help consumers reduce energy use and emissions.
- A vision for energy efficiency's long-term mission and goals. Recommendations will include how to promote, design and deliver demand-side energy management programs that deliver an environmental advantage. Examples include energy efficiency and conservation, fuel switching, demand response, and demand-side energy systems.

The panel comprises individuals with the expertise and experience that will help Alberta establish long-term energy efficiency and community energy systems programming to bring the greatest reduction of greenhouse gas emissions at the lowest overall cost to the economy.

Over the coming months, the panel will gather input from Albertans, Indigenous communities, municipal and other civil society sectors, and technical stakeholders. This will ensure a well-rounded perspective on the challenges and opportunities related to energy efficiency and community energy.

Visit www.EnergyEfficiency.alberta.ca for more information, to learn about the engagement process, opportunities, to attend public meetings, or to submit feedback online.

¹ Examples may include replacing diesel generated electricity in remote First Nation communities, or bioenergy operations on farms.



The image above outlines how the panel's engagement ties into the development of the agency and the launch of programs in early 2017.

The purpose of this document is to help facilitate discussions by highlighting the various energy efficiency and community energy program areas, programming tools and opportunities available to Albertans.

For the purposes of this document:

Energy efficiency refers to initiatives that would increase the effective use of energy through a particular technology or process. Exchanging a light bulb for one that uses less energy is an example of energy efficiency.

Energy conservation is simply using less energy. Turning off a light when you leave the room is an example of energy conservation.

Demand side management (DSM) refers to all changes made by energy users to achieve large-scale energy efficiency improvements (International Energy Agency, 2011). It includes activities that change how much energy consumers use, when it is used it, or in what form – for example shifting electricity use from periods of high peak to off-peak hours, and improving energy efficiency and conservation.

Community energy systems technologies includes both micro-generation and small-scale energy generation. Micro-generation is not intended to produce electricity beyond the owner's needs. Generated capacity is less than one megawatt from alternative or renewable sources of energy. Small-scale community generation refers to generation owned by a local community, co-operative or non-profit organization (including schools, post-secondary institutions and hospitals, etc.). Generation capacity from alternative or renewable sources of energy may be larger than a micro-generation site.

Opportunities for Energy Efficiency and Community Energy

Energy efficiency is widely recognized as the most cost-effective way to reduce greenhouse gas emissions. Energy efficiency is always less expensive and easier to use than developing new energy sources over the long term. Through energy efficiency gains, it is possible to defer the development of new sources of energy while continuing to meet demand.

Across Alberta, the unique needs of individuals, communities and businesses may differ. Energy efficiency and community energy programs can be designed specifically to cater to these sectors. For example:

- Province-wide programs (residential, commercial and transportation)
- Indigenous community programs
- Institutional programs (schools, hospitals, charitable sector)
- Lower-income programs
- Agricultural programs and programs with a rural focus

- Small/medium business and small industrial consumer programs
- Not-for-profit group programs
- Community energy systems including district energy, combined heat and power and small-scale renewables
- Programs targeting micro-generation

Each unique sector or area has opportunities for efficiency in housing, buildings, transportation and renewable and alternative energy are available. Within housing, specific opportunities include:

- Heating, ventilation and air conditioning systems (HVAC)
- Building envelope (e.g., insulation)
- Information and building management (e.g., day-to-day operations, programmable thermostats, smart metering, storage, etc.)
- End-use technologies (e.g., kitchen appliances, electronics);
- Lighting
- Renewable energy generation

In the transportation sector, energy efficiency opportunities include:

- Fuel switching (from gas vehicles to electric, hybrid and other advanced technology vehicles)
- Conservation (e.g., ride sharing, public transportation, biking or walking);
- Vehicle fuel efficiency awareness (e.g., fuel consumption labels, comparator charts)
- Driving practices (e.g., slow acceleration, driving consistent speeds)

Barriers to Implementing Energy Efficiency and Community Energy

While energy efficiency is one of the best ways to achieve cost-effective greenhouse gas emission reductions, it is sometimes difficult to implement energy efficiency improvements. A number of factors such as those below can be barriers to adoption.

Awareness – Homeowners, businesses and communities can be unaware of their level of energy efficiency and are unsure what they can do to change their energy consumption.

Ownership Transfer Barrier – This arises when the payback period on an energy efficiency upgrade or a small scale renewable investment exceeds the length of time the owner or manager will own a facility or business.

Payback Periods - Individual consumers, businesses and communities are sometimes much more sensitive to the initial cost of a device than to future long-term cost savings.

Split Incentive Problem – This arises when the person, business or community responsible for facility maintenance is not responsible for energy costs, which means there is no incentive to make efficiency upgrades or explore opportunities for renewable energy, smart grid or storage investments.

Technical Capacity – Individuals, community organizations and small businesses may lack access to technical expertise and may be unable to explore and execute investments in efficiency or small scale renewables.

Technological Risk – New or unfamiliar technologies are sometimes associated with higher risk, because of unproven performance.

Transaction Costs - There can be time-consuming steps involved in improving energy efficiency and deploying community energy systems, including energy audits, researching energy efficiency opportunities, designing systems and installing devices.

Upfront Costs - The upfront costs for high-impact energy efficiency upgrades, or the need to finance a renewable energy development, may exceed the capital budgets for repairs and renovations at household, small business or community levels.

How do we overcome these barriers to promote energy efficiency and community energy?

Discussion – Barriers:

- Q1.** Are there barriers not listed that you think are important?
- Q2:** What are the most significant barriers to adopting energy efficient and community energy system technologies that are common to all sectors?
- Q3.** Are certain barriers unique to a particular sector?
- Q4.** Given the large number of potential program areas, where should government focus its efforts in the short-, medium- and long-term?

Programming Tools and Options

Different programming tools can promote energy efficiency and community energy systems.

Consumers can take advantage of a number of available low-cost energy efficiency measures. Many homeowners and businesses, however, are not fully aware of opportunities to reduce their energy consumption and utility bills. **Education and outreach** provides information on best practices in technology as well as associated benefits and risks. This allows consumers to learn about new technologies and compare different options to improve energy efficiency.

Examples:

- Home and business energy assessment tools
- Detailed energy billing
- Building and equipment labeling
- Consumer-focused websites

A major barrier to implementing energy efficiency is the up-front capital costs associated with many energy efficiency improvements. **Incentives**, whether direct grants or loans, or indirect tax breaks, help users adopt newer, more efficient technologies. Incentives can reduce some risk of investing in new technologies to reduce energy use and greenhouse gas emissions.

Examples:

- Rebates for new energy efficiency and community energy system technologies
- No- or low-interest loans
- Rebates for household and business energy audits

Once technologies mature, implementing **standards and regulations** and other policy tools can ensure the level of energy efficiency is continually improving throughout all sectors in the province.

Complementary programs and policy approaches support improvements.

Examples:

- Equipment and appliance minimum performance standards
- Building codes

What programming tools best promote energy efficiency and community energy?

Discussion – Programming Tools:

- Q1.** Which programming tools are most effective at driving uptake of energy efficiency and community energy system technologies and why?
- Q2.** Are certain programming tools more effective than others at driving efficiency in a particular sector? If so, please specify the programming tool (or combination of tools) and the sector.

Defining Success

To design effective energy efficiency and community energy programs, it is necessary to develop an objective approach to determine which technologies should be selected. Some examples of measures of success include:

Economic impact: the number of stable green jobs associated with program options and the direct and indirect benefits to urban and rural economies associated with the implementation of programs.

Cost-effectiveness: the cost of achieving greenhouse gas (GHG) emissions reductions, also known as the abatement cost. Technology or behaviour changes with a lower abatement cost will achieve greater emissions reductions and energy savings per dollar invested.

GHG reduction potential: the total GHG reduction potential of a particular technology or program.

Incentive cost: the cost of the incentive to motivate energy consumers to adopt the technology or behaviours (based on the incremental cost between the conventional technology/behaviour and the energy efficient alternative).

Proven: the program or technology has been proven to be successful in Alberta, or elsewhere in the world.

Regional diversity and reach: the potential reach of a particular technology or program in terms of the number of households, people, buildings, communities or businesses that can implement this technology.

Regional relevance: ensuring that programs are helpful to Albertans in all types of communities, including rural and remote.

Social benefit: the reduction of energy costs to low- and middle income households.

Social inclusion: the economic and social benefits to Indigenous communities, for example, through job creation and lower energy costs per household.

What measures of success best demonstrate energy efficiency and community energy?

Discussion – Measures of Success:

- Q1.** Which measures of success do you feel are most important to informing energy efficiency and community energy programming?
- Q2.** Are there additional measures you would add? Are there any measures you think should be removed?

Technologies

A large number of energy efficiency and community energy technologies and measures are available to consumers. Technologies vary significantly from sector to sector, and in terms of capital costs, installation costs, maturity of technology, and impact on energy use. Energy audits often are used to assess the specific needs of a household, business or industrial facility, and to recommend appropriate equipment or appliance upgrades.

Examples of Energy Efficient Technologies and Practices

	Category	Technologies and Behaviours
Residential Buildings	Low cost conservation measures	Programmable thermostats, weather stripping, low flow showerheads, energy audits
	Appliances	High efficiency appliances (e.g., fridges, washing machines)
	Space and water heating	Insulation, high efficiency furnace and hot water heaters, waste heat recovery systems
	Lighting	Light emitting diodes (LED)
	Building operations	Day-to-day management and operations to improve efficiency
	Behavioural change	Individuals take responsibility for reducing energy use
Commercial Buildings	Auxiliary Motors	High efficiency motors
	Space and water heating	High efficiency furnaces and boilers, furnace vent dampers, and waste heat recovery
	Lighting	Fluorescent upgrades (e.g., t5), bulb, light emitting diodes (LED)
	Auxiliary equipment	High efficiency equipment
	Building operations	Day-to-day management and operations to improve efficiency
	Behavioural change	Individuals take responsibility for reducing energy use
Transportation	High efficiency passenger and commercial vehicles	High efficiency gasoline, high efficiency diesel, hybrid electric and electric vehicles
	Commercial vehicle upgrades	Devices to increase efficiency of commercial vehicles (e.g., anti-idling devices, aerodynamic aids, etc.)
	Conservation and efficient driving techniques	Ride sharing, public transit, fuel consumption labeling, driving consistent speeds, slow acceleration, etc.

Examples of Small-Scale and Community Energy Technologies and Practices

Technology	Application Examples	Considerations
Solar Photovoltaic (Solar PV) - Producing electricity using solar energy	<ul style="list-style-type: none"> • Residential • Commercial • MUSH sector (Municipal, Universities, Schools and Hospitals) • Industrial • Community 	<ul style="list-style-type: none"> • Capital costs decrease as technology improves • Alberta has good solar PV potential • Requires space and access to sunlight
Solar Thermal – Producing hot water using solar energy	<ul style="list-style-type: none"> • Residential • Commercial • MUSH sector • Industrial 	<ul style="list-style-type: none"> • Mature technology • Alberta has good solar thermal potential • Requires space and access to sunlight
Small Wind Turbines	<ul style="list-style-type: none"> • Residential • Commercial • MUSH sector 	<ul style="list-style-type: none"> • Not as common as solar technologies • Wind potential varies throughout Alberta
Geothermal – using earth’s heat to produce electricity and/or heat	<ul style="list-style-type: none"> • Residential • Commercial • MUSH sector • Industrial • Community 	<ul style="list-style-type: none"> • Potential varies throughout province • Installation is more involved than other technologies • Can include benefit of electricity and heat provisions
Combined Heat and Power systems	<ul style="list-style-type: none"> • Commercial • MUSH sector • Industrial • Community 	<ul style="list-style-type: none"> • Improved efficiency with combined generation • Scalable and suitable for aggregate and larger systems

What technologies and practices best drive energy efficiency and community energy?

Discussion – Technologies and Practices:

- Q1. What are the most important factors in determining which technologies and practices should be included in energy efficiency and community energy programs?

Getting Involved

Albertans are invited to participate and provide feedback to the Energy Efficiency Advisory Panel. This feedback will inform energy efficiency and community energy system programming, which can help Albertans, businesses and communities transition to a lower carbon economy.

Visit www.EnergyEfficiency.alberta.ca for more information, to learn about the engagement process, opportunities, to attend public meetings, or to submit feedback online.