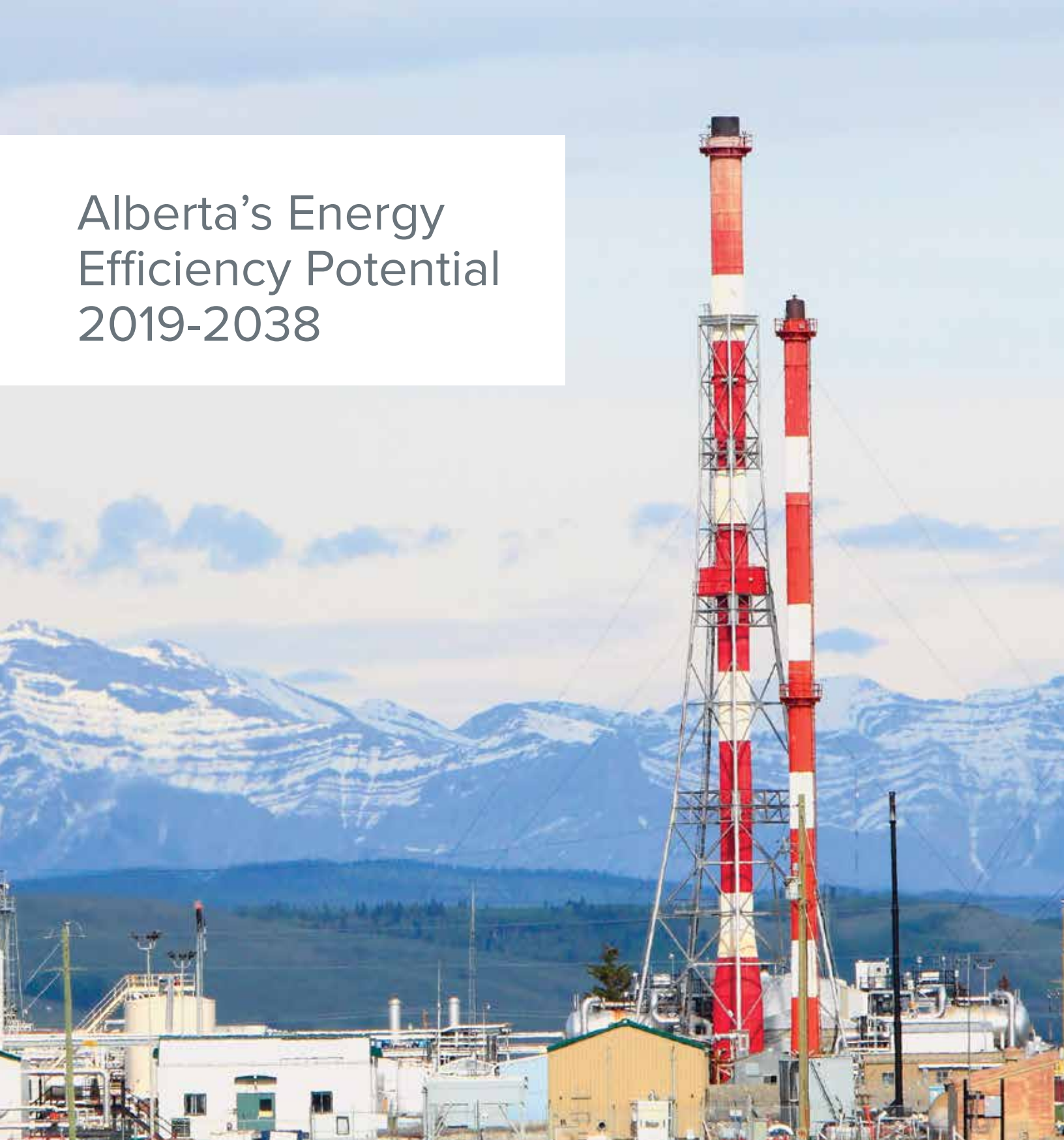


Alberta's Energy Efficiency Potential 2019-2038



Energy
Efficiency
Alberta

Alberta's Energy Efficiency Potential

Energy Efficiency Alberta delivers province-wide programs to increase the uptake of energy efficiency and small-scale renewable energy in Alberta. To help with this work, Energy Efficiency Alberta commissioned Navigant Consulting to undertake a study to estimate the potential for these types of programs to help Albertans save energy, save money and reduce emissions. The study that was completed is similar to potential studies undertaken for other jurisdictions, including potential studies that Navigant has done previously for Saskatchewan and British Columbia.

Benefits of the study:

- Identifies potential costs and benefits of province-wide programs
- Identifies the relative opportunities within sectors, sub-sectors and end-uses
- Helps inform the design of programs and budget setting

Results

This study found there is the potential to generate \$1 billion in gross savings for every year of programming and 4.4 Mt CO₂e of greenhouse gas emission reductions. To achieve these results, the average cost of programs would be \$150 million per year and leverage \$290 million of investment from participants.



\$150 MILLION
ANNUAL
PROGRAM
BUDGET



\$290 MILLION
PROGRAM
PARTICIPANT
INVESTMENT



\$1B
\$1 BILLION/
YEAR GROSS
SAVINGS

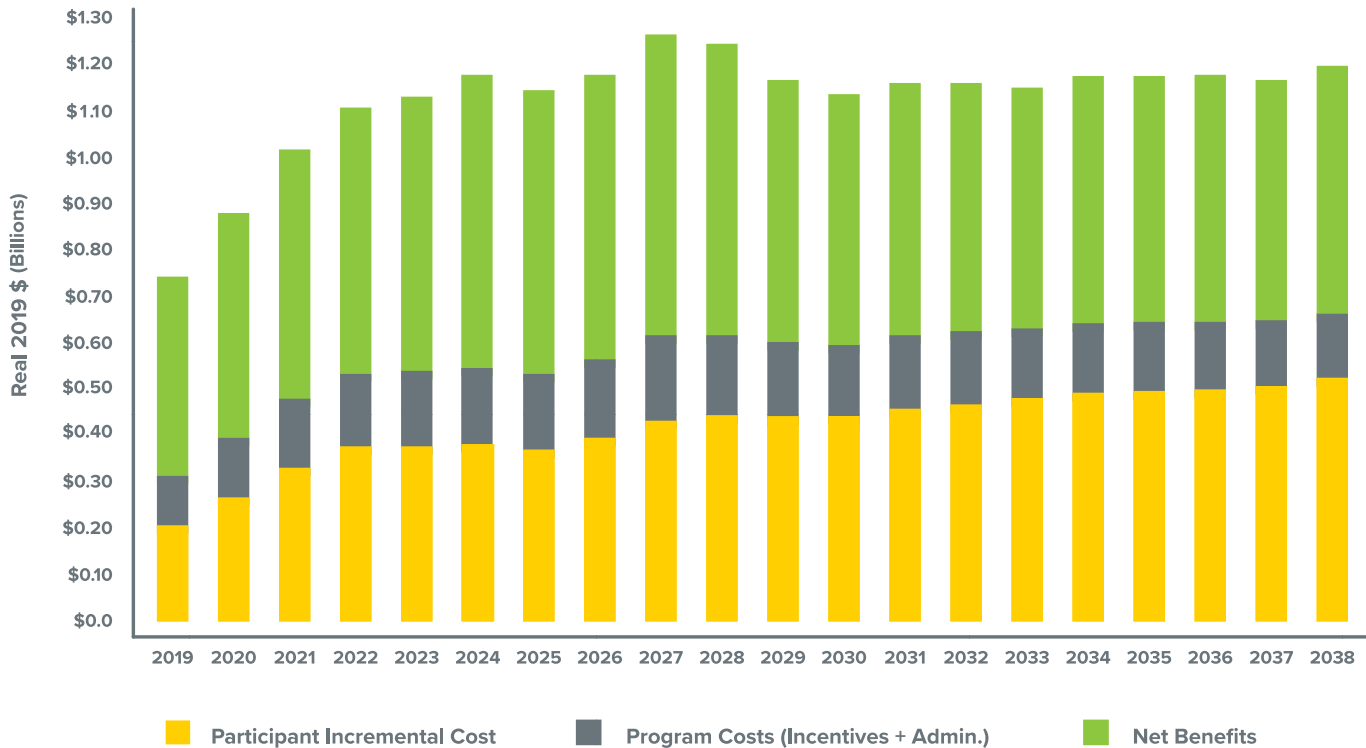


4.4 MT CO₂e OF
GREENHOUSE
GAS EMISSION
REDUCTIONS



* CO₂e = Carbon dioxide equivalent

Benefits and Costs, Energy Efficiency and Solar Measures (excluding Oil & Gas)



2.0% inflation was used to convert values to real 2019 dollars
 Source: Navigant Consulting

Energy Efficiency Alberta is currently focused on energy savings in residential and commercial buildings, and small- and medium-sized industrial facilities. This was approximated in the modelling by excluding the oil and gas sector within the base scenario as a significant amount of energy used in that sector is within facilities considered Large Final Emitters (LFEs).

Opportunities in the transportation sector were not included in the current study, but will be further investigated as Energy Efficiency Alberta’s program portfolio evolves.

This base scenario had an average program budget of \$150 million/year. This would result in an average annual investment of \$290 million/year from program participants and \$1 billion in savings, as well as 4.4 Mt CO_{2e} in GHG emission reductions. This is a two to one return on investment. Peak electricity savings for this scenario are estimated to be 900 MW by the end of the study period in 2038.

This means \$125 is saved for every tonne of CO_{2e} reduced.

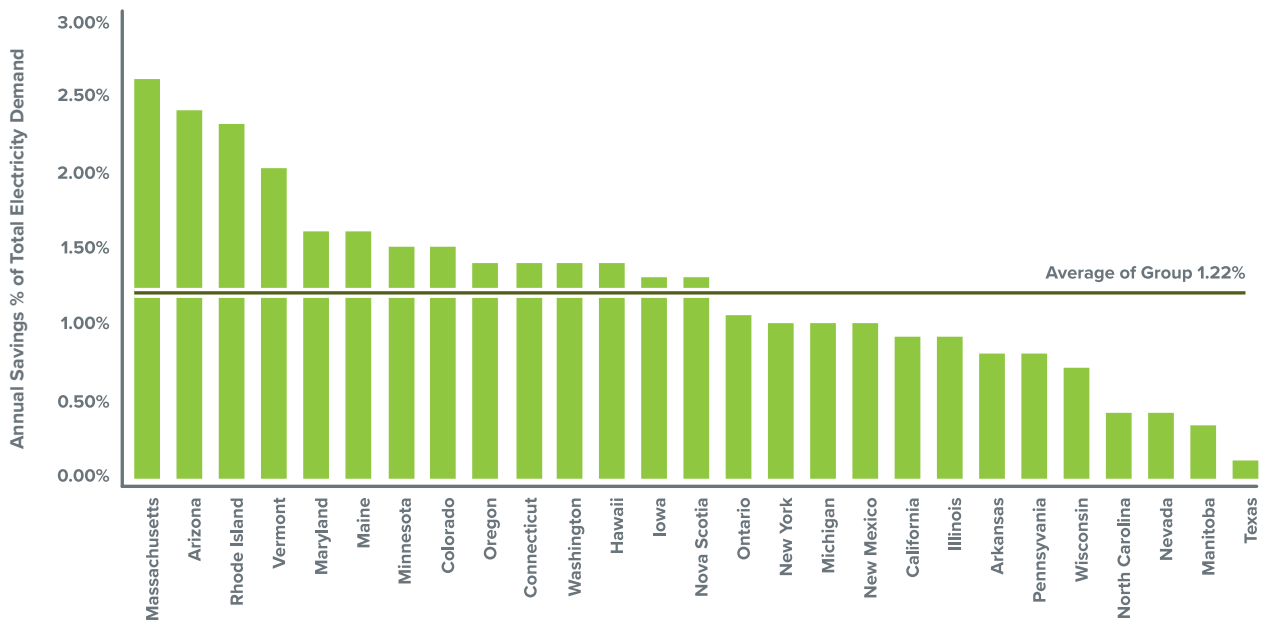
Scenario Including Oil and Gas

If the oil and gas sector is included in the base scenario, the average program budget goes up to \$270 million/year to respond to the increased opportunities available for saving energy. This would result in an average annual investment of \$380 million/year from program

participants, \$1.6 billion in savings, and 8.9 Mt CO_{2e} in GHG emission reductions. This is a benefit-cost ratio of 2.5 to 1. Peak electricity savings for this scenario are estimated to be 1,300 MW by the end of the study period in 2038.

Annual Electricity Savings Targets Across North America (2014-2020)

The Potential Study results are similar to what has been seen in other markets. For example, the base scenario found potential electricity savings in buildings, and non-oil and gas industrial facilities to be around 1% per year. This is similar to electrical efficiency targets found in other jurisdictions in Canada and the US.



Source: <http://www.aeea.ca/pdf/energy-efficiency-scenarios-for-alberta.pdf>

Base Scenario – Includes Residential, Commercial and Non-Oil & Gas Industrial Facilities in Alberta (Study Period 2018-2038)

 **\$150M**
ANNUAL PROGRAM BUDGET

 **\$290M**
PROGRAM PARTICIPANT INVESTMENT



2.3:1
BENEFIT TO COST

 **\$1B**
IN SAVINGS

 **4.4 Mt**
CO₂e
IN GHG REDUCTION

 **900 MW**
DECREASE IN ELECTRICITY DEMAND

Base + LFE Scenario – Includes Residential, Commercial and Industrial Facilities including Oil & Gas in Alberta (Study Period 2018-2038)

 **\$270M**
ANNUAL PROGRAM BUDGET

 **\$380M**
PROGRAM PARTICIPANT INVESTMENT



2.5:1
BENEFIT TO COST

 **\$1.6B**
IN SAVINGS

 **8.9 Mt**
CO₂e
IN GHG REDUCTION

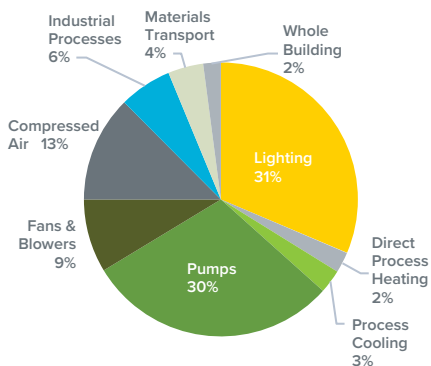
 **1,300 MW**
DECREASE IN ELECTRICITY DEMAND



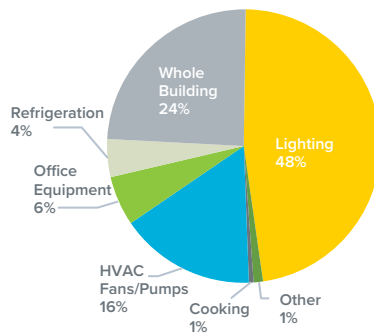
2028 Achievable Potential from Energy Efficiency, Cumulative Gross Savings at Meter, by End Use²

For the base scenario, the breakdown of energy efficiency savings by sector and end-uses shows that lighting, and space or process heating present considerable opportunity for saving energy.

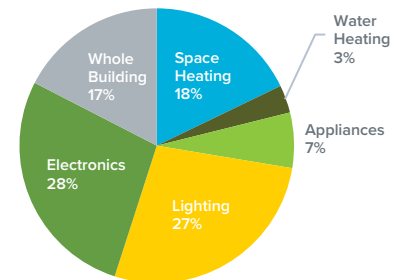
Industrial Electric Energy Achievable Potential by End Use (GWh/year)



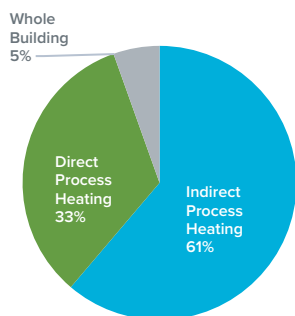
Commercial Electric Energy Achievable Potential by End Use (GWh/year)



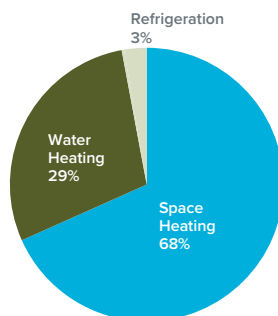
Residential Electric Energy Achievable Potential by End Use (GWh/year)



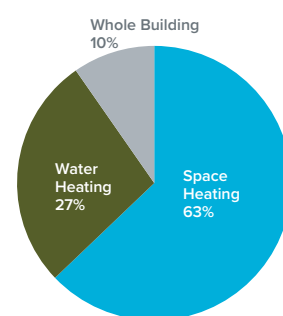
Industrial Gas Energy Achievable Potential by End Use (TJ/year)



Commercial Gas Energy Achievable Potential by End Use (TJ/year)

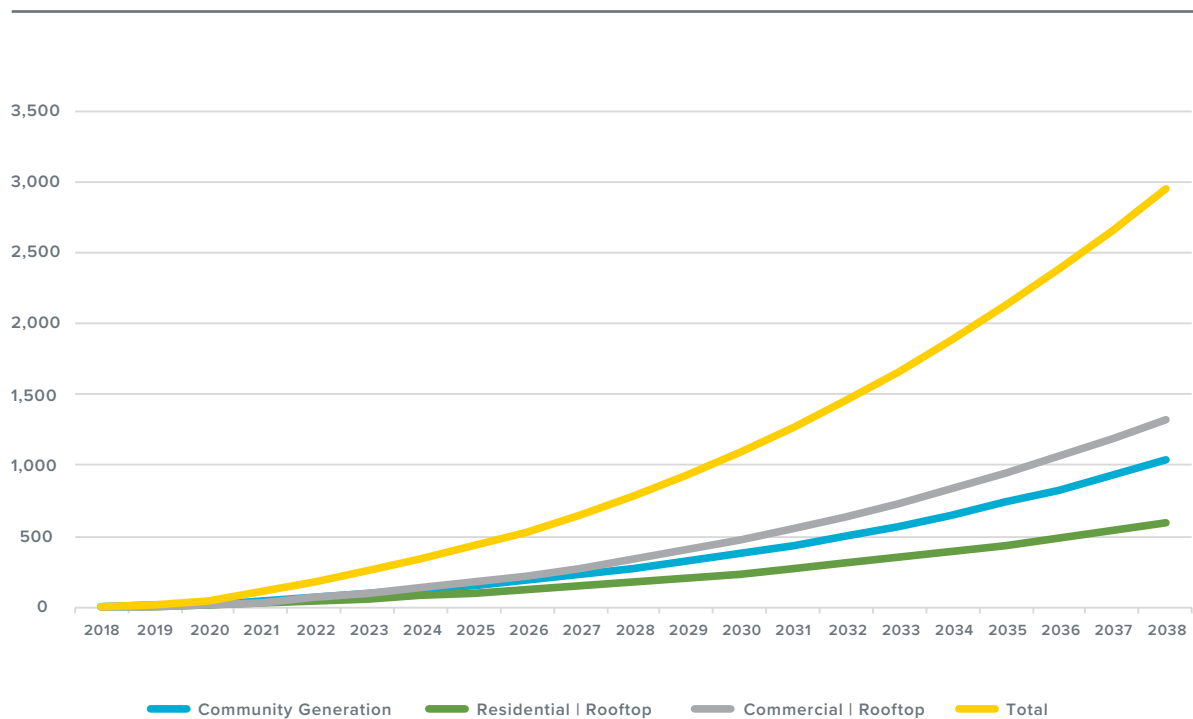


Residential Gas Energy Achievable Potential by End Use (TJ/year)



² The whole building end use accounts for energy savings attributed to combined heating and cooling savings (e.g. from control systems upgrades) and envelope measures.

Total Cumulative Installed Solar Capacity (MW)



Opportunities for increased solar generation are also projected to be considerable as prices continue to decrease over the next 20 years. It should be noted, however, that community-based solar projects are still in their infancy in Alberta and results should be interpreted as an indication of long-term potential.

Cost of Saved Energy

The average cost for energy efficiency measures in the base scenario is 2.4 cents/kWh of electricity and \$3.88/GJ of natural gas saved. The average cost for solar energy in the base scenario is 5.5 cents/kWh of electricity generated and takes into account an expected decrease in the cost of solar panels into the future. These figures include costs incurred by both the program and participants to purchase and install the measures. These costs are lower than the expected delivered cost of energy over the 20-year study period (8.5 cents/kWh for electricity and \$5/GJ of natural gas³) and result in a greater than two to one benefit-to-cost ratio for the measures installed.

³ Navigant Consulting. 2019 – 2038 Energy Efficiency and Small-Scale Renewables Potential Study. Prepared for Energy Efficiency Alberta. Page B-3. Link: efficiencyalberta.ca/potentialstudy



Revenue Streams

It is common for energy efficiency programs to generate revenue based on the range of benefits provided including:

- Energy savings
- Contribution to a capacity market
- Ability to reduce utility infrastructure costs
- Emissions reduction
- Economic development
- Poverty alleviation

The different revenue sources often work independently. For example, government funds may be directed towards poverty alleviation or economic development, whereas energy savings and reduced infrastructure costs are most often funded through utility systems to keep overall costs down for consumers. There are also times where a single program has multiple revenue sources (e.g. energy and infrastructure savings are funded through the utility rate base, capacity contributions are bid into the electricity capacity market, and emission reductions are sold through an emission trading market or funded from a price on emissions).

Base Scenario

The base scenario in this study was set to maximize savings if it is funded solely from an emissions reduction perspective. Funding in this case was targeted at \$30 of program spending for each tonne of CO₂e reduced.

Alternate Scenarios

A more common way to fund energy efficiency programs is through the utility system as a way to reduce overall consumer costs. This scenario is based

on incentive levels benchmarked against other jurisdictions. When excluding the oil and gas sector, this results in an average annual program budget of \$250 million/year. Adding the base scenario and the utility system scenario together results in an average annual budget of \$470 million/year and would place Alberta among the leaders in per capita investments in energy efficiency programs while providing a return on investment of nearly \$2 for every dollar spent.



Realizing Alberta's Energy Efficiency Potential

Energy efficiency programs are a common way to reduce utility system costs and emissions at the same time. They also contribute to economic development and job creation, and can be used to help support vulnerable sectors.

Energy Efficiency Alberta looks forward to delivering on the potential that energy efficiency programs can offer, and working with stakeholders to identify the right level of activity to target.



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