



PROGRAM AND SERVICE REVIEW OF ARCTIC ENERGY ALLIANCE

**PREPARED FOR THE GOVERNMENT OF THE
NORTHWEST TERRITORIES**

Final Report

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ECONOLER

ACRONYMS AND ABBREVIATIONS

AEA	Arctic Energy Alliance
AETP	Alternative Energy Technologies Program
CECEP	Commercial Energy Conservation and Efficiency Program
CGBERP	Community Government Building Energy Retrofit Program
CREP	Community Renewable Energy Program
EEIP	Energy Efficiency Incentive Program
EML	Effective measure life
ERSSP	Energy Rating Service Support Program
GHG	Greenhouse gas
GNWT	Government of the Northwest Territories
KPIs	Key performance indicators
LED	Light-emitting diode
NRCan	Natural Resources Canada
NWT	Northwest Territories
SWOT	Strengths, weaknesses, opportunities and threats (analysis)

DEFINITIONS

Base case	The base case details the information on how assumed gross savings used in the tracking system or database have been established. Usually, these savings are calculated using a series of variables such as hours of operation, wattage or base consumption.
Effective useful life/Effective measure life	The period a measure is expected to be in service and provide both energy and peak demand savings.
Free-ridership	Percentage of savings attributable to participants who would have implemented the same or similar energy efficiency measures, with no change in timing, in the absence of the program.
Gross energy savings	Energy savings generated by energy efficiency measures before applying the net-to-gross ratio.
Incremental costs	Incremental product costs represent the difference in costs between the energy-efficient measure and the cost of the measure that corresponds to the baseline scenario.
Net energy savings	Energy savings that can be reliably attributed to a program, obtained by applying the net-to-gross ratio to gross energy savings.
Net-to-gross ratio	The ratio between net energy savings and gross energy savings, which includes effects such as free-ridership and spillover, that positively or negatively affects the energy savings generated by a program.
Spillover	Savings attributable to participants who implement unincented additional energy efficiency measures due to influence from prior participation in a program.

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EXECUTIVE SUMMARY

The Arctic Energy Alliance (AEA) is responsible for developing and implementing energy efficiency and renewable energy programs on behalf of the Government of the Northwest Territories (GNWT). The AEA operates programs, services, projects and other initiatives that target homeowners, businesses, communities, non-profit organizations and Indigenous governments. Econoler was hired by the GNWT to perform a review of the current AEA program portfolio to ensure it is aligned with the following GNWT 2030 Energy Strategy objectives:

- Objective 1: Work together to find solutions: community engagement, participation and empowerment;
- Objective 3: Reduce GHG emissions from road transportation by 10% per capita;
- Objective 4: Increase the share of renewable energy used for community space heating to 40% by 2030;
- Objective 5: Increase residential, commercial, and institutional building energy efficiency by 15% over 2015 levels by 2030;

The Econoler evaluation also served to assess whether programs target the right customers and if there are segments, sectors or client groups that are not reached but should be, as well as whether AEA programs and activities provide the best value for money in terms of energy savings and GHG emission reductions.

Overview of Current AEA Program Portfolio

The AEA currently delivers both energy efficiency and renewable energy programs targeted at the residential, commercial and community government sectors. The AEA has four core energy efficiency programs, namely the:

- › Energy Efficiency Incentive Program (EEIP) provides rebates on energy-efficient lighting, appliances and other products to all sectors currently targeted by the AEA;
- › Energy Rating Service Support Program (ERSSP) provides home energy evaluations, and while it does not provide savings directly, it aims to be an enabling measure for the other energy efficiency programs;
- › Commercial Energy Conservation and Efficiency Program (CECEP) and Community Government Building Energy Retrofit Program (CGBERP) provide audits and rebates to allow commercial businesses and community governments respectively to improve energy efficiency by installing measures not already covered by the EEIP.

The AEA has three core renewable energy programs, namely the:

- › Alternative Energy Technologies Program (AETP) targets renewable energy projects in residential and commercial sectors;
- › Community Renewable Energy Program (CREP) targets the community government sector;
- › Biomass Energy Program provides education and incentives to promote wood burning best practices in both the residential sector (wood stoves) and community government and commercial sectors (district energy systems and commercial boilers).

In addition to administrative support for the AEA, the Regional Offices Program supports five regional offices that provide close community connections to enable delivery of AEA programs in these regions, as well as broader education and awareness activities related to energy efficiency, conservation and renewable energy. Finally, the portfolio includes special projects which are initiatives, generally no longer than one year, that are not part of core funding. In 2017, special projects included the Community LED Swap-Out and Community Energy Planning projects.

Evaluation Methodology and Key Findings

The evaluation methodology included several activities to analyze the AEA portfolio and its current processes: (1) review of documentation (e.g. 2030 Energy Strategy, AEA Annual Reports, AEA tracking sheets); (2) benchmarking and cost-effectiveness analysis; (3) interviews with GWNT and AEA staff, AEA stakeholders and program participants; and (4) strengths, weaknesses, opportunities and threats (SWOT) analysis. The results of these analyses are presented below.

Portfolio Benchmarking and Cost-Effectiveness Analysis

Econoler conducted a benchmarking study of five comparable Canadian jurisdictions: Nova Scotia, Saskatchewan, Newfoundland and Labrador, New Brunswick and Yukon. The benchmarking study revealed that the customer segment coverage of the AEA portfolio is similar to other jurisdictions, with one significant exception: low-income clients. Three of the five jurisdictions offer a program targeted at low-income residents, and utilities spend 7-40% of their budget on low-income homeowners and tenants.¹

Overall, AEA programs provide good technology coverage in terms of the range of renewable and energy efficiency measures offered relative to the jurisdictions surveyed, both on the residential and commercial side. One key difference between the AEA and other jurisdictions is how commercial programs are delivered. In addition to a custom commercial program, jurisdictions surveyed also offer a prescriptive program targeted at commercial customers, which streamlines the incentive process for both the customer and the program administrator for a number of products such as light-emitting diodes (LEDs).

¹ Range of percent spent on low-income includes research on U.S. jurisdictions.

Of the jurisdictions surveyed, the AEA has the second lowest total energy conservation and efficiency² spending, but the highest per capita annual spending. AEA has the second lowest share of incentives compared to total energy conservation and efficiency spending and the highest share of overhead³ costs reported among the other jurisdictions. Econoler would expect AEA relative costs to be higher than other jurisdictions due to the higher costs in the region, the complexity of project logistics (e.g. winter roads), and the smaller size of the operation, which therefore means fewer available economies of scale.

In addition to benchmarking energy conservation and efficiency spending, Econoler performed a cost-effectiveness analysis of AEA programs, calculating the levelized cost (i.e. \$/MWh or \$/GHG emissions) based on the budget and results available in the AEA 2016-2017 Annual Report. The table below summarizes the cost-effectiveness results for programs where data was available.

Table 1: Cost-Effectiveness Results

	\$/MWh	\$/GHG Emissions (tonnes)
Energy Efficiency Programs		
EEIP	Not available	Not available
CECEP	48	126
CGBERP*	1,570	714
Renewable Energy Programs		
AETP	Not available	420
CREP	Not available	Not available
Biomass Energy Program	-	94
Total Core Programs	652	994
Supplementary Projects		
Community LED Swap-Out Project	49	73
Community Government Solar Project	222	280
*Due to the large difference between budgeted and actual spending for this program, actual spending comprised 30% of the budget, the latter value was used to calculate cost-effectiveness.		

The analysis demonstrates that on a dollar per MWh basis, the CECEP and the Community LED Swap-Out project had the lowest cost per MWh in 2016-2017 since these programs also had the highest electricity savings among AEA programs. In terms of GHG emission reductions, again the Community LED Swap-Out project, followed closely by the Biomass Energy Program, had the lowest cost per GHG emission avoided. The CGBERP had the highest cost both in terms of

² For the purposes of this report, the term energy conservation and efficiency includes renewable energy programs.

³ Overhead costs are defined as costs not directly tied to a program but that are still connected to the energy conservation and efficiency effort, for example costs related to planning, regulatory funding, administration, etc.

electricity savings and GHG emissions. As a point of comparison, the carbon tax in GNWT is estimated at \$10/tonne for 2018 and will attain \$50/tonne in 2022.⁴

This analysis highlights some of the differences in accessing community governments versus commercial customers. AEA did 20 community government site audits in 2017, however only one project was incentivized as part of the CGBERP. Community projects generally require more AEA oversight and participation and have higher costs than commercial projects due to the capacity of the participant as well as the fact that commercial projects are more likely to be completed in Yellowknife.

Feedback from Interviews

What follows are some of the key findings from the in-depth interviews with GNWT and AEA staff, stakeholders and program participants.

- › Barriers to energy efficiency and conservation include limited access to certain resources, technologies, contractors and qualified trades in many communities, the capacity for communities to manage energy efficiency or renewable energy projects, and the high cost of energy and measures.
- › Most interviewed stakeholders know about the AEA and its programs, but awareness levels greatly vary.
- › According to stakeholders, renters, low-income residents and small businesses are especially unaware of AEA programs.
- › Stakeholders and program staff agree that more can be accomplished to achieve savings in the transportation sector.
- › All four interviewed program participants were very satisfied with their overall experience with the program, mentioning that the program participation process was straightforward and simple, with no hassle, little paperwork to complete, and they complimented the assistance provided by the AEA.

Assessment of AEA Strengths, Weaknesses, Opportunities and Threats

The following table summarizes the strengths, weaknesses, opportunities and threats (SWOT) of the AEA based on interviews with AEA and GNWT staff, stakeholders and Econoler feedback.

⁴ Government of Northwest Territories (2017). Implementing Pan-Canadian Carbon Pricing in the Northwest Territories. http://www.fin.gov.nt.ca/sites/default/files/documents/discussion_paper_implementing_pan-canadian_carbon_pricing_in_the_nwt_july_2017.pdf

Table 2: SWOT Analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> › Staff and leadership at AEA › Trust and reputation in communities › Adaptable and innovative › Regional offices 	<ul style="list-style-type: none"> › Insufficient funding to meet public demand for some programs › Issues with public understanding of AEA programs and services, including eligible equipment › Organizational structure › Planning and reporting › Communications and outreach › Leveraging partnerships › Not moving customers who have done audits and home energy assessments to implementing projects
Opportunities	Threats
<ul style="list-style-type: none"> › Regional and territorial-level relationships and strong engagement with community governments › Increase partnerships with community governments and universities › Dedicated funding to expand programs and develop new ones and reach untapped potential › Focus from GWNT and Federal Government on GHG emission reductions › New markets such as transportation, low-income homeowners, elders and tenants › Increases in the use of some renewable energy sources such as biomass and solar in the NWT › Leverage advertising and marketing 	<ul style="list-style-type: none"> › Succession planning and ability to hire qualified staff › Sustainability of federal funding and ability to adapt as needed › Decreases in quality and client service due to growth › Capacity of communities to deal with increases in funding

Conclusions and Recommendations

This section presents Econoler’s main conclusions on AEA alignment with each objective of the 2030 Energy Strategy, followed by recommended actions for increased alignment. Note that while the Strategy comprises six objectives, objectives 2 and 6 are not discussed as they are not connected to the AEA mandate. Recommendations specific to AEA program management, tracking and reporting were also formulated to further align AEA activities with the Strategy as said activities are expanded.

Objective 1: Work together to find solutions, community engagement, participation and empowerment

Econoler sees the work of the AEA in close alignment with Objective 1. Community engagement, as well as AEA staff and regional offices were noted as a key AEA strengths. Current AEA activities aid in empowering communities by working directly with them to build capacity, manage their energy use and bills, and increase self-sufficiency in the case of the renewable programs. However, the results of the community programs are mixed. For example, CGBERP has not to date been effective in gaining energy savings. Two areas of success (based on results in Annual report) are the community-based LED Swap-Out and Biomass Energy Program (which has one large community district energy project). More education and awareness to educate the population, particularly residents and small businesses, on the benefits of AEA initiatives is still needed. In 2017, many AEA programs were fully subscribed and had maximum participation based on funding levels. As discussed, the CGBERP underperformed in terms of participation. While Indigenous governments and non-profits can access EEIP and CGBERP, they do not have access to CECEP incentives. Interviewees reported that because programs are in rebate form, low-income residents who do not have money upfront are unable to participate due to that limitation. The AEA portfolio lacks a program targeted directly at addressing barriers of low-income homeowners and renters.

Objective 3: Reduce GHG emissions from road transportation by 10% per capita

Currently, the AEA does not offer programs that target reducing emissions from vehicles. While the jurisdictional review found no other energy efficiency agencies that currently offer transportation programs, there are synergies between energy efficiency and transportation programs. Input from interviewees highlighted the challenges of reducing vehicular miles travelled due to territorial conditions (e.g. long travel distances, lack of public transportation, climate). One area for exploration is electric or plug-in hybrid fleets (e.g. taxis or car coops) and plug-in hybrid trucking. However, it should be noted that incorporating transportation in the AEA program portfolio involves broadening scope.

Objective 4: Increase the share of renewable energy used for community space heating to 40% by 2030

The AEA currently offers four programs that target increasing the share of renewable energy used for space heating. The AETP is well positioned to increase participation in residential and commercial sectors to increase renewable energy used for space heating. The program has generated a significant amount of interest and is currently oversubscribed, however only a portion of AETP projects are directed at space heating.

On the other hand, CREP targets community governments and had lower participation in 2017 due to lack of funding, as well as the time and resources required for projects to be approved and implemented. Biomass heating systems (boilers, co-generation, district energy) have a large impact on GHG emissions but require increased funding and project management due to their complexity and size. The Biomass Energy Program supported one district energy project in 2017, which should result in significant reductions in GHG emissions.

The EEIP provides rebates for pellet and wood stoves, and the Wood Stove project provides support for increasing the efficiency and safety of wood stove heating. However, the impacts of both these programs on increases in renewable fuel use and GHG reductions are not currently measured.

Objective 5: Increase the residential, commercial and institutional building energy efficiency by 15% over 2015 levels by 2030

The AEA EEIP, CECEP and CGBERP are positioned to support this objective. However, the impact of the CGBERP has been low, and the impact of EEIP remains unclear. The Community LED Swap-Out project was reported to have provided significant savings for the communities in which it was implemented. The AEA has invested sizable effort in energy audits, both in the residential and commercial sectors, however the energy savings impact of these efforts has not yet been measured. The ERSSP has completed a large number of home audits, but the savings impact of this program is unclear because of minimal follow-up with participants, and it is not integrated with other offers (e.g. EEIP). Similarly, CGBERP has completed audits in almost two thirds of NWT communities, however few are currently initiating projects and the incentive budget for this program is undersubscribed.

In light of these conclusions, Econoler provides the following recommendations to increase AEA program portfolio alignment with the GNWT 2030 Energy Strategy.

Table 3: Recommendations in Relation to 2030 Energy Strategy Objectives

Objective Number	Recommendations
1	<p>1a. Increase education, outreach and awareness efforts to address awareness and acceptance barriers. Use case studies to show potential participants the energy and non-energy benefits of energy efficiency and renewable projects and how such projects are completed.</p> <p>1b. Identify opportunities to collaborate with key stakeholders and local organizations to help promote the benefits of energy efficiency, renewable energy, and programs.</p> <p>1c. Address accessibility gaps in the AEA portfolio, such as low-income residents, as well as tenants and elders. Allow non-profits and Indigenous governments to participate in CECEP.</p> <p>1d. Implement performance standards and clear expectations to ensure that the regional offices resources are resulting in regional uptake in programs and services, meeting the regional needs, and addressing the capacity gaps in regions.</p> <p>1e. Leverage the regional offices to use a community-focused approach to delivering programs (i.e. similar to the approach used in Community LED Swap-Out and Deep Energy Retrofit projects).</p> <p>1f. Review and modify community based program and service delivery model to ensure it meets the needs of communities given community capacity constraints, and is effective in achieving results.</p>
3	<p>3a. Implement an incentive for low or zero emission vehicle (e.g. taxis and car coops) and plug-in hybrid electric trucking to reduce road vehicle emissions.</p> <p>3b. Provide a rebate for emissions reduction technologies such as aux. heating devices to reduce idling.</p>
4	<p>4a. Exclude projects that do not displace fossil fuels from AETP and CREP eligibility, thus</p>

Objective Number	Recommendations
	<p>prioritizing projects that will result in GHG reductions. Focus on technologies that reduce the most GHGs such as biomass.</p> <p>4b. Increase funding, project management support, and local operator training for biomass projects to facilitate these in communities.</p>
5	<p>5a. Expand incentive budgets of energy efficiency programs that are fully subscribed and advertise them to increase uptake, namely CECEP and EEIP.</p> <p>5b. Review eligible technologies and incentive levels to ensure that incented measures are resulting in cost-effective incremental energy savings and that incentive levels take into account market barriers as well as participation, energy-savings and cost-effectiveness goals.</p> <p>5c. Consider adding the following initiatives to the AEA portfolio to increase building efficiency: (1) a commercial prescriptive program targeted at fast-tracking measures that do not require an audit (e.g. lighting); and (2) a deep energy retrofit program for residential customers targeted at ensuring that customers who have received a home evaluation through the ERSSP implement recommended measures, including incentives for windows and doors.</p> <p>5d. Provide training seminars for the trades to educate on the value of energy efficiency measures and how to install specific new technologies.</p>

Econoler provides the following recommendations to improve program planning, reporting and management.

Table 4: Recommendations Related to Program Planning, Reporting and Management

Recommendations
<p>Program Planning and Reporting</p>
<p>6a. Improve program planning processes:</p> <ul style="list-style-type: none"> › Set annual objectives with KPIs for each program (including Regional Offices Program), and report on them (with variance explanation) in Annual Report. Targets related to number of participants, energy savings, GHG emission reductions should be set, and assess whether targets are reached. › Estimate effective measure life for each measure to understand long-term impact of programs. <p>6b. Improve program tracking and reporting processes:</p> <ul style="list-style-type: none"> › Estimate and track energy and peak demand savings for all programs, broken down by community, region, hydro and non-hydro communities, and ensure baseline is taken into account in calculations. › Estimate fuel savings in GJ to allow apple-to-apple comparisons between fuel types (e.g. oil and propane). › Integrate tracking of ERSSP with other residential programs to understand how ERSSP customers follow through on audit recommendations. › Calculate and report on cost-effectiveness using levelized cost method (\$/MWh, \$/GHG) to start. In future, consider adopting energy efficiency cost-benefit tests. › Report on actual costs in Annual Report, and break costs down by program administration costs and incentives for each program and overhead (i.e. cross-cutting costs) for the portfolio.

Recommendations

Program Management

- 7a.** Examine overhead and Regional Offices Program costs to identify efficiencies and ensure that spending is closely tied to program objectives.
- 7b.** Consider combining the internal management and processes of the CGBERP and CECEP for efficiencies. Advertising the programs and any other external offer should be continued separately, under different program names so that customers know that both community government and commercial customers have access to such a program type.
- 7c.** Consider conducting impact evaluations, prioritizing programs that provide the largest impacts (GHG emissions and/or energy savings), to revise tracked savings values and assumptions, measure free-ridership and determine actual program savings and energy impacts.

INTRODUCTION

The Government of the Northwest Territories (GNWT) is committed to providing residents, communities and businesses with affordable, reliable and environmentally sustainable sources of energy. This commitment translates, among other things, into energy efficiency and conservation initiatives and investments in the Northwest Territories (NWT).

The Arctic Energy Alliance (AEA) is responsible for developing and implementing public facing energy efficiency and renewable energy programs on behalf of the GNWT. The AEA operates programs, services, projects and other initiatives that target homeowners, businesses, communities, non-profit organizations and First Nations.

The new GNWT 2030 Energy Strategy highlights the following six objectives:

- 1 Work together to find solutions: community engagement, participation and empowerment;
- 2 Reduce greenhouse gas (GHG) emissions from electricity generation in diesel powered communities by an average of 25%;
- 3 Reduce GHG emissions from road transportation by 10% per capita;
- 4 Increase the share of renewable energy used for community space heating to 40% by 2030;
- 5 Increase residential, commercial, and institutional building energy efficiency by 15% over 2015 levels by 2030;
- 6 A longer term vision: developing the NWT's energy potential, address industry emissions, and do their part to meet national climate change objectives.

Evaluation Objectives

Econoler was hired by the GNWT to perform a review of the current AEA program portfolio to ensure it is aligned with the new GNWT strategy priorities in terms of energy savings and GHG emission reductions. Another important aspect of the evaluation involved assessing whether programs target the right customers and if there are segments, sectors or client groups that are not reached by the AEA, but should be. Additionally, neither the GNWT nor AEA have well-characterized logic models for these programs and hence lack clear program goals.

Therefore, the evaluation covers the following main objectives:

- › Assess program portfolio coherence with GNWT Strategy Objectives 1,3,4, and 5;
- › Where discrepancies are identified, develop recommended actions and key performance indicators (KPIs) that are in line with the GNWT Strategy and priorities;
- › Make recommendations to ensure the program portfolio meets client needs; and
- › Capture the current program goals, objectives, outputs, outcomes and barriers through logic models.



This evaluation provides a thorough review of the AEA program portfolio and includes an overall evaluation of AEA processes. However, this review does not include the impact evaluation of AEA program results or a detailed program-by-program process evaluation.

1 PROGRAM PORTFOLIO OVERVIEW

The AEA offers various programs, services and projects to the residents, businesses and communities of the NWT. The following section provides a brief overview of these programs, along with target client groups.

Energy Efficiency Incentive Program

The Energy Efficiency Incentive Program (EEIP) provides rebates to homeowners, businesses and communities when purchasing eligible products that include light-emitting diode (LED) bulbs, refrigerators, clothes washers, heating systems, air sealing and insulation, wood stoves and drain water heat recovery. Rebate amounts vary from one eligible product to another, and requests for rebates must be made through a mail-in rebate claim process, except for LED bulbs that have point-of-sale rebates in target communities through partnerships with participating vendors (e.g. Northern Store).

Through the EEIP, rebates are also provided to homeowners who reach an EnerGuide label of 85 or higher following an energy evaluation of their new home by an AEA certified energy advisor.

Energy Rating Service Support Program

Through the Energy Rating Service Support Program (ERSSP), the AEA provides affordable home energy evaluations conducted by Natural Resources Canada (NRCAN) registered energy advisors. For existing homes, two types of evaluation are available: a pre and a post-retrofit evaluation whereby the pre-retrofit evaluation identifies upgrade opportunities and recommendations and the post-retrofit evaluation is conducted after a homeowner implements recommended upgrades. For new homes, primarily in Yellowknife, the AEA provides a fee-for-service blueprint evaluation which involves an assessment of the new house plans to calculate expected energy use and identify energy saving areas at the design stage.

Alternative Energy Technologies Program

The Alternative Energy Technologies Program (AETP) provides financial incentives for the purchase and installation of eligible renewable energy technologies such as solar air and hot water heating systems, wind turbines, solar photovoltaic systems, wood pellet boilers and furnaces, and ground source heat pumps. Incentives are available to commercial businesses and NWT residents. Prior to implementation, the AEA evaluates each project on the basis of: (1) technical feasibility; (2) potential energy savings; and (3) environmental benefits including GHG emission reductions. Approved projects can obtain incentives that cover up to one third of the cost of the qualified renewable energy system. Incentives are capped at \$5,000 per year for the residential sector and \$15,000 per year for the commercial sector.

Community Renewable Energy Program

The Community Renewable Energy Program (CREP) specifically targets community and Indigenous governments as well as non-profit organizations. The program provides technical support and financial incentives to assist with the installation of alternative energy systems or the conversion of an existing conventional energy system to alternative energy technology. The AEA evaluates each project according to the same three criteria as for the AETP. Renewable energy projects may receive funding for up to half (50%) the project costs, capped at \$25,000 per year.

Community Government Building Energy Retrofit Program

The Community Government Building Energy Retrofit Program (CGBERP) helps improve the energy efficiency of community government-owned buildings in the NWT. Opportunities for energy savings are first identified through a Yardstick Energy Audit that is performed by the AEA at no cost to the participant. For a more in-depth energy assessment, the program also covers the first \$10,000 of the cost to perform a Targeted Energy Audit. Energy efficiency upgrades can include improving heating, controls, air sealing, lighting, ventilation, hot water and low flow devices, and other building components. Incentives cover the lowest amount of either 50% of total eligible costs, \$25,000, or five times the annual estimated money saved in fuel, water and electricity costs.

Commercial Energy Conservation and Efficiency Program

The Commercial Energy Conservation and Efficiency Program (CECEP) follows a process and guidelines that resemble the CGBERP. Yardstick and Targeted Energy Audits are available to commercial participants to help them identify the best energy-saving options for their facility. Incentives cover the lowest amount of either \$15,000, one third of total eligible costs, or five times the annual estimated money saved in fuel, water and electricity costs. Like the CGBERP, CECEP projects need to be pre-approved before upgrade installation may begin. Participants need to provide costs and savings estimates related to the building upgrades for the AEA to approve projects. Once the upgrades are completed, businesses must resubmit the application form to the AEA, along with copies of invoices and/or receipts for the works completed.

Biomass Energy Program

The Biomass Energy Program is meant to provide northerners from all sectors with education and technical advice to promote the use of biomass. The program has two components. The first component, Burn it Smart workshops, provides residents with information on better burning practices for their wood stoves. The second component is focused on providing support to encourage the use of biomass (i.e. wood pellets) in community-government district heating systems, co-generation or commercial boilers.

Regional Offices Program

The AEA has six offices across the NWT in Yellowknife, Inuvik, Norman Wells, Fort Simpson, Whati and Hay River. These offices allow the AEA to stay connected with communities in the NWT and serve to provide education and advice services about energy conservation and AEA programs. More specifically, the Regional Offices Program involves conducting various on-the-ground events to meet community members face-to-face and communicate energy efficiency related opportunities and information.

Special Projects

The AEA also offers special projects that vary greatly in scope and reach. Special projects are generally defined as projects that are granted one-time funding for the duration (often a year), but do not benefit from ongoing funding and are thus not considered part of AEA core programs. Special projects have included the Community LED Swap-Out which involved direct replacement of less efficient light bulbs with LED bulbs in over 50 communities, as well as the Wood Stove project which served to install new more efficient wood stoves in communities.

2 EVALUATION METHODOLOGY

This section presents the methodology employed and the activities carried out for the evaluation.

2.1 Review of Key Documentation

As one of the first steps in the evaluation, Econoler reviewed documentation developed by the GNWT and AEA. More specifically, the following documents and sources of information were reviewed and analyzed:

- › 2030 GNWT Energy Strategy;
- › Summaries of regional workshops conducted to develop the strategy;
- › Program databases and other tracking sheets;
- › AEA financial reports;
- › AEA Annual Reports;
- › AEA website.

2.2 Data Collection

A key component of the evaluation involved conducting in-depth interviews with GNWT and AEA staff, as well as key stakeholders and program participants.

2.2.1 Interviews with GNWT and AEA Staff

In December 2017, Econoler conducted 14 interviews, varying in length from 30 to 60 minutes, with members of the GNWT (n=3) and AEA (n=11) staff.

First, the interviews enabled Econoler to gather background information about the context of the 2030 Energy Strategy, how the AEA is contributing to the strategy and the relationship between the GNWT and AEA.

Second, Econoler discussed overall AEA portfolio performance including strengths, weaknesses, opportunities and threats, areas for changes and improvements, client groups or technologies to pursue, as well as any local challenges to consider going forward with AEA programs and services.

Third, Econoler asked AEA staff questions about how the individual programs are designed, delivered, marketed and tracked, how program goals and objectives are established, and how program performance is assessed. These interviews were key in understanding the program portfolio and AEA processes.

2.2.2 Interviews with Stakeholders

In December 2017, Econoler conducted six interviews with key stakeholders in the NWT, each lasting approximately 30 minutes. Respondents from the following stakeholder groups were interviewed:

- › City of Yellowknife;
- › Association of Communities;
- › Housing Corporation;
- › Chamber of Commerce;
- › Municipal and Community Affairs; and
- › Department of Education, Culture and Employment.

The interviews helped Econoler understand the following aspects:

- › Which groups are represented by the stakeholders interviewed;
- › What the stakeholder clients' needs and challenges are in terms of energy use;
- › How much of a concern or priority energy efficiency is to stakeholders and their clients;
- › How familiar stakeholders and their clients are with the AEA and its programs;
- › How the programs can be changed or adapted to better meet the needs of stakeholders and their clients;
- › Which opportunities exist for the AEA to collaborate with stakeholders in the NWT; and
- › Which energy efficiency and renewable energy opportunities and challenges exist for the NWT.

2.2.3 Interviews with Program Participants

In December 2017, Econoler conducted four interviews with participants in the business and residential programs. Two participants in the CECEP, one participant in the AETP and one participant in the EEIP shared their feedback with Econoler. Each interview lasted between 15 and 30 minutes. The interviews addressed the following research areas:

- › How participants found out about the program;
- › What their motivations were for participating in the program;
- › What expectations they had from the program;
- › How satisfied they were with the program and its aspects;
- › Which challenges, difficulties or barriers they encountered during the participation process;
- › What type of support they received from the AEA and whether they had to seek additional support to implement their projects;
- › How satisfied they are with the AEA;
- › Which opportunities exist to improve the program; and
- › How the program was a success and/or a challenge.

2.3 Process Review

Upon reviewing and analyzing the documentation and completing the in-depth interviews, Econoler began the process review.

This was accomplished by first painting a picture of the current state of AEA program portfolio offerings, spending, market and technology coverage, program planning and tracking, and cost-effectiveness.

Feedback from program staff, key stakeholders and program participants was then used to assess the performance of AEA efforts and programs. Feedback also served to gather insights on the energy-related needs of various client groups and the challenges that arise from developing and promoting energy efficiency and renewable energy initiatives in the NWT. The interviews also provided information that enabled Econoler to conduct a strengths, weaknesses, opportunities and threats (SWOT) analysis.

Once this overview of the current state was established, the program portfolio was assessed against select objectives of the 2030 Energy Strategy and other key aspects such as program coverage of NWT client sectors. Econoler also analyzed whether programs provide the best value for money in terms of energy savings and GHG emission reductions.

The process review also involved characterizing the core programs as they are currently implemented through logic models. The logic models are presented in Appendices I through VII and encompass the barriers, activities, outputs and results related to the seven programs identified as core AEA programs for the purposes of this report, namely the EEIP, ERSSP, CECEP, CGBERP, AETP, CREP and the Biomass Energy Program.

3 PROCESS EVALUATION

This section presents an analysis of how current AEA activities and the program portfolio align with the GNWT 2030 Energy Strategy. It summarizes the current AEA portfolio in terms of savings, market coverage and cost-effectiveness and presents feedback received from program staff, stakeholders and program participants, as well as presents the aforementioned SWOT analysis.

3.1 Background Information About the Energy Strategy and Relationship Between the GNWT and AEA

As discussed in the Introduction, the GNWT recently developed a 2030 energy strategy that outlines a long-term approach to making energy supply and use more affordable, safe and sustainable, as well as promoting renewable and alternative energy solutions. The strategy includes various objectives, which are hereafter mentioned again:

- 1 Work together to find solutions: community engagement, participation and empowerment;
- 2 Reduce GHG emissions from electricity generation in diesel powered communities by an average of 25%;
- 3 Reduce GHG emissions from road transportation by 10% per capita;
- 4 Increase the share of renewable energy used for community space heating to 40% by 2030;
- 5 Increase residential, commercial, and institutional building energy efficiency by 15% over 2015 levels by 2030;
- 6 A longer term vision: developing the NWT's energy potential, address industry emissions, and do their part to meet national climate change objectives.

The previous energy strategy set out for the NWT was focused on electricity. Upon community consultation, it was decided that the strategy should be revised to consider other aspects including renewable energy sources, transportation and industry. Additionally, the new strategy is meant to better tackle local challenges such as energy costs, GHG emissions, as well as energy reliability and sustainability.

The GNWT has mandated the AEA to put some of the 2030 Energy Strategy objectives into action. The AEA is an independent non-profit organization mandated as the main delivery agent of the strategy. The mission of the AEA is to “promote and facilitate the adoption of efficient and renewable energy practices by all members of NWT society.” Most of the funding used by the AEA to develop, design, implement and manage programs and services is provided by the GNWT.

Some of the objectives of the 2030 Energy Strategy apply directly to the AEA, namely objectives 1, 3, 4 and 5. This report serves to discuss whether AEA actions, programs and services: (1) support the long-term approach as set out in the new GNWT Energy Strategy; (2) represent the best value in terms of energy savings and GHG emission reductions; and (3) meet the needs of client groups.

3.2 Overview of Current Program Portfolio

The AEA currently offers energy efficiency and renewable energy programs targeting the residential, commercial and community government sectors.

The AEA maintains four core energy efficiency programs. The EEIP provides rebates on energy-efficient lighting, appliances and other products to all three sectors currently targeted by the AEA. The ERSSP provides home energy evaluations and, while it does not provide savings directly, it aims to serve as an enabling program toward the other AEA energy efficiency programs. The CECEP and CGBERP provide audits and rebates to respectively allow commercial businesses and community governments to improve energy efficiency by installing measures not covered by the EEIP.

The AEA offers three core renewable energy programs: AETP, CREP and the Biomass Energy Program. The AETP targets renewable energy projects in the residential and commercial sectors, whereas the CREP targets the community government sector. The Biomass Energy Program is focused on providing education on wood burning to residents, as well as incentives and support generally targeted at community governments for commercial biomass boilers and biomass district energy systems.

The Regional Offices Program encapsulates several AEA areas of effort:

- › Overhead such as administrative support and the executive office;
- › Regional offices which provide close community connections in five regions across the NWT and enable the delivery of AEA programs in these regions;
- › Education and awareness activities not tied to a specific program; and
- › Special projects which are initiatives (generally no longer than one year) that are not part of core AEA funding. Special projects may include pilots that could lead to future core programming. Depending on the initiative, special projects may result in direct energy savings (e.g. Community LED Swap-Out) or act more as an enabling activity for the other programs (e.g. Community Energy Planning).

In addition to core funding, the AEA may receive supplementary funding for additional special projects, either from the GWNT or other partners.

3.2.1 Summary of Program Portfolio Offerings

AEA programs provide annual energy savings in either electricity or other fuels (i.e. gas, oil, propane) and avoided GHG emissions. These programs are available to clients in both hydro and non-hydro communities. Projects that save or displace electricity in non-hydro communities result in significant avoided GHG emissions as they displace diesel-generated electricity. In addition, since the bulk of space heating in the NWT is non-electric, projects that increase the efficiency of or displace non-renewable space heating will result in GHG emission reductions. Table 5 outlines the 2016-2017 budgeted costs, energy savings and GHG emission reductions by program as reported in the AEA 2016-2017 Annual Report.

Table 5: AEA Program Portfolio – 2016-2017 Costs and Results

	Target Market	GNWT Funding	Annual Electricity Savings (MWh)	Avoided Power Demand (kW)	Annual Fuel Savings (litres)	Avoided Annual GHG Emissions (tonnes)
Energy Efficiency Programs						
EEIP	Residential, Commercial, Community Government, Indigenous Governments, Non-Profits	\$200 000	Not Reported	Not Reported	Not Reported	Not Reported
CECEP	Commercial	\$200 000	506	105	3,805	195
CGBERP	Community Government	\$200 000	11	3	0	5
Enabling Activity						
ERSSP	Residential	\$150 000	N/A	N/A	N/A	N/A
Total Energy Efficiency		\$750 000	517	108	3,805	200
Renewable Energy Programs						
AETP	Residential, Commercial	\$200 000	Not Reported	356	16,913	45
CREP	Community Government, Indigenous Governments, Non-Profits	\$100 000	Not Reported	134	0	0
Biomass Energy Program	Community Government	\$100 000	0	0	38,100	100
Total Renewable		\$400 000	0	490	44,340	117
Portfolio Activities						
Regional Offices Program	All	\$1,600 000	N/A	N/A	N/A	N/A
Total Core Programs		\$2,750 000	517	598	48,145	317
Supplementary Projects						
Community LED Swap-Out	Residential, Commercial	\$300 000	824	510	0	547
Community Government Solar	Community Government	\$80 000	34	41	0	27
Various Projects*	Residential, Commercial, Community Government	\$370 000	0	0	0	0
Supplementary Total		\$750 000	858	551	0	574
Total		\$3,500 000**	1,375	1,149	48,145	891
*Various Projects include: HVAC recommissioning, Community Wood Stove Projects, EnerGuide Rating System Follow-Up Rebate, Energy Information and Awareness.						
** Does not include GNWT Membership Dues (\$227.5K) and \$280K provided by other partners (e.g. NRCan).						

The 2016-2017 AEA budget was primarily provided by GNWT funding (92%), with some additional funds provided by other partners (NRCan, Indigenous and Northern Affairs, Canada Mortgage and Housing Corporation, and the Government of Nunavut). The core budget comprises almost 80% of AEA 2016-2017 GNWT funding. Considering solely the core budget (i.e. excluding supplementary project funding), energy efficiency programs account for 27% of core funding, renewable programs 15%, while regional offices/special projects and overhead comprise the remaining share at 58%. Over the next few years, the AEA budget is expected to grow two to three times current levels due to increases in GNWT funding.

The Community LED Swap-Out project provided the highest electricity savings in 2017, with CECEP providing the bulk of electricity savings among AEA core programs. The CECEP, AETP and CREP combined account for the total avoided power demand, with the AETP providing the bulk of demand savings. The Community LED Swap-Out project should have resulted in demand savings, however it was reported as zero. One district energy project in the Biomass Energy Program provides the bulk of annual fuel savings, however the CECEP and AETP also provide some fuel savings. The energy savings for EEIP are not currently being estimated, which makes it impossible to assess its performance and establish its contribution to the AEA portfolio.

In terms of reduced or avoided GHG emissions, the CECEP provides the largest contribution to GHG emission reductions, with the Biomass Energy Program as a close second. The AETP and the CGBERP provide some GHG reductions.

Note that while the Annual Report summarizes program results in terms of savings and GHG emission reductions, the costs provided in the report (and in Table 1 above) are budget or planned expenditures, not actuals. Econoler had access to some additional financial information and determined that most programs tracked relatively well against the budget.⁵ One program, the CGBERP, had much lower actual expenditures than budgeted, with actual spending at only about 30% of the budget. For future reports, to ensure costs and results are properly matched, Econoler recommends reporting not only budget costs, but also actual costs.

⁵ Source: 2016-17 AEA program spending on CA's.xls, provided by GNWT.

3.2.2 Program Planning and Tracking

As previously mentioned, most of the funding used by the AEA for program planning, development, management and implementation is provided by the GNWT. The GNWT provides guidelines about how the funding should be spent on programs. AEA staff then determine the specifics of these programs based on energy savings potential, consumer demand, new technologies, market penetration, etc. When establishing details for each program, service or even special project, the AEA uses a collaborative process. Any staff member is allowed to submit a proposal for a program or special project, which is then assessed and ranked by AEA staff to ensure it: (1) meets the AEA vision, mission and goals; (2) has tangible results, a meaningful impact on the population, and/or a practical application; (3) contributes to the AEA growth and development as an organization; and (4) is likely to appeal to clients. There are minimal energy savings and market potential assessments conducted at the program conception and design level. Additionally, few customer participation, energy and demand savings, or GHG emission reduction targets are established prior to program launch, thus rendering it difficult to assess program performance or success.

The AEA maintains fairly formal databases for some of the programs, whereas ad hoc Excel sheets are used for the remaining programs and services. Only EEIP tracking uses an online system where data about program rebates, customers and vendors can be entered and extracted through a reporting option. Therefore, most of the tracking effort is manual, not automated, and not integrated across programs. The AEA's current tracking system is mainly used to track clients, projects and measures implemented through the programs. It contains limited means for measuring or assessing program performance. Although the databases contain standard information that should be tracked according to best practices, for instance the types of measures installed, the project costs and the rebate amounts, they do not systematically include project savings estimates. For projects that have savings estimates, the methodology for calculating savings is not transparent, and no base case or net-to-gross ratio assumptions were found during the assessment. In addition, values important for calculating cost-effectiveness are missing, including effective measure life and incremental costs.

3.2.3 Benchmarking

This section benchmarks AEA programs and spending against other jurisdictions. Benchmarking energy efficiency and renewable energy programs remains challenging due to the lack of comparable and publicly available data, as well as the difficulty of comparing energy efficiency efforts across jurisdictions which have differing market realities, length of time in the market, etc. The unique context of the NWT further increases the challenges of benchmarking. Nevertheless, benchmarking can be useful to identify gaps to improve the AEA program offering.

Econoler selected four areas for benchmarking: (1) market coverage, i.e. how the coverage of AEA programs compares to other jurisdictions; (2) technology coverage, i.e. how the coverage of key energy efficiency and renewable energy technologies compares to other jurisdictions; (3) total and per capita spending; and (4) cost allocation, i.e. what proportion of the budget is spent on incentives and what proportion is spent on overhead?

Five Canadian jurisdictions (excluding NWT) were benchmarked: Nova Scotia, Saskatchewan, Newfoundland and Labrador, New Brunswick and Yukon.⁶ These jurisdictions were selected based on population size, as well as the scale of their energy efficiency and renewable energy efforts, to provide the most meaningful comparison to NWT. Quebec, Ontario, Alberta and British Columbia were excluded because their populations and/or scale of energy efficiency and renewable energy efforts are orders of magnitude larger than NWT and would not provide meaningful comparisons.

Market Coverage

The following table compares the market sectors covered by the energy efficiency and renewable energy programs delivered by the AEA, Efficiency Nova Scotia, SaskPower, Newfoundland Power, New Brunswick Power and Yukon Energy.

Table 6: Market Coverage

Jurisdiction	Low-Income	Residential	Small Commercial	Large Commercial	Government (G)/Municipal (M)/Institutional (I)	Industrial
Energy Efficiency Programs						
AEA		x	x	x	M⁷	
Efficiency Nova Scotia	x	x	x	x	M, I	x
SaskPower		x	x	x	M	x
Newfoundland Power	x	x	x	x	M, I, G	x
New Brunswick Power	x	x	x	x	M, I	x
Yukon Energy		x	x	x	I	
Renewable Energy Programs						
AEA		x	x		M³	
Efficiency Nova Scotia		x	x			
SaskPower			x			
Newfoundland Power						
New Brunswick Power						
Yukon Energy		x	x			

⁶ The Government of Nunavut currently has no incentives or programs in support of renewable energy or energy efficiency technology. Support for renewable energy projects is available through federal programs.

https://www.nunavutenergy.ca/en/Programs_and_Incentives

⁷ Includes Community Government.

The AEA has energy efficiency programs in all the above-presented market sectors except for industrial and low-income. All but one of the other jurisdictions (Yukon) have an industrial program. To date, the AEA has not targeted the industrial sector, which primarily comprises large mines and resource extraction companies. Three of five jurisdictions offer a program targeting low-income residents. New Brunswick Power spends approximately 14% of its total energy efficiency budget on its low-income program, which is slightly higher than the 7-10% of total budget spent on low-income programs found in a survey of U.S. jurisdictions.⁸ Nova Scotia (Efficiency Nova Scotia and the Province of Nova Scotia), a province fairly similar to New Brunswick in terms of population and size, is more active with low-income homeowners and tenants and spends approximately 35-40% on low-income initiatives. It should be noted that most or all of the Efficiency Nova Scotia and New Brunswick Power low-income budgets come from provincial funding.

Most jurisdictions that have low-income programs deliver them through a direct-install paradigm, where a service provider is responsible for determining eligible energy efficiency measures for the home and installing them. Efficiency Nova Scotia has two programs for low-income residents, both of which require minimal customer involvement and are free-of-charge: one for both homeowners and renters, and the second one just for homeowners. The first one focuses on low-cost measures such as LEDs, low-flow showerheads, faucet aerators and pipe wrap, whereas the second one focuses on building envelope upgrades. New Brunswick Power has one low-income program that includes both building envelope and low-cost measures. Similarly to one of the two Efficiency Nova Scotia programs, the New Brunswick Power program involves that a program energy advisor assess the home during a pre-retrofit assessment to determine eligible measures. Once measures are installed, a post-retrofit assessment is carried by an energy advisor to perform a final simulation of the home and estimate savings.

Many NWT low-income residents live in subsidized housing, which means they have less control over their home energy use and are therefore difficult to reach through a program. The Northwest Territories Housing Corporation operates a Seniors Aging-in-Place Retrofit program that focuses on energy-efficient retrofits for senior homeowners (residents 60 years or older).⁹ However, other NWT low-income homeowners and renters are currently not targeted by any program, which constitutes a gap in the AEA portfolio.

All jurisdictions analyzed have energy efficiency programs in the residential and commercial sectors, and all have programs for either government, institutional and/or municipal buildings. Government, municipal or institutional offerings are delivered under commercial programs in all jurisdictions except the AEA; therefore, there is no program specific to government, municipal or institutional buildings.

Only two other jurisdictions, in addition to the AEA, have renewable energy programs. The focus on renewables in the NWT compared to other jurisdictions is driven by a number of local drivers such as the price volatility of heating fuels, economics of electricity production, subsidies related to

⁸ Hoffman I., Leventis G., Goldman C. (2017). *Trends in the Program Administrator Cost of Saving Electricity for Utility Customer-Funded Energy Efficiency Programs*. Electricity Markets & Policy Group Technical Brief. Lawrence Berkeley National Laboratory. <https://emp.lbl.gov/sites/all/files/lbnl-1007009.pdf>

⁹ <http://www.nwthc.gov.nt.ca/seniors-aging-place-retrofits-0>

electricity tariffs in non-hydro communities, and the culture of self-sufficiency among the population.

It should be noted that none of the agencies surveyed offer a transportation program. While the AEA does currently not offer a transportation program, one of the 2030 Energy Strategy objectives relates to transportation. Therefore, a transportation initiative might be required moving forward.

Technology Coverage

The two tables below outline the various categories of technologies and measures offered by the benchmarked jurisdictions. Note that these comparisons involve overall coverage and do not provide detailed comparisons of program offerings (e.g. technology and eligibility criteria, incentive levels) available across jurisdictions.

Most of the measure categories rebated by the AEA in the residential sector are also rebated through the programs of other jurisdictions. One area where there were significant differences between jurisdictions was windows and doors. Two jurisdictions (Yukon Energy and Efficiency Nova Scotia) have offers aimed at windows and doors, while four (including AEA) did not. These differences are likely due to the space heating mix within each jurisdiction because the savings potential of windows and doors depends on the space heating fuel. For example, if the prime source of space heating in a jurisdiction is gas, there is a gas savings opportunity from installing more efficient windows and doors, but a limited electricity savings opportunity.

Table 7: Residential – Technology Coverage

Jurisdiction	LED	Appliances	Insulation and Air Sealing	Windows, Doors, Skylights	Water-Saving (e.g. Faucet Aerators, Low-Flow Showerheads) and/or Water Heat Recovery	Controls (e.g. Thermostats, Dimmers)	HVAC	Solar
AEA	x	x	x		x	x	x	x
Efficiency Nova Scotia	x	x	x	x	x	x	x	x
SaskPower	x					x		
Newfoundland Power	x	Dehumidifiers only	x		x	x	x	
New Brunswick Power	x	x	x		x	x	x	
Yukon Energy	x	x	x	x	x		x	x

All but one jurisdiction (Yukon Energy) have a custom program for commercial clients. The benchmarked jurisdictions also offer programs targeted at the commercial sector, which tend more toward a prescriptive than a custom model. Prescriptive means a program that includes a defined list of eligible products with a corresponding fixed rebate and per-unit savings values, whereas custom means a program where the types of measures rebated vary greatly depending on the needs of the clients and projects. Prescriptive programs are usually easier to deliver and manage from the perspective of the administrator, and are more straightforward and appealing from the

perspective of the participant. The products and equipment listed in the following table can all be incorporated into a prescriptive program model.

Table 8: Commercial – Technology Coverage

Jurisdiction	Lighting		Kitchen and Laundry	Refrigeration	Solar	HVAC	Water Heating	Water-Saving or Water Heat Recovery	Controls
	LED	Fluorescent or T8							
AEA	x				x	x	x	x	x
Efficiency Nova Scotia	x		x	x	x	x	x	x	x
SaskPower	x			x	x				x
Newfoundland Power	x	x	x	x		x		x	x
New Brunswick Power	x	x							x
Yukon Energy	x				x	x			

Most commercial measure categories rebated by the AEA under its only prescriptive program (EEIP) are also rebated by at least two other jurisdictions. Measures for commercial kitchen, laundry and refrigeration are included in at least three prescriptive programs offered by other jurisdictions, but the AEA currently provides incentives for kitchen and laundry, and refrigeration solely through its custom programs: CECEP and CGBERP. Note that the AEA EEIP, which is available to various types of customers including commercial customers, does provide rebates for appliances. However, the prescriptive programs in the other jurisdictions offer kitchen, laundry and refrigeration measures that are specifically designed for commercial clients.

It should be noted that other measure categories such as compressed air, pumping and motors are offered through by other jurisdictions, but to a lesser extent.

Overall, AEA programs offer good technology coverage relative to the benchmarked jurisdictions. Given the focus of the 2030 Energy Strategy on space heating, one potential gap for consideration is residential windows and doors. One gap in AEA's current program portfolio offering is a prescriptive program targeting commercial customers.

Program Spending

This section examines how energy conservation and efficiency¹⁰ program spending compares across selected jurisdictions. The table below looks at annual energy conservation and efficiency spending, per capita spending, and what percentage of total spending constitutes incentives. Finally, it compares the percentage of overhead spending across selected jurisdictions, where

¹⁰ For the purposes of this report, energy conservation and efficiency includes renewable energy programs.

overhead is defined as costs not directly tied to a program but that are still connected to the energy efficiency effort such as planning, regulatory funding, and administrative costs, etc.

Table 9: Program Spending¹¹¹²

	Total 2016-2017 Spending (\$M)	Per Capita Spending	% Incentives	% Overhead
AEA	\$3.50	\$79	32%	30% ⁽¹⁾
Efficiency Nova Scotia	\$30.80 ⁽²⁾	\$32	65%	8%
SaskPower	\$11.40	\$10	59%	Not reported
Newfoundland Power	\$7.43	\$14	40%	10%
New Brunswick Power	\$13.90	\$18	74%	10%
Yukon Energy	\$0.80 ⁽³⁾	\$21	29% ⁽⁴⁾	3%

⁽¹⁾ Source: Email communication, AEA, February 7, 2018.
⁽²⁾ ENS 2016 spending
⁽³⁾ Yukon Energy 2018 Plan
⁽⁴⁾ Yukon % incentives are based on Residential Program spending

The AEA has the second lowest total energy conservation and efficiency spending, but the highest per capita annual spending among all benchmarked jurisdictions. The AEA per capita spending of \$79/person is more than double that of Efficiency Nova Scotia (\$32/person), the second highest per capita spending. Given the small population of NWT compared to the other jurisdictions surveyed (except Yukon), one would expect relatively high per capita spending.

AEA has the second lowest share of incentives compared to total energy conservation and efficiency spending. Incentives represent 32% of the total AEA energy conservation and efficiency budget; in other words, it costs approximately \$3 for every \$1 rebated to a participant. Yukon Energy also has relatively low percent incentive spending at 29%, however the remaining utilities surveyed spent between 40-74% of their budget on incentives. The relative size of energy conservation and efficiency effort impacts the share of incentive spending compared to the overall program. However, Yukon Energy has a much smaller overall energy conservation and efficiency program offer than AEA and therefore should not be the only comparator. AEA also has the highest reported share of overhead spending among the jurisdictions (including Yukon Energy). These jurisdictions have overhead costs representing 3-10% of their total spending, compared to AEA overhead constituting 30% of total spending.

In terms of hours spent, 50% of AEA staff hours relate to regional offices and AEA administration costs that are not directly connected to programs. Another 17% of staff time relates to R&D. Core programming comprises slightly under 25% of staff time. As discussed above, Econoler would expect AEA's relative costs to be higher than other jurisdictions due to the higher costs in the region and the complexity of project logistics (e.g. winter roads). Moreover, the smaller size of operations, which in turn means fewer economies of scale opportunities, should also increase relative costs. However, due to the magnitude of these differences, it is recommended that the

¹¹ Values shown in the table were provided by utilities via email communications.

¹² Table does not include percent spending on program-specific non-incentive costs.

AEA examine their cost structure to identify possibilities for efficiencies and ensure that spending is closely tied to program objectives.

3.2.4 Cost-Effectiveness

To understand the value of the GWNT investment in AEA programs and compare effectiveness across programs, the cost-effectiveness of AEA programs from the perspective of the GNWT was calculated.¹³ Cost-effectiveness, in its simplest form, is a measure of whether an investment's benefits exceed its costs.

Background

Current best practice for program administrators examining cost-effectiveness is to use five key tests, originally described in the California Demand Side Management Practice Manual, to compare the costs of program benefits from various perspectives (e.g. society, program administrator, and participant).¹⁴ These cost tests are predicated on comparing the costs of a program against their avoided costs, for example the marginal cost of energy supply. A good resource on the topic of cost-effectiveness tests is *Understanding Cost-effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods, and Emerging Issues for Policy-Makers*.¹⁵ However, these tests require detailed analyses and a number of parameters (including avoided costs) to evaluate how efficiency costs and benefits accrue to various parties with different perspectives.

Another measure of program cost-effectiveness is the *levelized cost* which is the cost of the program relative to its energy savings or avoided GHG emissions. In calculating the levelized cost of a program, upfront investments are annualized over the life of the investment assuming a real discount rate. This captures the fact that energy efficiency and renewable energy program investments continue to save energy over several years of their effective useful lifetime, thus ensuring that higher cost programs or projects that provide significant savings over their lifetime are not unfairly penalized. Considering only annual savings to examine cost-effectiveness misrepresents the full benefits of energy efficiency and renewable energy programs or projects.

The advantages of the levelized cost method are that it is relatively simple to calculate and, given its transparency, it is possible to compare values among jurisdictions. The disadvantages of this method are that it provides the program administrator perspective only, and it is unable to account for multiple benefits (for example a program that provides both electricity and gas savings).¹⁶

Due to limited available data (e.g. avoided costs were not provided) and for the sake of simplicity, levelized costs were calculated as a measure of AEA program cost-effectiveness.

¹³ Cost effectiveness can also be examined from the perspective of society or the program participant. Due to the nature of this program review, we have chosen to consider the GWNT perspective, the program funder. In this case, the GWNT perspective would be the same as the program administrator (AEA).

¹⁴ (2002). *California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects*. http://www.calmac.org/events/spm_9_20_02.pdf

¹⁵ National Action Plan for Energy Efficiency (2008). *Understanding Cost-Effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods, and Emerging Issues for Policy-Makers*. Energy and Environmental Economics, Inc. and Regulatory Assistance Project. www.epa.gov/eeactionplan.

¹⁶ Maggie Molina (2014). *The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs*. American Council for an Energy-Efficient Economy. <http://aceee.org/research-report/u1402>

Methodology

Econoler calculated the levelized cost for AEA programs based on the data available in the 2016-2017 Annual Report for both energy savings and avoided GHG emissions.¹⁷ The methodology for the levelized cost calculation is:

$$\text{Levelized Cost in \$/MWh or \$/GHG} = (C) * (\text{Capital recovery factor}) / (D)$$

Where:

$$\text{Capital recovery factor} = [A * (1+A)^{(B)}] / [(1+A)^{(B)} - 1]$$

A = Real discount rate

B = Estimated measure life in years

C = Total annual program cost in 2017

D = Incremental annual energy (MWh) saved or GHG emissions avoided by program

Assumptions

Where AEA data was unavailable, Econoler made the following assumptions:

Real discount rate = 7%, based on average discount rate for U.S. program administrators.¹⁸

The effective life of a measure is defined as the period a measure is expected to be in service and provide both energy and peak demand savings, and is a key parameter in the assessment of a program's cost-effectiveness. An estimate of effective measure life (EML) for the programs was unavailable. Hence, the EML values were drawn from secondary sources. The EML for the residential and commercial energy efficiency programs are eight years for residential programs, 12.5 years for commercial programs, with an 11 year average for the overall portfolio.¹⁹ The EML for the renewable programs was assumed to be 20 years for both solar technologies and district energy.²⁰

Results

Table 10 below presents the results of the cost-effectiveness analysis for 2016-2017 AEA programs and projects. Cost-effectiveness results are based on the budget costs and results provided in the 2016-2017 Annual Report. Results are not provided for EEIP or CREP since energy savings and GHG emission reductions for these programs were not available.

¹⁷ Note that some programs also provide demand savings and other fuel savings, however these benefits are not accounted for in the \$/kWh or \$/GHG values.

¹⁸ Maggie Molina (2014). *The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs*. American Council for an Energy-Efficient Economy. <http://aceee.org/research-report/u1402>.

¹⁹ Ibid.

²⁰ Lazard (2014). Lazard's Levelized Cost of Energy Analysis – Version 8.0.

https://www.lazard.com/media/1777/levelized_cost_of_energy_-_version_80.pdf

Table 10: Cost-Effectiveness Results

	\$/MWh	\$/GHG Emissions (tonnes)
Energy Efficiency Programs		
EEIP	Not available	Not available
CECEP	48	126
CGBERP*	1,570	714
Renewable Energy Programs		
AETP	Not available	420
CREP	Not available	Not available
Biomass Energy Program	-	94
Total Core Programs	652	994
Supplementary Projects		
Community LED Swap-Out Project	49	73
Community Government Solar Project	222	280
*Due to the large difference between budgeted and actual spending for this program, actual spending comprised 30% of the budget, the latter value was used to calculate cost effectiveness.		

Table 10 demonstrates that on a dollar per MWh basis, the CECEP and the Community LED Swap-Out project have the lowest cost per MWh. These two programs, at \$48/MWh and \$49/MWh respectively, are within the range of average program costs found during the review of U.S. jurisdictions, ranging from \$40-\$50/MWh.²¹ However, it should be noted that this is not an apples-to-apples comparison because the U.S. average values use evaluated savings and likely take into account free-ridership and spillover, which makes U.S. programs less cost effective than AEA programs.

The Community LED Swap-Out project and the CECEP have the highest electricity savings of the programs. Since the programs all have similar levels of expenditures, it follows that programs with the highest electricity savings are more cost effective. Also, the CGBERP and Community Government Solar Project have much higher levelized costs than the U.S. average.

In terms of GHG emission reductions, again the Community LED Swap-Out project, followed closely by the Biomass Energy Program, has the lowest cost per avoided GHG emissions. The CGBERP has the highest cost in terms of both electricity savings and GHG emissions. As a point of comparison, the carbon tax in GNWT is estimated at \$10/tonne in 2018 and will attain \$50/tonne in 2022.²²

²¹ Maggie Molina (2014). *The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs*. American Council for an Energy-Efficient Economy. <http://aceee.org/research-report/u1402>

²² Government of Northwest Territories (2017). *Implementing Pan-Canadian Carbon Pricing in the Northwest Territories*. http://www.fin.gov.nt.ca/sites/default/files/documents/discussion_paper_implementing_pan-canadian_carbon_pricing_in_the_nwt_july_2017.pdf

This analysis highlights some of the differences in accessing community governments versus commercial customers. The 2016-2017 Annual Report shows that while the AEA conducted 20 site evaluations, only one project was incented as part of the CGBERP. In contrast, CECEP conducted six on-site evaluations in 2017 and 10 projects were incented as part of the program. Community projects appear to take longer than commercial projects to progress from site evaluation to project and have a lower probability of becoming a project. Community projects generally require more AEA oversight and participation and have higher costs than commercial projects due to participant capacity. Also, commercial projects are more likely to be completed in Yellowknife than any other NWT region.

One element that this analysis is unable to capture is the differences between regions in the territory. For instance, energy conservation and efficiency costs might be higher in some communities (e.g. where winter road access is required), or benefits might be higher in some regions, particularly in places where GHG emissions from electricity is non-hydro sourced. In future, it would be useful to analyze cost-effectiveness by hydro and non-hydro communities.

3.3 Feedback on Program Portfolio and NWT Energy Use and Needs

The following subsections present the main findings from the interviews with the program staff, stakeholders and program participants. Findings relate to the state of energy efficiency in the NWT and the challenges thereof, as well as on the AEA and its current program portfolio.

3.3.1 Barriers to and Challenges with Energy Efficiency and Renewable Energy

Stakeholders and program staff mentioned various elements related to the local and varied contexts in NWT communities as barriers to energy efficiency. These include limited literacy and access to the Internet to complete applications, as well as isolation, environmental conditions, limited access to certain resources, technologies, contractors and qualified trades, the capacity for communities to manage energy efficiency or renewable energy projects, the perceived and real risks of adopting new technologies, and the high costs of energy efficiency and renewable energy measures.

Stakeholders were also asked about the challenges their members face in terms of their energy use or needs. While challenges varied from one stakeholder and client group to the next, there were some recurring elements. The cost of energy was named as a major challenge, which constitutes an opportunity for the AEA. Stakeholders have been encouraging their corporate and community members to switch to renewable energy and install energy-efficient measures to alleviate this challenge, but it has proved difficult for communities due to lack of money, knowledge and human capacity. In addition, NWT electricity pricing policy is not consistent with energy efficiency and renewable energy policy objectives. Subsidized electricity pricing in non-hydro communities results in pricing signals that are not aligned with energy efficiency and GHG reduction objectives.

Energy efficiency is both a concern and a priority for all stakeholders. However, there is a perception among the stakeholders interviewed that energy efficiency is viewed as unattainable by the general population. Stakeholders believe that their members, especially residents and small businesses, see energy efficiency as a major up-front investment with little benefits. According to stakeholders, education is the key to changing this perception. Lack of information and education about the benefits of energy efficiency, including cost savings and non-energy benefits like comfort, was identified as another major challenge. Concrete examples and case studies presenting actual monetary savings and benefit descriptions were brought up as ways to effectively educate and raise awareness.

3.3.2 Awareness about AEA and Programs

The six interviewed stakeholders were asked about their awareness of the AEA and its programs and services. All but one are familiar with AEA programs, although the level of awareness varies among these stakeholders. They are more aware of the program(s) in their respective sector of activity and therefore have partial knowledge of the entire program portfolio offerings. Additionally, awareness of AEA programs was lower among stakeholders outside of government.

Stakeholders believe that the members they represent are, for the most part, unaware of AEA programs and services, especially renters, low-income residents and small businesses. Half the interviewed stakeholders do not promote AEA programs to their members or clients, and the other half has either just started promoting them or does not promote them as much as needed. A perceived lack of interest from members and a lack of resources to develop the necessary promotional materials were identified as reasons for stakeholders not promoting AEA programs.

Staff from the AEA and GNWT agree that increased communication and collaboration with key stakeholders, including those involved in trades, contracting, as well as communal and municipal activities, will be needed to achieve greater program uptake and therefore meet the objectives of the 2030 Energy Strategy. According to program staff, limited program communication and marketing have been mainly due to some programs being fully subscribed and incentive budgets fully spent.

Stakeholders also suggested a consultation for program planning between themselves, the AEA and the GNWT. Stakeholders mentioned increasing partnerships to increase awareness among target customer groups and using social media, promotional events and trade shows to raise awareness.

The four interviewed participants learned about the AEA and their programs mostly through word of mouth and paper ads.

3.3.3 Program Portfolio Scope and Reach

Stakeholders and program staff shared their opinions about whether the current program portfolio meets the needs of the population. Recurring feedback included mentions that low-income households, as well as elders and tenants need to be better engaged. According to stakeholders, these client groups need to be addressed face-to-face as much as possible by using simple and adapted language. It should be noted that the AEA is considering developing a program offering for low-income residents. AEA staff have also mentioned that non-profit organizations and Indigenous government buildings are not fully targeted by the current program portfolio.

One stakeholder expressed reservations about the AEA investing in communities as a catalyst for energy efficiency and especially renewable energy. According to this stakeholder, there is a lack of expertise and capacity in certain communities, thereby limiting the reach of investments made. Along the same lines, another stakeholder recommended focusing on retrofit rather than renewable energy initiatives since retrofit projects are easier to manage and implement.

Finally, both the GNWT and AEA staff agree that more can be accomplished to achieve savings in the transportation sector.

3.3.4 Satisfaction with Programs

All four interviewed program participants were satisfied by their overall experience with the program, providing ratings of 8 or more on a scale from 0 to 10, where 0 is “not at all satisfied” and 10 is “completely satisfied”. The main reasons for satisfaction include the program participation process being straightforward and simple, with no hassle, little paperwork to complete, and the assistance provided by the AEA.

Participants were then asked to speak of their satisfaction with specific aspects of their respective program, namely: (1) the program application forms and other paperwork they had to fill out; (2) the clarity of the information provided by the program; (3) the program eligibility criteria; (4) the value of the program relative to the required time and cost; (5) the incentive amounts; and (6) the overall program participation process. Again, satisfaction ratings were very high, with no rating under 8 for any aspect. One participant did mention, however, that participating in this type of program can likely be intimidating to people who do not have access to a computer or are not literate. This feedback was also echoed by stakeholders. In addition, participants mentioned that although the incentive amounts were adequate for them, they may not be for other client groups including low-income residents.

All participants would recommend or have already recommended the program to a friend or family member.

From the AEA and GNWT staff perspective, no trends in dissatisfaction were reported, observed or brought to their attention about any program.

3.3.5 Reasons for Participation

When asked about why they decided to take part in their respective program, all four participants mentioned they believe energy savings and reduced energy costs had a fairly high influence on their decision. The information and advice provided were also influential for two of the four participants (one residential and one commercial participant). The program rebates or incentives were viewed as very influential for only one of the participants (commercial). Although participants saw the importance of saving energy when deciding to participate in their respective program, most also saw the program as an opportunity to upgrade their current equipment at a lower price. One participant mentioned that they would have selected the same equipment with the same level of efficiency without the program. This type of finding might indicate free-ridership.

3.3.6 Program Support and Communications

Participants did not face any challenges during their participation in their respective program. Commercial participants identified the calculation of the anticipated energy savings as the most complicated part of the process, but they received the help they needed from the AEA. According to them, if the AEA remains available to provide support and assistance, this part of the process is not an issue.

Participants rated interactions with the AEA very highly. All four participants mentioned being completely satisfied with the AEA. While all participants feel they obtained the support they needed to complete their project, some participants suggested a lack of technical support and cross-promotion between the programs to optimize the scope of projects and measures implemented.

All four participants worked with a professional such as a consultant, contractor or electrician to implement their project. One commercial participant found it difficult to find a professional to assist with installation.

3.3.7 Areas for Improvement

In addition to the improvement suggestions discussed in the previous subsections, the following recommendations were mentioned during the interviews:

- › Collaborate with key actors in the market, such as major multi-unit building owners to implement large-scale projects and help set standards in the NWT;
- › Work together with the power utility toward the same objectives;
- › While AEA staff feel tracking works well for the most part, they feel limited in terms of what they could do. They would like to have a customer relationship management system that would allow them to follow up with potential or previous participants to assess project possibilities. Additionally, they would like for participants to be able to contact AEA staff directly, through an interface, should they have any questions about their projects;
- › Similarly, program staff see a need to better track and follow up with participants who complete audits or home energy assessments but do not benefit from a program to go carry out their projects.

Participants did not provide any recommendations for program improvement except for allowing more time to commence works upon rebate pre-approval under the CECEP (currently 30 days).

3.4 SWOT Analysis

A SWOT analysis is a tool for understanding and organizing strengths, weaknesses, opportunities of and threats to an organization, business, or individual. A SWOT analysis was completed based on interviews with AEA and GNWT staff, as well as stakeholders. This subsection presents the results of this analysis of these interviews; Evaluator feedback is also included.

AEA staff were mentioned during the interview process as an unequivocal strength. Staff were described as knowledgeable, dedicated and supportive, and the AEA is viewed as a collaborative workplace. AEA staff approach each project by factoring in its own set of constraints and conditions, which makes staff adaptable, innovative and prone to offer quality customer service. The AEA is also seen as a trustworthy and independent organization that provides reliable expert advice and information. Its regional offices constitute an important connection between communities and Yellowknife.

In terms of weaknesses, the current organizational structure of the AEA is very linear, rendering top-down initiatives, processes and efficient communication and decision-making difficult to implement. This issue will be further compounded with a larger portfolio of programs and services. Planning and reporting – encompassing a lack of information on (1) goals and objectives, (2) how programs and services meet the needs of and add value to the territory, and (3) decision-making criteria for setting priorities – will also require additional effort on the part of the AEA, especially should program portfolio changes or growth occur. Also related to reporting, the AEA should improve tracking and following up with customers who have completed audits or home energy assessments to encourage them to implement projects. Though the AEA has recently hired a communications manager, limited communications and outreach has been carried out to date because many programs were fully subscribed. Similarly, the AEA has not leveraged many partnerships and lacks expertise in certain aspects of contracting partnerships. These elements should become important AEA considerations going forward.

Opportunities for the AEA are varied, with some being closely linked to weaknesses. There is strong potential for the AEA to develop partnerships and close relationships with community governments and key stakeholders either at the regional or territorial level, as well as with universities to increase awareness of programs and education about the benefits of energy efficiency and renewable energy. Increasing marketing and advertising to the general public is another significant opportunity. Untapped markets and sectors with potential for energy and GHG emission savings are also available, including plug-in hybrid transportation (e.g. trucks) and elders, tenants and low-income households. All these opportunities entail the need for growth. Threatening concerns relate to finding qualified staff to perpetuate the mission of the AEA and expanding the program portfolio based on funding and market needs without affecting quality and customer service. Implementing projects in community areas requires significant resources and expertise which the AEA provides more and more. Should additional community funding be available, the current lack of community capacity would be a concern.

Table 11: SWOT Analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> › AEA staff and leadership › Trust and reputation in communities › Adaptable and innovative › Regional offices 	<ul style="list-style-type: none"> › Insufficient funding to meet public demand for some programs › Issues with public understanding of AEA programs and services, including eligible equipment › Organizational structure › Planning and reporting › Communications and outreach › Leveraging partnerships › Not enticing customers who have conducted audits and home energy assessments to implement projects
Opportunities	Threats
<ul style="list-style-type: none"> › Regional and territorial-level relationships and strong engagement with community governments › Increased partnerships with community governments and universities › Dedicated funding to expand programs, developing new ones and reaching untapped potential › Focus from GWNT and Federal government on GHG emission reductions › New markets such as transportation, elders, tenants and low-income households › Increases in the use of some renewable energy sources such as biomass and solar › Leverage advertising and marketing 	<ul style="list-style-type: none"> › Succession planning and ability to hire qualified staff › Sustainability of federal funding and ability to adapt as needed › Decreases in quality and client services due to growth › Capacity of communities to deal with increases in funding

4 CONCLUSIONS AND RECOMMENDATIONS

This section outlines Econoler's conclusions and provides recommendations to help the AEA build on its strengths and address its weaknesses to further align its programs with the 2030 Energy Strategy and make improvements to processes moving forward.

4.1 Conclusions

The future state of the AEA will be shaped by the 2030 Energy Strategy and the applicable Strategy objectives. In addition, the GNWT identified several priorities for AEA activities. First, GHG emission reductions are a high priority for the GNWT and, in some cases, may be a higher priority than energy savings. Second, energy affordability is a high priority for the GNWT, which means while GHG reductions are important, programs should also result in energy bill savings for participants, particularly residents whose energy costs represent a high proportion of their income. Finally, value for money, or cost-effectiveness, is a key priority for the GNWT. Programs should be delivered as efficiently as possible.

The AEA expects to receive federal funding from the Low Carbon Fund, which will increase the AEA budget significantly over the next three years. This constitutes an opportunity to expand current AEA activities, explore new program areas and ensure further alignment with the Strategy objectives and GNWT priorities.

The following subsections serve to analyze how current AEA activities align with the 2030 Energy Strategy and identify key performance indicators (KPIs) to track how activities are performing against GNWT priorities.

4.1.1 Alignment of Program Portfolio with 2030 Energy Strategy

This subsection analyzes the level of alignment between the AEA program portfolio and the 2030 Energy Strategy objectives. Note that while the 2030 Energy Strategy has six objectives, objectives 2 and 6 are not discussed since they are not connected to the AEA mandate.

Objective 1: Work together to find solutions, community engagement, participation and empowerment

Econoler sees the work of the AEA in close alignment with Objective 1. Community engagement was noted as a key AEA strength by many of the staff and stakeholders interviewed. The regional offices are seen by many as a key component in engaging residents outside of Yellowknife. Current AEA activities aid in empowering communities by working directly with them to build capacity, manage their energy use and bills, and increase self-sufficiency in the case of the renewable programs. However, the results of the community programs are mixed. For example, CGBERP has not to date been effective in gaining energy savings. Two areas of success (based on results in Annual report) are the community-based LED Swap-Out and Biomass Energy Program which has one large community district energy project.

More education and awareness to educate the population, particularly residents and small businesses, on the benefits of AEA initiatives is still needed. In addition, a community-focused approach must include capacity building within communities (e.g. project management support) and incentives to address the affordability barriers in these communities.

In 2017, many AEA programs were fully subscribed and had maximum participation based on funding levels. As discussed, the CGBERP underperformed in terms of participation, therefore further action is required to improve participation therein. Given the increased budget, fully subscribed programs could be expanded to allow greater participation. While Indigenous governments and non-profits can access EEIP and CGBERP, they do not have access to CECEP incentives. Interviewees reported that because programs are in rebate form, low-income residents who do not have money upfront are unable to participate due to that limitation. The AEA portfolio lacks a program targeted directly at addressing barriers of low-income homeowners and renters.

Objective 3: Reduce GHG emissions from road transportation by 10% per capita

Currently, the AEA does not offer programs that target reducing emissions from vehicles. While the jurisdictional review found no other energy efficiency agencies that currently offer transportation programs, there are synergies between energy efficiency and transportation programs. Input from interviewees highlighted the challenges of reducing vehicular miles travelled due to territorial conditions (e.g. long travel distances, lack of public transportation, climate). One area for exploration is electric or plug-in hybrid fleets (e.g. taxis or car coops) and plug-in hybrid trucking. However, it should be noted that incorporating transportation in the AEA program portfolio involves broadening scope.

Objective 4: Increase the share of renewable energy used for community space heating to 40% by 2030

The AEA currently offers four programs that target increasing the share of renewable energy used for space heating. The AETP is well positioned to increase participation in residential and commercial sectors to increase renewable energy used for space heating. The program has generated a significant amount of interest and is currently oversubscribed, however only a portion of AETP projects are directed at space heating. In 2017, six of the 20 AETP projects were biomass projects directed at space heating. Therefore, 70% of AETP projects targeted electricity generation, with over half of those being based in hydro communities (and therefore not resulting in GHG emission reductions).

On the other hand, CREP targets community governments and had lower participation in 2017 due to lack of funding, as well as the time and resources required for projects to be approved and implemented. Biomass heating systems (boilers, co-generation, district energy) have a large impact on GHG emissions but require increased funding and project management due to their complexity and size. The Biomass Energy Program supported one district energy project in 2017, which should result in significant reductions in GHG emissions.

The EEIP provides rebates for pellet and wood stoves, and the Wood Stove project provides support for increasing the efficiency and safety of wood stove heating. However, the impacts of

both these programs on increases in renewable fuel use and GHG reductions are not currently measured.

Objective 5: Increase the residential, commercial and institutional building energy efficiency by 15% over 2015 levels by 2030

The AEA EEIP, CECEP and CGBERP are positioned to support this objective. However, the impact of the CGBERP has been low, and the impact of EEIP remains unclear. The Community LED Swap-Out project was reported to have provided significant savings for the communities in which it was implemented. The AEA has invested sizable effort in energy audits, both in the residential and commercial sectors, however the energy savings impact of these efforts has not yet been measured. The ERSSP has completed a large number of home audits, but the savings impact of this program is unclear because of minimal follow-up with participants, and it is not integrated with other offers (e.g. EEIP). Similarly, CGBERP has completed audits in almost two thirds of NWT communities, however few are currently initiating projects and the incentive budget for this program is undersubscribed. The AEA should target this pipeline of potential projects and move them from the study to implementation phase.

4.1.2 GWNT Priorities and Key Performance Indicators

This review outlines three priorities to guide AEA activities toward increasing alignment with the 2030 Strategy objectives: (1) reduce GHG emissions, (2) improve energy affordability and (3) provide value for taxpayer money.

The table further below provides recommendations on KPIs that will allow the GWNT and AEA to track performance against these priorities by program, customer sector and the territory.

As mentioned in the Evaluation Methodology section, logic models for the EEIP, ERSSP, CECEP, CGBERP, AETP, CREP and the Biomass Energy Program were developed during this evaluation. A logic model is a representation of how a program works and how it contributes to the intended or observed outcomes. The logic models provided here can therefore serve as another tool for assessing program performance. These program characterizations are meant to provide insight on the following program parameters:

- › Barriers;
- › Target client groups;
- › Program activities;
- › Program goals, objectives and targets;
- › Intended outputs;
- › Short, medium and long-term outcomes.

Where no defined results or outcomes were identified, Econoler suggests short, medium and long-term results for each program. The seven logic models developed by Econoler are presented in Appendices I through VII.

Table 12: Key Performance Indicators (KPIs)

Priority	KPI	Notes
Reduce GHG Emissions	GHG emissions reduced (tonnes)	<ul style="list-style-type: none"> › Track for each program, by sector and by portfolio › For each program, track by hydro and non-hydro communities
Improve Energy Affordability	Energy savings (MWh, GJ) Bill savings (\$) Low-income participation	<ul style="list-style-type: none"> › Track energy savings and bill savings for each program by sector and by portfolio › For each program
Provide Value for Taxpayer Money	\$/GHG reduced \$/MWh avoided	<ul style="list-style-type: none"> › Track by program and by portfolio › For each program, track by hydro and non-hydro communities
	Number of residents touched by program Number of businesses touched by program GHG emissions reduced (tonnes) Energy Savings (MWh, GJ) Optional: Level of awareness/satisfaction	<ul style="list-style-type: none"> › For Regional Offices Program only, for each regional office

4.2 Recommendations

This subsection provides Econoler’s recommendations to increase alignment of AEA activities with the 2030 Energy Strategy, as well as improve program planning and tracking to measure future progress.

The recommendations are divided into two groups. The first comprise recommendations directly tied to increasing alignment with the 2030 Energy Strategy objectives. These recommendations are outlined in Figure 1 below. The second, presented in



Figure 2 and Figure 3, comprise additional actions, namely program planning, reporting, program management, education and awareness, which Econoler considers important factors for AEA going forward as it further aligns operations with the GWNT Energy Strategy and expand activities

Figure 1: Recommended Actions in Relation to 2030 Energy Strategy Objectives

Objectives	Recommended Actions
<p>1</p> <p>Work together to find solutions: community engagement, participation and empowerment</p>	<p>1a. Increase education, outreach and awareness efforts to address awareness and acceptance barriers. Use case studies to show potential participants the energy and non-energy benefits of energy efficiency and renewable projects and how such projects are completed.</p> <p>1b. Identify opportunities to collaborate with key stakeholders and local organizations to help promote the benefits of energy efficiency, renewable energy, and programs.</p> <p>1c. Address accessibility gaps in the AEA portfolio:</p> <ul style="list-style-type: none"> • Develop a program targeting low-income homeowners and tenants, ensuring coordination with other programs targeted at this segment (e.g. Senior Aging in Place Retrofit program). A combination of directly installing energy-efficient products and point-of-sale rebates should be considered for this new program to address specific barriers faced by these clients. • Allow non-profits and Indigenous governments to participate in CECEP. <p>1d. Implement performance standards and clear expectations to ensure that the regional offices resources are resulting in regional uptake in programs and services, meeting the regional needs, and addressing the capacity gaps in regions.</p> <p>1e. Leverage the regional offices to use a community-focused approach to delivering programs (i.e. similar to the approach used in Community LED Swap-Out and Deep Energy Retrofit pilots).</p> <p>1f. Review and modify community based program and service delivery model to ensure it meets the needs of communities given community capacity constraints. and is effective in achieving results.</p>
<p>3</p> <p>Reduce GHG emissions from road transportation by 10% per capita</p>	<p>3a. Implement an incentive for low or zero emission vehicle (e.g. taxis and car coops) and plug-in hybrid electric trucking to reduce road vehicle emissions.</p> <p>3b. Provide a rebate for emissions reduction technologies such as aux. heating devices to reduce idling.</p>

Figure 2: Recommended Actions in Relation to 2030 Energy Strategy Objectives (continued)

Objectives	Recommended Actions
<p>4</p> <p>Increase the share of renewable energy used for community heat by 40% by 2030</p>	<p>4a. Exclude projects that do not displace fossil fuels from AETP and CREP eligibility, thus prioritizing projects that will result in GHG reductions. Focus on technologies that reduce the most GHGs such as biomass.</p> <p>4b. Increase funding, project management support and local operator training for biomass projects to facilitate these in communities.</p>
<p>5</p> <p>Increase residential, commercial and institutional building energy efficiency by 15% over 2015 levels by 2030</p>	<p>5a. Expand incentive budgets of energy efficiency programs that are fully subscribed and advertise them to increase uptake, namely CECEP and EEIP.</p> <p>5b. Review eligible technologies and incentive levels to ensure that incented measures are resulting in cost-effective incremental energy savings and that incentive levels take into account market barriers as well as participation, energy-savings and cost-effectiveness goals.</p> <p>5c. Consider adding the following initiatives to the AEA portfolio to increase building efficiency:</p> <ul style="list-style-type: none"> • Commercial prescriptive program targeted at fast-tracking measures that do not require an audit (e.g. lighting). • A deep energy retrofit program for residential customers targeted at ensuring that customers who have received a home evaluation through the ERSSP implement recommended measures, including incentives for windows and doors. <p>5d. Provide training seminars for the trades to educate on the value of energy efficiency measures and how to install specific new technologies.</p>

Figure 3: Recommended Actions in Relation to Program Planning and Reporting

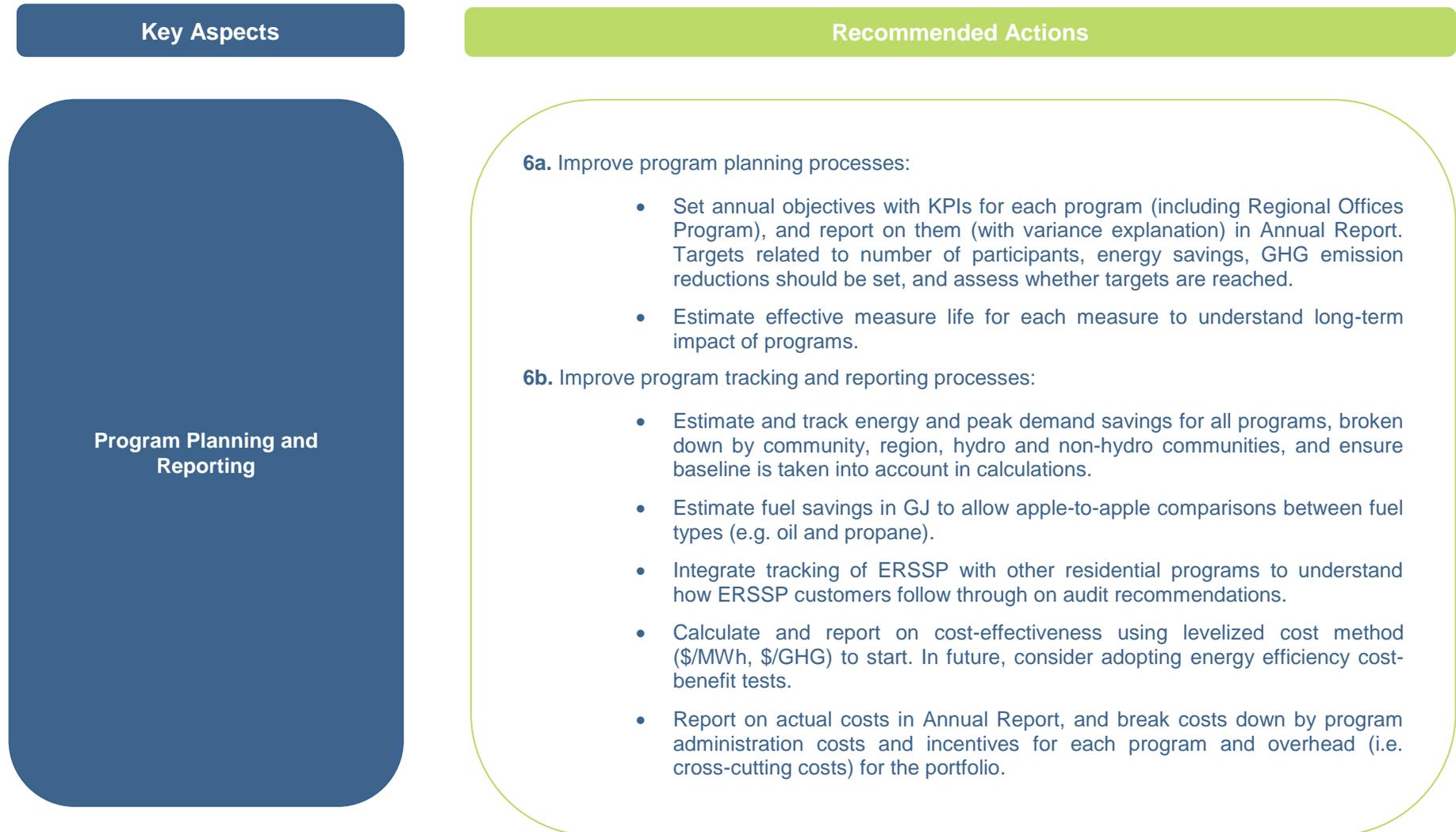
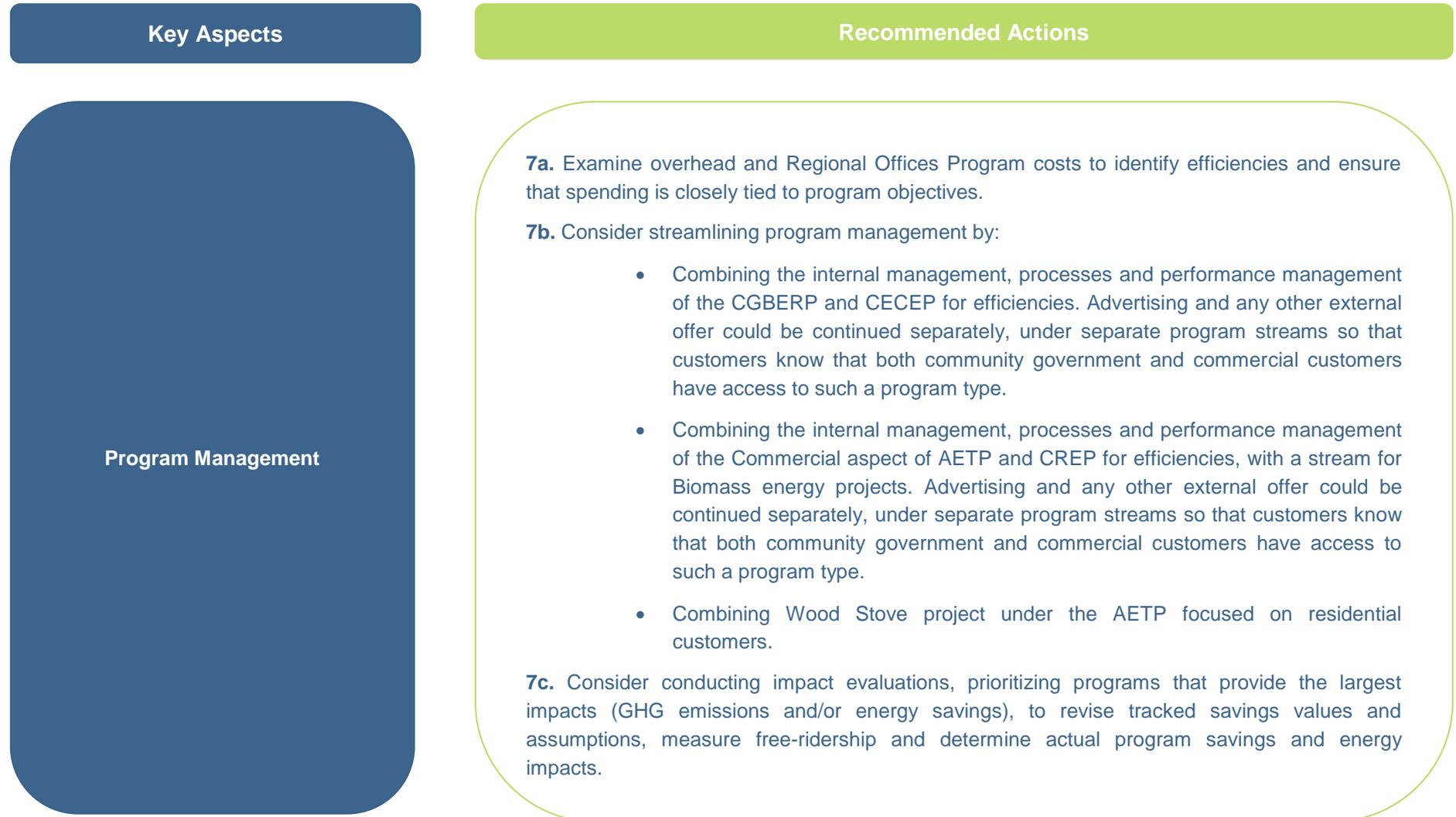
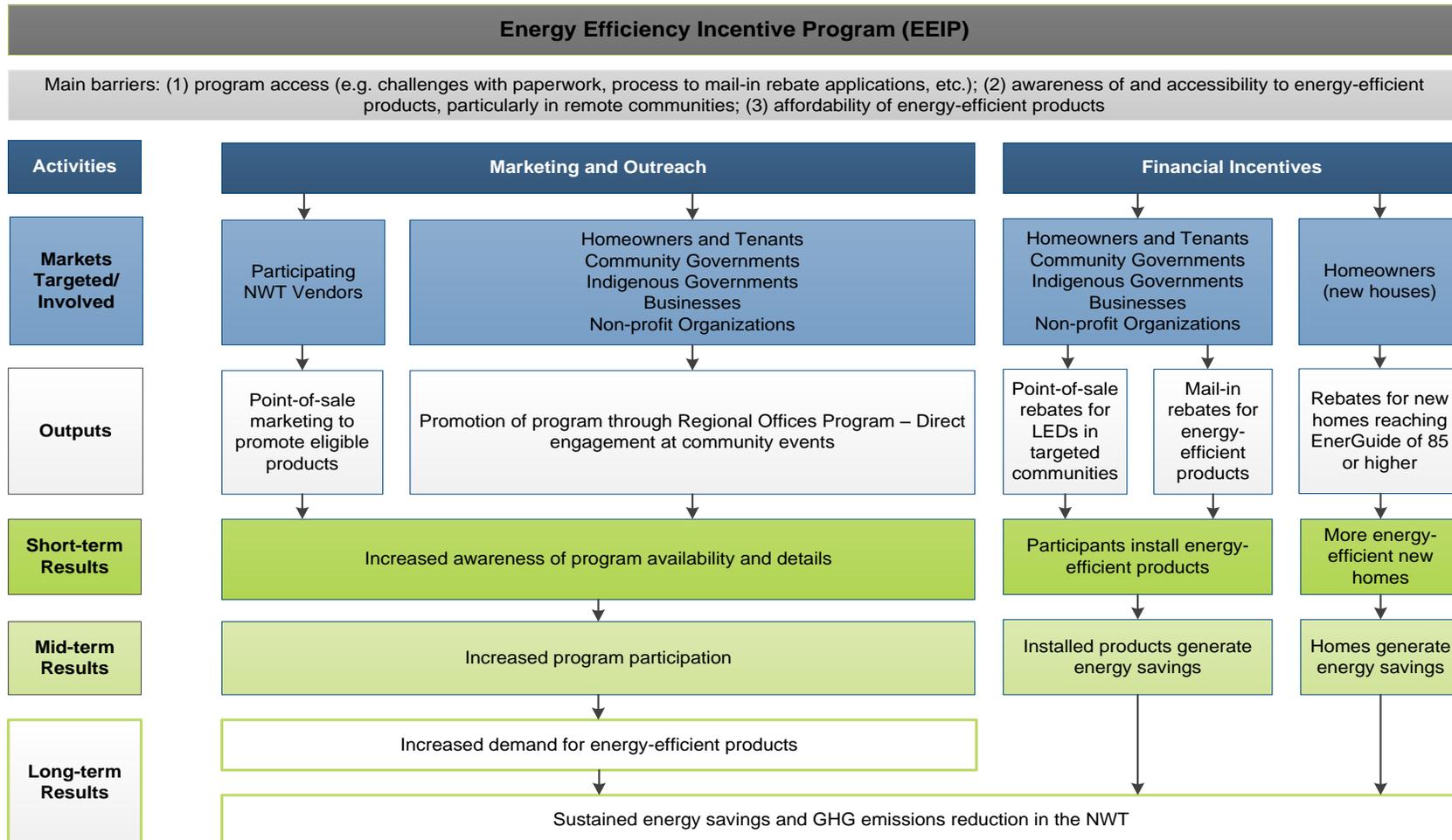


Figure 4: Recommended Actions in Relation to Program Management



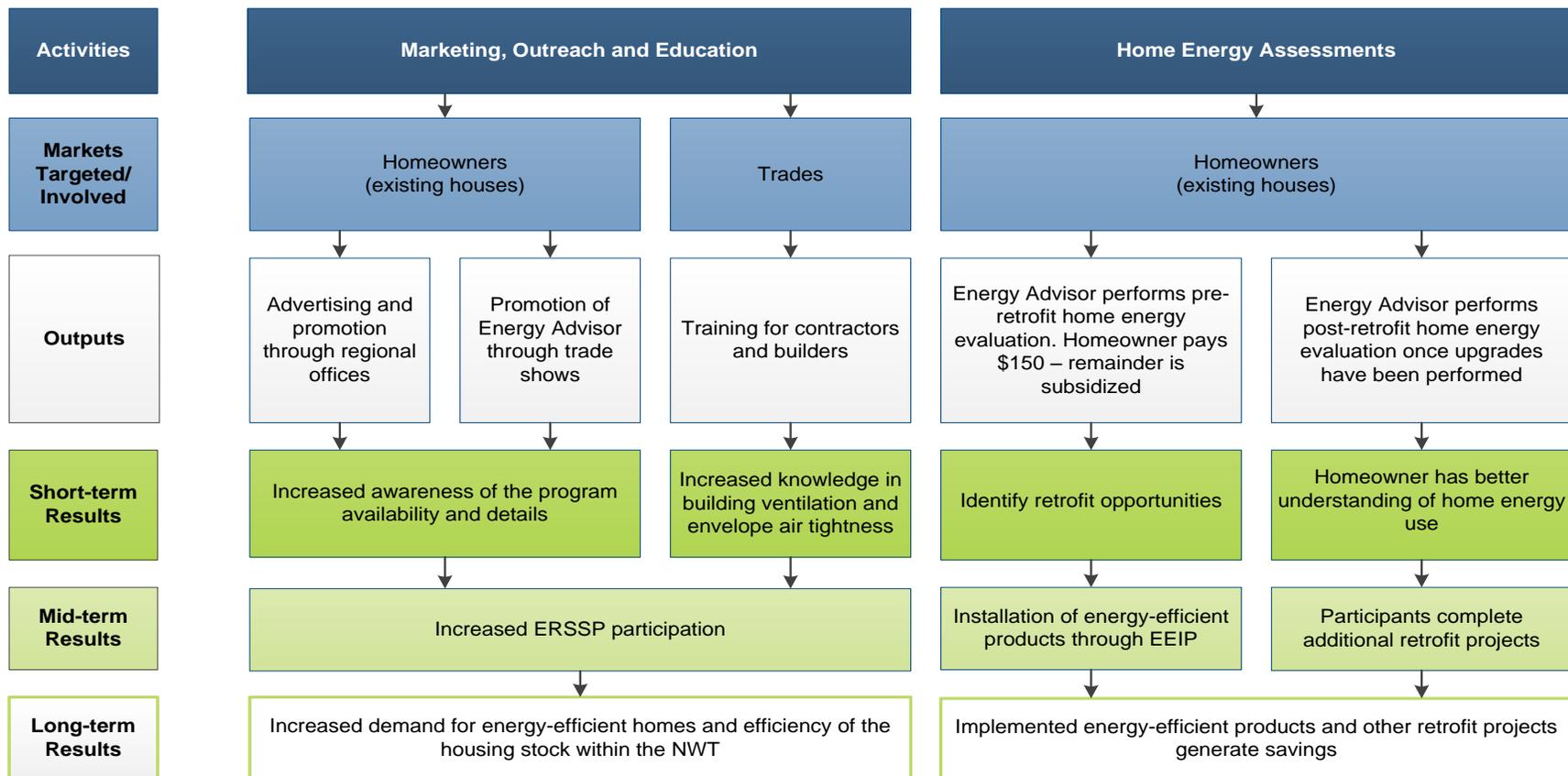
APPENDIX I EEIP LOGIC MODEL



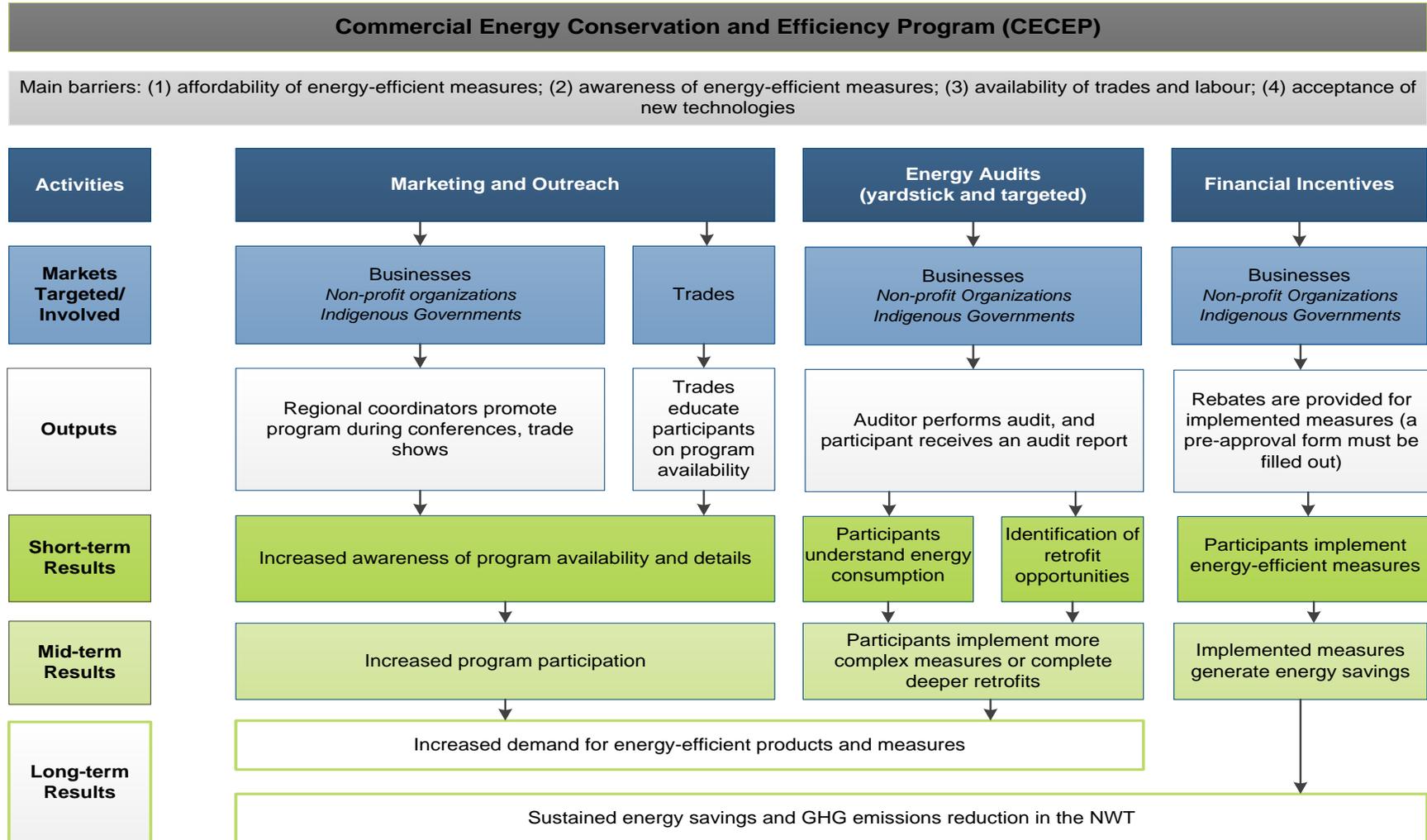
APPENDIX II ERSSP LOGIC MODEL

Energy Rating Service Support Program (ERSSP)

Main barriers: (1) challenges with moving audits to actual projects/installation of products; (2) awareness of actual home energy consumption; (3) short-term homeownership and highly transient populations in regional centers



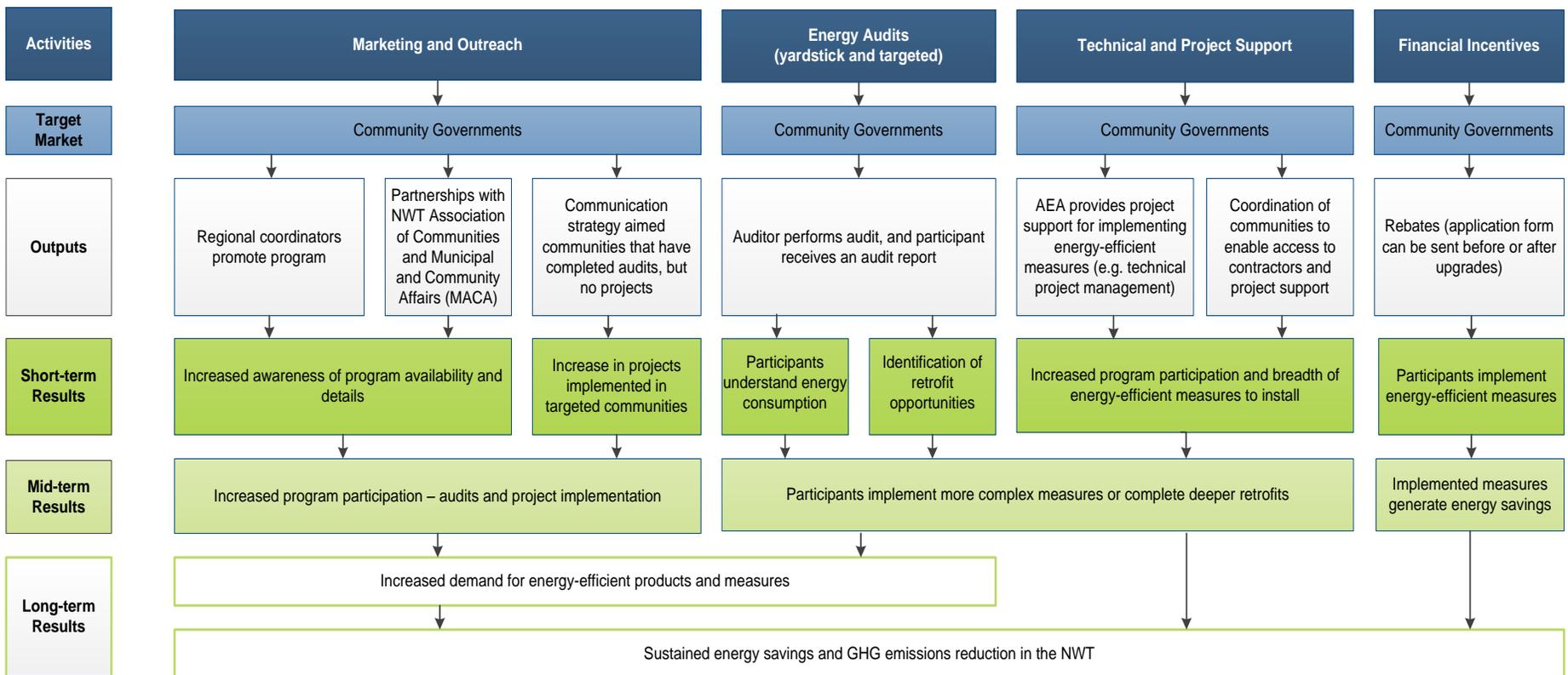
APPENDIX III CECEP LOGIC MODEL



APPENDIX IV CGBERP LOGIC MODEL

Community Government Building Energy Retrofit Program (CGBERP)

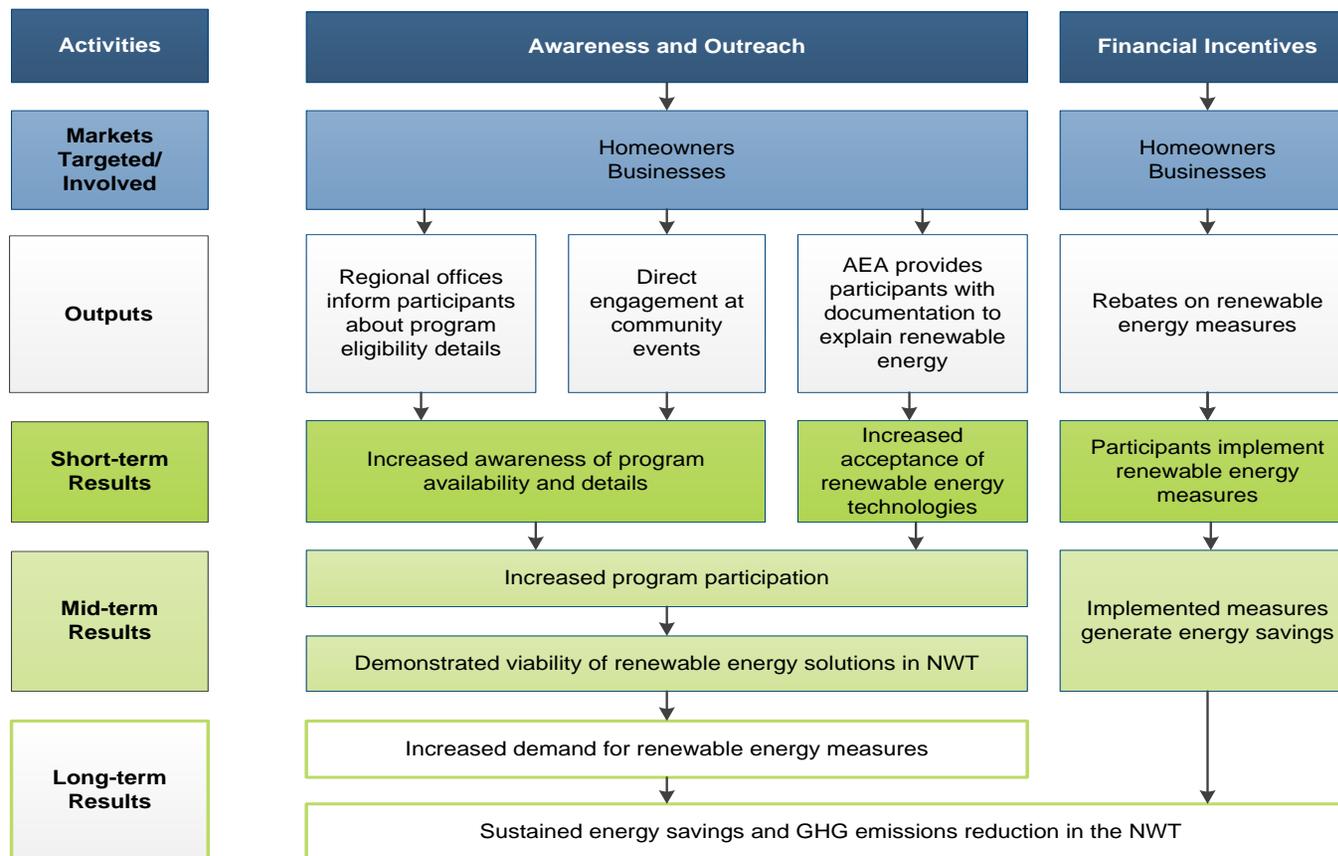
Main barriers: (1) affordability of energy-efficient measures; (2) awareness of energy-efficient measures; (3) availability of trades and labour; (4) acceptance of new technologies; (5) availability of project managers and contractors; (6) time and capacity of community governments



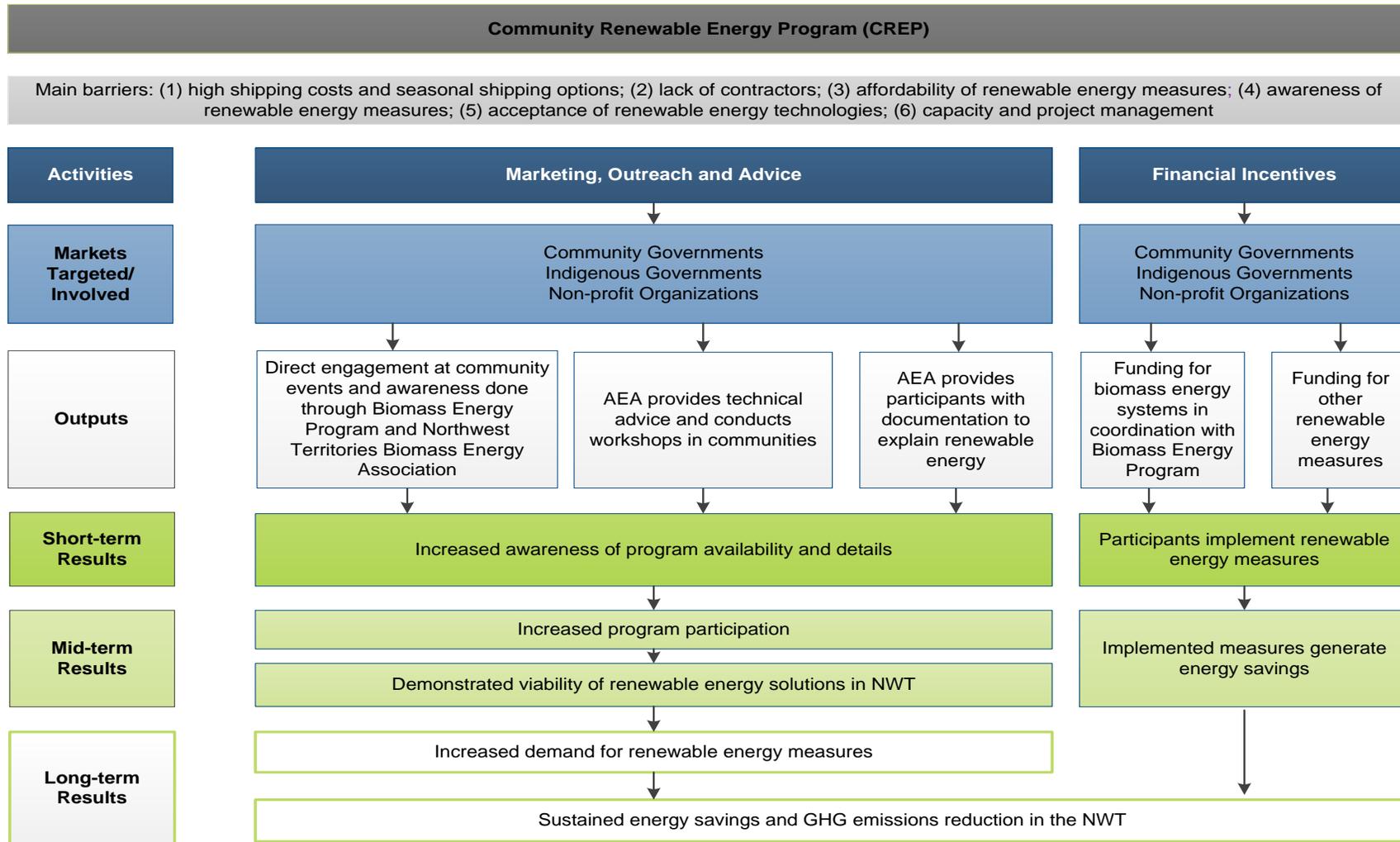
APPENDIX V AETP LOGIC MODEL

Alternative Energy Technologies Program (AETP)

Main barriers: In the NWT in general: (1) affordability of renewable energy measures; (2) awareness of renewable energy measures; (3) acceptance of new technologies; Outside of Yellowknife: (4) high shipping costs and seasonal shipping options, and (5) lack of contractors.



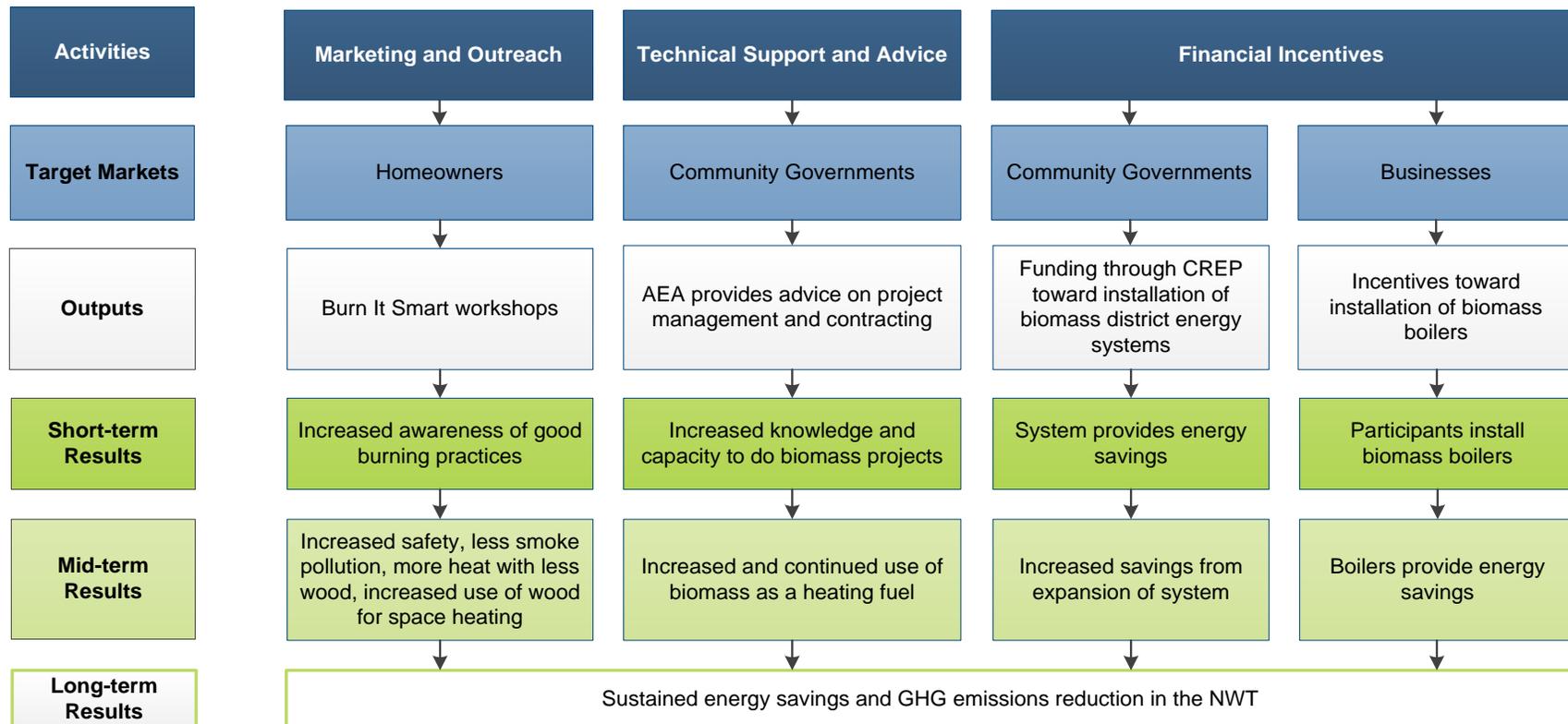
APPENDIX VI CREP LOGIC MODEL



APPENDIX VII BIOMASS ENERGY PROGRAM LOGIC MODEL

Biomass Energy Program

Main barriers: In the NWT in general: (1) affordability of biomass measures; (2) awareness of biomass measures; (3) acceptance of new technologies. Outside of Yellowknife: (4) high shipping costs and seasonal shipping options, and (5) lack of contractors.



APPENDIX VIII

CALCULATING NET SAVINGS: FREE-RIDERSHIP AND SPILLOVER

The Uniform Methods Project (UMP), which provides some of the most reliable evaluation guidelines, defines gross and net savings as:

- › Gross savings: The difference in energy consumption with the energy-efficiency measures promoted by the program in place versus what consumption would have been without those measures in place.
- › Net savings: The difference in energy consumption with the program in place versus what consumption would have been without the program in place.

Essentially, the equation to calculate net savings is: Gross Savings – free-ridership + spillover.

As described by the equation above, when assessing program savings, two types of effects are typically considered: free-ridership and spillover. Free-ridership is a negative effect since it describes participants who would have still implemented energy efficiency measures without the program. Spillover is a positive effect; it occurs when participants implement additional energy efficiency measures after participating in the program and without asking the utility for incentives. These effects are calculated and applied to gross savings to obtain net savings which can be reliably attributed to a program.

Free-ridership and spillover are often assessed through data collection processes which typically include participant surveys or interviews and on-site visits, and rely on a self-report approach. The exact data collection activity to be carried out varies from one type of program to another, and should be adapted depending on the size of the population of participants. It should be noted that except for low-income programs, where free-ridership and spillover levels are assumed to be nil, free-ridership should be assessed in impact evaluations. Depending on the type of program, the Evaluator and the program administrator may discuss the potential for spillover and therefore the need to evaluate it.

The questions developed to assess free-ridership should include two notions: intention and influence. Specifically, the questions should cover relevant variables of the decision-making process, including planning, efficiency, amount, timing and cost, as well as the influence of various program elements on the participants' decision to implement measures. Feedback collected from the participants on intention and influence is then converted into an overall free-ridership level using an algorithm.



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