Bristol Bay Region
Tribal Priority Climate Action Plan

March 1, 2024

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Acknowledgements

The Priority Climate Action Plan (PCAP) is the result of the hard work and persistence of many people (see list below), including staff from various agencies, consultants, Tribal representatives, and reviewers who spent many hours researching, writing, crunching numbers, and reviewing the Plan.

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In the spirit of our ancestors and with deep respect for the land that sustains us, we dedicate this PCAP to our families, our friends, and the children of the Bristol Bay region. This climate action plan is our promise to the future generations who will walk this land after us and a commitment to uphold the legacy and wisdom of our elders. May our successes today pave the way for their prosperity, ensuring they inherit a world where our traditions, our culture, and our community continue to thrive in harmony with nature.

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Agencies/Organizations:
Alaska Housing Finance Corporation (AHFC)
Alaska Native Tribal Health Consortium (ANTHC)
State of Alaska (SOA)

Participant Tribes:
Native Village of Aleknagik, Chignik Bay Tribal Council (formerly Native Village of Chignik), Native Village of Chignik Lagoon, Chignik Lake Village, Village of Clarks Point, Curyung Tribal Council, Egegik Village, Native Village of Ekwok (formerly Ekwok Village), Native Village of Ekuk, Igiugig Village, Village of Iliamna, Ivanof Bay Tribe (formerly Ivanof Bay Tribe and Ivanof Bay Village), Native Village of Kanatak, King Salmon Tribe, Kokhanok Village, New Koliganek Village Council, Levelock Village, Manokotak Village, Naknek Native Village, Newhalen Village, New Stuyahok Village, Nondalton Village, Pedro Bay Village, Native Village of Perryville, Native Village of Pilot Point, Native Village of Port Heiden, Portage Creek Village (Ohgsenakale), South Naknek Village, Traditional Village of Togiak, Twin Hills Village, Ugashik Village.

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Purpose and Scope

Purpose and Scope: Tribal Roadmap for GHG Reduction
The core purpose of this our Climate Action Plan is to create a tangible, effective roadmap for reducing greenhouse gas (GHG) emissions by leveraging this planning phase to develop impactful projects. This Climate Action Plan, developed with the support of the EPA's Climate Pollution Reduction Program, represents the concerted effort of a consortium of Tribes dedicated to preserving their way of life and natural resources. It is a strategic response to the urgent challenge of climate change, encompassing both the Priority Climate Action Plan (PCAP) and the Comprehensive Climate Action Plan (CCAP), reflecting the Tribes' role as stewards of their ancestral lands.

Phase I: Priority Climate Action Plan (PCAP) – March 1, 2024
The first phase of our journey begins with the creation of the PCAP. Our focus in this phase is to identify immediate, actionable strategies to reduce greenhouse gas (GHG) emissions. The PCAP will encapsulate near-term priorities, reflecting our unique environmental challenges. This plan will serve as a springboard, enabling us to pursue the necessary funding through the EPA CPRG Implementation Phase and support for our envisioned projects.

Implementation Grant Applications

Application Type	Applicant Eligibility	PCAP Deadline	Grant Application Deadline
General Competition ($2MM - $500MM)	State, Municipality, Tribe, Tribal Consortium, Territory	March 1, 2024	April 1, 2024, at 11:59 p.m. (ET)
Tribal Competition ($1MM - $25MM)	Tribe, Tribal Consortium, Territory	April 1, 2024	May 1, 2024, at 11:59 p.m. (ET)

**Note – Measures/Projects must be listed in a PCAP to be eligible to be included in an Implementation Grant Application. See: https://www.epa.gov/inflation-reduction-act/about-cprg-implementation-grants for more information.*

Phase II: Comprehensive Climate Action Plan (CCAP)
With the foundational work of the PCAP in place, we will expand our vision in the CCAP, due Summer 2025. This comprehensive plan will delve deeper, covering significant GHG emission sources and carbon sinks within our region. It will outline both short- and long-term goals, strategies, and measures, encompassing a broad spectrum of environmental, economic, and project opportunity considerations. The CCAP is our roadmap to not only meet the immediate challenges of climate change but to set a course for the future.

Region Description

Nestled in the heart of southwestern Alaska, the Bristol Bay Native Association (BBNA) service area is a landscape of unparalleled natural beauty and rich cultural heritage, home to 31 Tribal communities deeply rooted in the land and its traditions. This vast region, stretching over an area roughly the size of Ohio, encompasses the pristine waters of Bristol Bay, vast wetlands, meandering river systems, and the rugged beauty of Alaska's wilderness. Renowned for its ecological diversity, it hosts the world's largest wild salmon runs, forming the backbone of the local economy and the subsistence lifestyle of its inhabitants.

The BBNA area is characterized by its significant remoteness and lack of road connectivity, with each community typically operating a standalone diesel electric utility in the absence of a unified electrical grid. This geographical isolation restricts transportation options, meaning fuel and goods can only be transported by air or during the brief ice-free period for barges. Such constraints significantly increase the costs of goods and services, including energy, further complicating the economic landscape of the region. Year-round employment opportunities are predominantly found in public services, health, and education, complemented by seasonal work, which together shape the region's economic fabric. However, the high energy costs, driven by the reliance on diesel for electricity and heating, not only exacerbate the economic challenges but also leave less disposable income for residents, hindering local economic development and contributing to substantial greenhouse gas emissions.

As we embark on the critical journey towards sustainability and resilience within this remarkable region, the Priority Climate Action Plan stands as a testament to our collective commitment to reducing greenhouse gas (GHG) emissions and addressing the urgent challenges posed by climate change. This comprehensive strategy aims to revolutionize our energy systems, bolster community resilience, and preserve the invaluable natural environment and cultural heritage for future generations.

Central to this plan is a suite of measures designed to mitigate the impacts of climate change and to seize the potential for sustainable development within our region. A pivotal aspect of our strategy involves reducing our dependence on diesel fuel for heating and electricity, thereby aiming to markedly decrease our carbon footprint and alleviate the economic vulnerabilities tied to high energy costs. Championing the integration of renewable energy technologies—specifically, solar-battery and wind-battery systems—with existing diesel electric utilities represents a cornerstone of our approach. These innovative hybrid energy systems herald a future powered by clean, renewable energy sources, contributing to reduced GHG emissions and enhanced energy security while addressing the logistical challenges of energy supply in such a remote setting.

Moreover, this plan underscores the critical role of energy efficiency as an integral component of our climate action efforts. Implementing measures to improve the energy efficiency of homes and community buildings stands to significantly reduce overall energy demand, further diminishing our reliance on fossil fuels.

List of Tribal Communities

	Community Name	Federally Recognized Tribe
1	Aleknagik	Native Village of Aleknagik
2	Chignik Bay	Chignik Bay Tribal Council (formerly Native Village of Chignik)
3	Chignik Lagoon	Native Village of Chignik Lagoon
4	Chignik Lake	Chignik Lake Village
5	Clarks Point	Village of Clarks Point
6	Curyung (Dillingham)	Curyung Tribal Council
7	Egegik	Egegik Village
8	Ekwok	Native Village of Ekwok (formerly Ekwok Village)
9	Ekuk	Native Village of Ekuk
10	Igiugig	Igiugig Village
11	Iliamna	Village of Iliamna
12	Ivanof Bay	Ivanof Bay Tribe (formerly Ivanof Bay Tribe and Ivanof Bay Village)
13	Kanatak	Native Village of Kanatak
14	King Salmon	King Salmon Tribe
15	Kokhanok	Kokhanok Village
16	New Koliganek	New Koliganek Village Council
17	Levelock	Levelock Village
18	Manokotak	Manokotak Village
19	Naknek	Naknek Native Village
20	Newhalen	Newhalen Village
21	New Stuyahok	New Stuyahok Village
22	Nondalton	Nondalton Village
23	Pedro Bay	Pedro Bay Village
24	Perryville	Native Village of Perryville
25	Pilot Point	Native Village of Pilot Point
26	Port Heiden	Native Village of Port Heiden
27	Portage Creek	Portage Creek Village (Ohgsenakale)
28	South Naknek	South Naknek Village
29	Togiak	Traditional Village of Togiak
30	Twin Hills	Twin Hills Village
31	Ugashik	Ugashik Village

Map

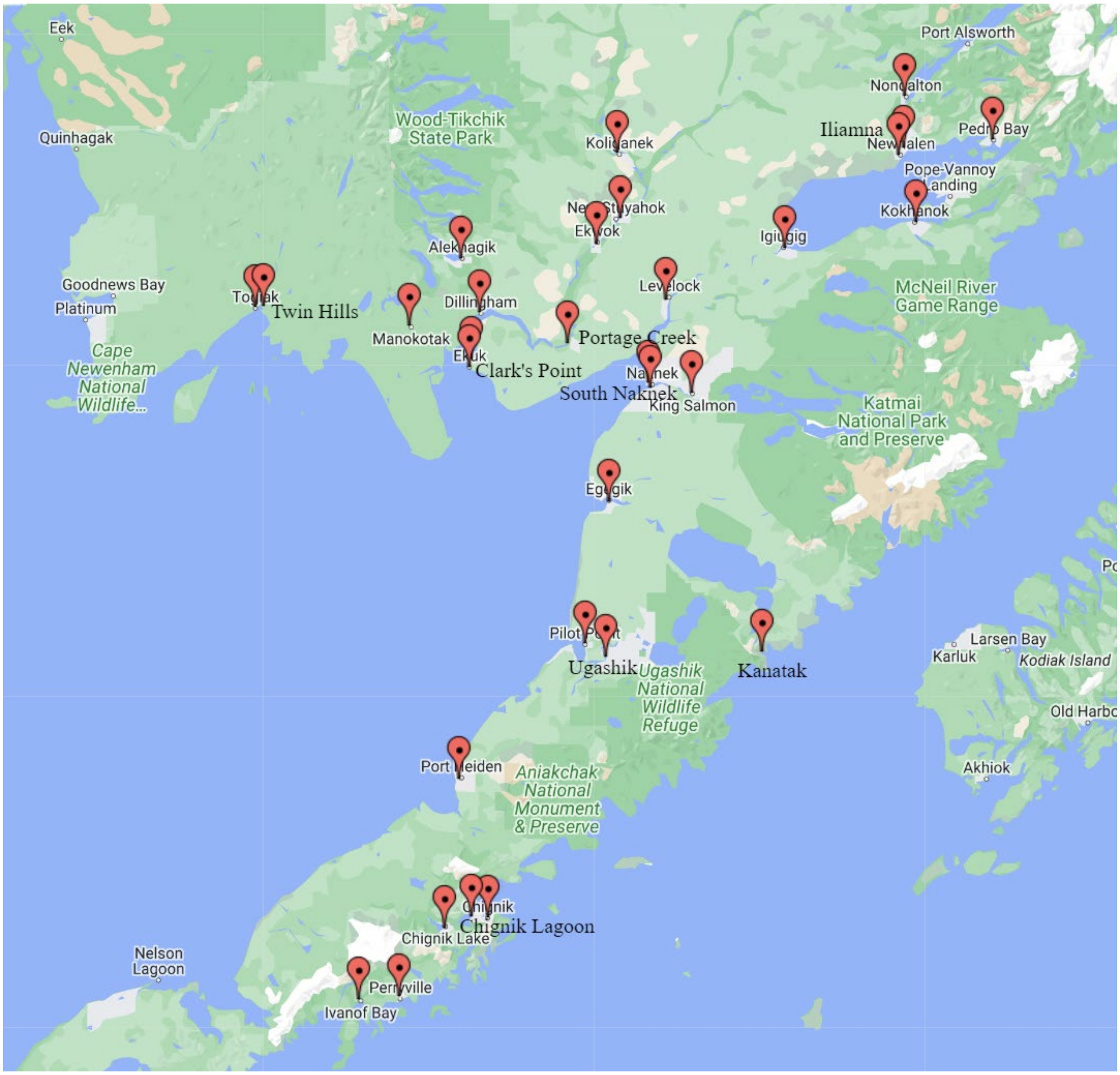

Figure 1 – Map of the 31 BBNA communities included in this Climate Action Plan

Entities in the Region

There are three entities that function within most of the villages. This includes the Native Corporation, the city government and the Tribal government. It is easy to get confused and there are some common misconceptions about the various entities and their roles. There are also other entities that provide services in the region. Below is information regarding the different regional entities including what their role is and how they can be a resource.

Tribes

Tribal governments are sovereign entities in the U.S., recognized by the Constitution as having the same powers as federal and state governments for internal regulation. These governments, predating the U.S. and the State of Alaska, have their own laws primarily for their citizens, and manage various programs for their communities. Federally recognized Tribes are considered sovereign governments by the U.S. Most organized under the Indian Reorganization Act, adopting constitutions and forming "IRA Councils," while others are governed by traditional councils. Both types of councils are legitimate, federally recognized sovereign entities with the authority to create laws and justice systems. They also provide social and economic services, often in partnership with an Alaska Native Regional Non-Profit. Tribal Councils, consisting of elected members including a President or Chief, govern these Tribes. Membership requirements vary by Tribe.

Alaska Native Regional & Village Corporations

Under the Alaska Native Claims Settlement Act (ANCSA), Regional Corporations and Village Corporations were established as for-profit entities with different focuses and scales of operation. Regional Corporations were created to manage land and financial assets on a broad scale, aiming to generate revenue for shareholders—Alaska Natives enrolled at the time of ANCSA's enactment in 1971 and those born afterward. They typically hold rights to subsurface estate and engage in various business ventures, including the development of natural resources, to increase shareholder value through dividends.

Village Corporations, in contrast, operate at a more localized level, holding title to the surface estate of lands received under ANCSA. Their focus is using and developing this land for community benefits, such as housing and local commercial projects. Shareholders are Native individuals from specific villages, and these corporations aim to foster economic growth within their immediate areas, often focusing on the village's social and economic well-being.

While both types of corporations serve the economic interests of their shareholders, Regional Corporations focus on large-scale economic development and subsurface rights across extensive geographic areas. In contrast, Village Corporations concentrate on surface rights and local development. This approach under ANCSA offered a unique method for economic self-determination for Alaska Natives, differing from the reservation system in the "Lower 48" by promoting corporate structures and asset management.

City

Cities in Alaska operate as autonomous municipal governments, functioning within the boundaries set by the state constitution and laws, particularly under the authority of Title 29 of the Alaska Statutes. Some of their responsibilities may include managing utilities, overseeing landfills, and providing essential services like fire protection and public safety and sometimes these responsibilities are split with the Tribe. Residents who live within city limits are considered citizens of the municipality and have the right to elect their local government officials, including the Mayor and City Council, who direct municipal operations and enact local ordinances enforceable through the State's court system.

Service Organizations

Regional Non-Profit | Bristol Bay Native Association

In Alaska, there are 12 regional non-profit organizations focused on serving Alaska Native communities. These non-profits were established to administer a wide array of social services, healthcare, and educational programs, aiming to improve the welfare of Alaska Native peoples. Unlike the corporations formed under the Alaska Native Claims Settlement Act (ANCSA), these regional non-profit corporations operate independently, focusing primarily on service delivery rather than corporate benefits.

The mission of these organizations often includes enhancing healthcare access, promoting cultural and educational opportunities, and supporting the preservation of Alaska Native heritage. To achieve these goals, they rely on a combination of federal contracts, grant funding, support from ANCSA Regional Corporations, and partnerships with village non-profits. Their services range from providing comprehensive healthcare and behavioral health services to offering scholarships for Alaska Native students, sponsoring cultural events, preserving Alaska Native languages, and protecting sites of historic or religious significance.

These regional non-profits play a crucial role in the Alaska Native community by bridging the gap between federal support and local needs. Regional Non-Profit Corporations contract with the federal government to ensure that Alaska Native people in their regions have access to essential social, education, and health services. The non-profits are tasked with the administration of these services, ensuring that programs are effectively targeted to meet the community's needs. Through this collaborative effort, Alaska Native regional non-profit organizations work to ensure the health, education, and cultural vitality of Alaska Native peoples, operating with a deep commitment to the communities they serve.

Regional Health Corporation | Bristol Bay Area Health Corporation

Regional Health Organizations (RHOs) serve as key healthcare providers across various regions, operating as non-profit health corporations. These organizations are not federally recognized Tribal governments but play a crucial role in delivering healthcare services to all residents within their respective regions, regardless of Native status. Their operations are characterized by a strong commitment to community health and well-being, offering a comprehensive range of medical services that cater to the needs of the local population.

Funding for RHOs typically comes from a mix of sources, including the Indian Health Service (IHS) of the U.S. Government, state and federal grants, and reimbursements from programs like Medicare and Medicaid, as well as private insurance. This diverse funding base supports the RHOs in their mission to provide accessible and quality healthcare services.

The governance of RHOs is typically overseen by a Board of Directors, which includes representatives from Tribal governments within the region, appointments from local municipalities, and representatives from key regional organizations. This governance structure ensures that the RHOs' policies and strategies are closely aligned with the community's needs, allowing for effective management and decision-making that reflects the interests and well-being of Alaska Natives and other residents in the region.

Regional Housing Authority | Bristol Bay Housing Authority

Regional Housing Authorities (RHAs), also known as Tribally Designated Housing Entities, operate under the Native American Housing and Self-Determination Act (NAHASDA) of 1996 and Alaska Statutes to address housing needs. They focus on constructing low-income housing and managing affordable housing programs for Alaska Native and broader communities. Funded by federal grants, state funding, and housing-specific resources, RHAs collaborate with local governments, Tribal entities, and regional organizations to develop sustainable housing solutions tailored to regional needs and cultural considerations. Governed by a board of community and Tribal government representatives, RHAs work to improve housing accessibility and quality, supporting community development through strategic housing initiatives.

Electric Utilities | Varies by Community

In rural Alaska, electric utilities operate as independent islanded microgrids, managed either by local entities such as Tribes and city governments or by cooperatives owned by the communities they serve. These microgrids, crucial for areas where connecting to larger grids is impractical, face unique challenges due to their isolation but also have opportunities for innovative energy solutions, including the integration of renewable resources. The governance by local entities or cooperatives allows for energy decisions that align closely with community needs, promoting energy sovereignty and sustainability.

Water/Sewer Utilities | ANTHC & VSW

Water and Sanitation utilities are typically locally owned and operated by the city or the Tribe. The owner is often supported by an outside entity such as the Alaska Native Tribal Health Consortium or Village Safe Water, which support project development, securing grant funding, and assistance in carrying out projects.

Greenhouse Gas (GHG) Inventory Baseline

The baseline Greenhouse Gas (GHG) inventory for the 31 communities represented through this Climate Action Plan is a comprehensive accounting of all greenhouse gas emissions by prioritized sectors within each community. Regional baseline data includes:

- Baseline GHG emissions in the primary sectors of opportunity in remote Alaska: Residential Energy Consumption, Commercial and Community Energy Consumption, and Electrical Generation and Distribution. Its purpose within this Climate Action Plan is to identify where the most significant emissions are occurring and opportunities for reductions.
- This inventory focuses on direct carbon dioxide emissions from the use of diesel fuel for electrical generation by the utility or Independent Power Producers and heating oil for all community heating needs. Emissions are expressed in terms of metric tons of CO2 equivalents.
- Usage data on all relevant activities that lead to GHG emissions within the prioritized sectors of electrical generation and distribution, residential energy consumption, commercial facility energy consumption, and community facility energy consumption was collected on the community scale. The source of most of the data was the FY2022 Power Cost Equalization data published by the State of Alaska. Other sources of data are referenced in the methods section of each measure.
- Emission Factors are coefficients that quantify the emissions or removals of greenhouse gases per unit of activity. Emission factors were used to convert displaced diesel fuel and heating oil into estimates of GHG emissions or removals.
- A Data Management plan ensured data quality, including accuracy, completeness, consistency, transparency, and comparability.
- An independent review of the inventory to ensure its accuracy and reliability was conducted in accordance with the approved Quality Assurance Project Plan.

This baseline GHG inventory serves as a crucial tool for communities represented by this Climate Action Plan to understand their impact on climate change, set reduction targets, and track their progress over time.

The table below summaries the baseline greenhouse gas emissions.

Sector		Baseline GHG Emissions by Sector (MTCO2e)
Residential Energy Consumption		
	Residential Buildings	35,505
Community Building & Commercial Building Energy Consumption		
	Community Buildings	12,271
	Commercial Buildings	43,507
	Lake & Peninsula Schools	1,468
Electricity Generation & Distribution		
	Utility Infrastructure	42,735
Total Emissions		135,486

GHG Reduction Targets

In the remote communities of this region, the aspiration to curtail GHG emissions remains steadfast, despite formidable obstacles. Rugged terrain, considerable distances between communities, isolated microgrids, and other unique challenges render a 50% reduction by 2030 and net-zero GHG emissions target by 2050 extremely ambitious.

In alignment with the United States' commitment to climate action, this PCAP has established ambitious GHG reduction targets. The following table outlines values for 50% reduction in GHG Emissions by 2030 and net-zero by 2050.

2022 Baseline GHG Emissions (CO_2e)	2030 50% Reduction Target (CO_2e)	2050 100% Reduction Target (CO_2e)
135,486	67,743	0

GHG Emissions Projections

Below are projections of GHG emissions in two scenarios. Scenario 1 – is in the absence of plan measures being implemented. Scenario 2 – assumes the plan is fully implemented and all measures are completed.

GHG reductions for each measure were calculated by identifying the diesel fuel reductions for electrical generation projects and heating oil reductions for heating-related measures. The displaced gallons were converted to GHG emissions using the emission factors summarized in the Assumptions page of the detailed calculations in Appendix C.

The goal of net-zero emissions is ambitious, and contingent upon identification of additional GHG reduction measures and projects as well as significant advancements in technology and infrastructure for isolated communities. Despite hurdles, continuing efforts have identified projects to reduce GHG emissions by 42% by 2050, and our region is committed to aggressively incorporating the adoption of green technologies as they become more economically and technically viable. Net-zero emissions are crucial for the health of the region’s environment and communities.

	2022 Baseline GHG Emissions (CO2e)	2030 Near-term Projections (CO2e) (percent +/- from baseline)	2050 Long-term Projections (CO2e) (percent +/- from baseline)
Scenario 1 – No measures implemented	135,486	135,486	135,486
Scenario 2 - Fully Implemented	N/A	100,294 (26%)	78,730 (42%)

Quantified GHG Reduction Measures

Measures refer to proposed projects, programs, and policies that would reduce greenhouse gas emissions if implemented.

The strategy for selecting greenhouse gas (GHG) reduction measures is informed by data on the highest sources of GHG emissions. The rural, Tribal communities addressed in this plan are predominantly isolated, relying on independent microgrid electric utilities predominantly powered by diesel for both electricity generation and the bulk of heating requirements. Consequently, GHG mitigation strategies are focused on three key areas:

1. **Residential Energy Consumption**
2. **Community Building & Commercial Building Energy Consumption**
3. **Electricity Generation & Distribution**

The objective in concentrating on these areas is to decrease energy demand for heating and electricity, thereby lessening the reliance on diesel-generated electricity and fuel oil heating. Such initiatives not only aim to conserve energy but also significantly reduce GHG emissions, aligning with broader environmental sustainability goals.

Although these primary sectors do not encompass all sources of emissions within each community, they represent the largest contributors to GHG emissions, offer the most substantial opportunities for reductions, and are identified as the highest priority for emissions reduction efforts across the region. Below, the plan outlines specific measures for each prioritized sector to achieve these goals.

Sector – Residential Energy Consumption

Residential energy consumption refers to the amount of energy used within households or residential buildings. This includes energy for various purposes such as heating, cooling, lighting, cooking, water heating, and running appliances and electronic devices. The type and amount of energy consumed in residential settings can vary widely depending on factors such as geographic location (i.e., homes in colder regions often consume more energy for heating), building characteristics (size, design, insulation, age of building), how efficient the household appliances are, and personal preference (thermostat setting). Monitoring and managing residential energy consumption is important for reducing environmental impact, controlling costs, and ensuring sustainable energy usage. Under this sector, the prime measure to reduce residential energy consumption is the reduction in energy usage for both heating and electrical needs, largely the recommendations are weatherization related energy efficiency.

Measure 1 - Residential Energy Efficiency, including Heat Pumps

Measure 1A – Residential Energy Efficiency

The proposed measure would provide weatherization and energy efficiency retrofits to all households in the community that could benefit from the improvements. Some residences have received retrofits in the past decade, but there are still significant opportunities for improvements.

In 2020, the Alaska Housing and Finance Corporation (AHFC) recommended $30,000 per house for weatherization in remote, rural Alaska communities. For the purposes of this plan this value was increased by 20% based on inflation. Thus, it is assumed that each house in the region will cost approximately $36,000 for materials and labor to retrofit. These are ballpark cost estimates and are useful for requesting funding but are not refined based on the needs of each individual home. Additionally, this cost estimate does not account for all the necessary logistics (i.e. shipping/freight costs, equipment storage costs, project management, or other contingencies). A project budget would be required to include the total of all costs associated with carrying out this measure for every home in the 31 Tribal communities covered by this climate action plan.

Typical energy efficiency retrofits may include actions such as increased insulation in walls, floors, and roofs, more efficient windows and doors, boiler replacement or maintenance, maintenance of heating distribution devices, woodstove change outs, LED lighting retrofits, set-back thermostats, and replacement of appliances with more energy efficient appliances.

Methods for Quantifying the Measure

The annual average electricity consumption of a residential home was captured from the FY-2022 PCE data for each community. For this plan, it is estimated that residential energy efficiency measures could result in a 10% reduction in electricity usage. Because nearly 100% of the electricity in the region is generated from diesel fuel, the reduction in electricity was converted to gallons of diesel fuel saved by the electric utility considering the utility's diesel efficiency; this resulted in an equivalent gallons of diesel fuel displaced for energy efficiency due to reduced electricity consumption. The displaced equivalent diesel gallons were converted to MTCO2e of greenhouse gases reduced. The cost savings for the reduced electricity consumption were calculated from the reduced annual kWh and the resulting reduction in diesel fuel usage for generating the electricity.

The annual heating oil usage for a residential home was developed using the 2014 AHFC Alaska Housing Assessment report. From this 2014 AHFC data, we estimated that a typical home in rural Alaska uses 694 gallons of heating oil.

Based on contractor reports on previous building shell and heating system energy efficiency retrofits, it is estimated that implementing residential energy efficiency can achieve a 20% reduction in heating fuel consumption across all residences in the region. The 20% reduction is measured in gallons of heating oil which were converted to reduced MTCO2e of greenhouse gas emissions.

The benefits of Residential Energy Efficiency were quantified as total greenhouse gas reductions for both electricity and heating oil usage. The simple payback was calculated by using an implementation cost of $36,000 per residential energy efficiency retrofit and dividing by the total cost savings to the owners, resulting in a simple payback period in years.

Community	Baseline Annual GHG Emissions (MTCO2e)	Estimated Annual Cost Savings	Estimated Total Cost to Implement	Authority to Implement	Near Term / Long Term	Near Term - 2030 GHG Reductions (MTCO2e)	Long Term - 2050 GHG Reductions (MTCO2e)
Chignik Bay	445	$ 49,205	$ 1,692,000	Housing Authority, Tribe, City	Near Term	78	0
Chignik Lagoon	666	$ 254,391	$ 140,741	Housing Authority, Tribe, City	Near Term	51	0
Chignik Lake*	434	$ 82,436	$ 1,548,000	Housing Authority, Tribe, City	Near Term	74	0
Clarks Point*	492	$ 73,323	$ 1,836,000	Housing Authority, Tribe, City	Near Term	85	0
Curyung (Dillingham), Aleknagik	10,830	$ 1,669,241	$ 37,260,000	Housing Authority, Tribe, City	Near Term	1,814	0
Egegik	749	$ 111,607	$ 3,060,000	Housing Authority, Tribe, City	Near Term	135	0

Ekuk	473	$ 52,310	$ 2,412,000	Housing Authority, Tribe, City	Near Term	99	0
Igiugig	291	$ 113,546	$ 1,116,000	Housing Authority, Tribe, City	Near Term	51	0
Iliamna, Nondalton, Newhalen	1,982	$ 483,504	$ 6,804,000	Housing Authority, Tribe, City	Near Term	332	0
Ivanof Bay	113	$ 18,266	$ 576,000	Housing Authority, Tribe, City	Near Term	1,530	0
Kanatak	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kokhanok*	590	$ 151,666	$ 2,016,000	Housing Authority, Tribe, City	Near Term	99	0
Levelock*	344	$ 72,416	$ 1,368,000	Housing Authority, Tribe, City	Near Term	61	0
Manokotak*	2,544	$ 307,810	$ 4,572,000	Housing Authority, Tribe, City	Near Term	344	0
Naknek, King Salmon, South Naknek	8,720	$ 1,258,059	$ 33,516,000	Housing Authority, Tribe, City	Near Term	1,530	0
New Koliganek	739	$ 148,615	$ 2,700,000	Housing Authority, Tribe, City	Near Term	127	0
New Stuyahok, Ekwok	1,703	$ 422,090	$ 5,472,000	Housing Authority, Tribe, City	Near Term	278	0

Pedro Bay	346	$ 72,558	$ 1,512,000	Housing Authority, Tribe, City	Near Term	64	0
Perryville	275	$ 64,276	$ 864,000	Housing Authority, Tribe, City	Near Term	44	0
Pilot Point	454	$ 78,383	$ 1,584,000	Housing Authority, Tribe, City	Near Term	76	0
Port Heiden*	500	$ 105,933	$ 1,800,000	Housing Authority, Tribe, City	Near Term	85	0
Portage Creek	14	$ 1,326	$ 72,000	Housing Authority, Tribe, City	Near Term	3	0
Togiak, Twin Hills	2,637	$ 600,456	$ 8,820,000	Housing Authority, Tribe, City	Near Term	437	0
Ugashik	163	$ 18,516	$ 828,000	Housing Authority, Tribe, City	Near Term	33	0
Total	**35,505**					**7,430**	**0**

**These communities have under reported kWh generation and diesel consumption. It is very likely Energy Retrofits or Renewable Energy Power Generation would reduce more GHG emissions than what is calculated.*

***Measures with "N/A" means the community currently exceeds the quantified methods for GHG emissions reductions or the area does not have a viable resource.*

Measure 1B – Heat Pumps for Communities with High Levels of Renewable Energy

The proposed measure would displace heating oil with arctic heat pumps in communities that have high levels of renewable energy during the heating season. Three communities within this region are served by nearly 100% hydroelectric power and produce significant levels of excess renewable energy that can be used to meet heating needs. Heat pumps can operate at an efficiency of up to 250% and the new arctic technology is effective down to approximately -20°F. The BBNA region has relatively warm winters and is a good candidate for heat pump technology.

Methods for Quantifying the Measure

While this measure requires some feasibility work, it is a fair assumption that all residences in communities with high levels of renewable energy power generation are candidates for this technology with a goal to displace 75% of heating oil usage. Heat pumps would result in a 50% cost savings over the cost of heating oil. Capital cost for each household was based on recent experience with the installation of more than 100 heat pumps in Southeast Alaska, averaging $10,000 per residence. The annual heating oil usage for a residential home was developed using the 2014 AHFC Alaska Housing Assessment report. From this 2014 AHFC data, we estimated that a typical home in rural Alaska uses 694 gallons of heating oil. GHG emission baselines were based on current heating oil usage, and GHG reductions were calculated using the 75% reduction in heating oil usage. A simple payback was calculated using the total capital cost for installing heat pumps in all homes divided by the annual savings to residential heating oil customers. While heat pump opportunities were quantified for only Illiamna, Nondalton, and Newhalen, the communities of Chignik Bay and Chignik Lagoon have operating hydroelectric plants with improvement needs that could utilize heat pump technologies in the future.

Community	Total Annual GHG Emissions Reductions (MTCO2e)	Total Cost Savings	Total Cost to Implement	Authority to Implement	Near Term / Long Term	Near Term - 2035 GHG Reductions (MTCO2e)	Long Term - 2050 GHG Reductions (MTCO2e)
Iliamna, Nondalton, Newhalen	1,982	$ 465,639	$ 5,670,000	Housing Authority, Tribe, City	Near Term	1,336	0
Total	**1,982**					**1,336**	**0**

Sector – Community & Commercial Building Energy Consumption

In Alaska, community buildings and commercial buildings energy consumption is notably distinct due to the State's unique climatic, geographical, and infrastructural characteristics. The harsh and long winters demand extensive energy use for heating and maintaining comfortable indoor environments in commercial and community buildings, such as offices, schools, hospitals, and retail spaces. These buildings often rely on a mix of energy sources, which in this region is largely characterized by electricity generated with diesel fuel and diesel fuel for heating. Sometimes natural gas or propane is available for heating and in limited quantities, some energy is generated with renewables. This Regional Climate Action Plan will focus on measures that increase community and commercial building energy efficiency thereby decreasing diesel fuel consumption and reducing greenhouse gas emissions.

Measure 2 - Community Building Energy Efficiency

The proposed measure would provide weatherization and energy efficiency retrofits to all community buildings that could benefit from improvements.

Typical energy efficiency retrofits may include actions such as increased insulation in walls, floors, and roofs, more efficient windows and doors, boiler replacement or maintenance, maintenance of heating distribution devices, woodstove changeouts, LED lighting retrofits, set-back thermostats, and replacement of appliances with more energy efficient appliances.

Methods for Quantifying the Measure

Community buildings vary in size and condition in remote Alaska, so an informal sampling of the size of community buildings was performed in the region and a typical building size was estimated to be 2,500 square feet. Data from the Alaska Energy Authority (AEA) FY 2022 Power Cost Equalization (PCE) Statistical Report was used to determine the number of community buildings in each community. Because energy efficiency measures target a reduction in both electricity and heating oil consumption, the calculations to estimate greenhouse gas and cost savings were quantified as electricity reductions or heating oil reductions.

The AEA FY2022 (PCE) Statistical Report provided the data used to estimate annual electricity consumption for community buildings in each community. It was estimated that energy efficiency measures in these buildings could lead to a 10% decrease in their electricity use. Given the region's near-total reliance on diesel-generated electricity, this reduction translates directly into savings in diesel fuel consumption for the electric utilities, based on their diesel generation efficiency. Consequently, this leads to fewer gallons of diesel being used, which in turn reduces greenhouse gas emissions measured in MTCO2e. The financial savings from this reduced electricity consumption were calculated by considering the decrease in annual kWh usage and the corresponding reduction in diesel fuel needed for electricity generation.

The annual heating oil usage for community buildings was calculated using data from the 2014 AHFC Alaska Housing Assessment report that estimated 195,000 BTU/sq ft are used annually for heating community buildings. Using the estimated community building size in the region, the annual heating oil usage for all community buildings was calculated. Based on past weatherization and energy efficiency retrofits to reduce heating oil usage, it was estimated that weatherization and energy efficiency could achieve a 20% reduction in heating oil consumption across all community buildings. The 20% reduction is measured in gallons of heating oil which were converted to reduced MTCO2e of greenhouse gas emissions.

The potential benefits of this measure were quantified as total greenhouse gas reductions for both electricity and heating oil consumption reductions. The simple payback was calculated by using an implementation cost of $20/square foot for each community building for weatherization and energy efficiency retrofits and dividing by the total cost savings to the building owners, resulting in a simple payback period in years.

Community	Baseline Annual GHG Emissions (MTCO2e)	Estimated Annual Cost Savings	Estimated Total Cost to Implement	Authority to Implement	Near Term / Long Term	Near Term - 2030 GHG Reductions (MTCO2e)	Long Term - 2050 GHG Reductions (MTCO2e)
Chignik Bay	467	$ 38,008	$ 500,000	City, Tribe	Near Term	83	0
Chignik Lagoon	283	$ 38,800	$ 350,000	City, Tribe	Near Term	53	0
Chignik Lake*	356	$ 52,213	$ 450,000	City, Tribe	Near Term	68	0
Clarks Point*	81	$ 8,455	$ 100,000	City, Tribe	Near Term	15	0
Curyung (Dillingham), Aleknagik	2,438	$ 185,718	$ 2,550,000	City, Tribe	Near Term	427	0
Egegik	760	$ 68,986	$ 900,000	City, Tribe	Near Term	141	0
Ekuk	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ekwok	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Igiugig	449	$ 82,319	$ 550,000	City, Tribe	Near Term	84	0
Iliamna, Nondalton, Newhalen	743	$ 84,536	$ 750,000	City, Tribe	Near Term	128	0
Ivanof Bay	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kanatak	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kokhanok*	392	$ 62,185	$ 450,000	City, Tribe	Near Term	71	0
Levelock*	243	$ 34,110	$ 300,000	City, Tribe	Near Term	46	0

Manokotak*	299	$	28,868	$	250,000	City, Tribe	Near Term	48	0
Naknek, King Salmon, South Naknek	2,145	$	60,994	$	1,900,000	City, Tribe	Near Term	351	0
New Koliganek	461	$	52,298	$	550,000	City, Tribe	Near Term	85	0
New Stuyahok, Ekwok	857	$	107,165	$	900,000	City, Tribe	Near Term	150	0
Pedro Bay	164	$	26,567	$	200,000	City, Tribe	Near Term	31	0
Perryville	245	$	37,769	$	300,000	City, Tribe	Near Term	46	0
Pilot Point	408	$	42,757	$	500,000	City, Tribe	Near Term	77	0
Port Heiden*	189	$	23,192	$	200,000	City, Tribe	Near Term	33	0
Portage Creek	N/A		N/A		N/A	N/A	N/A	N/A	N/A
Togiak, Twin Hills	1,292	$	139,430	$	1,250,000	City, Tribe	Near Term	219	0
Ugashik	N/A		N/A		N/A	N/A	N/A	N/A	N/A
Total	**12,271**							**2,155**	**0**

**These communities have under reported kWh generation and diesel consumption. It is very likely Energy Retrofits or Renewable Energy Power Generation would reduce more GHG emissions than what is calculated.*

***Measures with "N/A" means the community currently exceeds the quantified methods for GHG emissions reductions or the area does not have a viable resource.*

Measure 3 - Commercial Building Energy Efficiency, including Schools

Measure 3A – Commercial Building Energy Efficiency

The proposed measure would provide weatherization and energy efficiency retrofits to all commercial buildings, including schools, in the community that could benefit from improvements.

Typical energy efficiency retrofits may include actions such as, increased insulation in walls, floors, and roofs, more efficient windows and doors, boiler replacement or maintenance, maintenance of heating distribution devices, woodstove changeouts, LED lighting retrofits, set-back thermostats, and replacement of appliances with more energy efficient appliances.

Methods for Quantifying the Measure

Commercial buildings vary in size and condition in remote Alaska, so an informal sampling of the size of community buildings was performed using Google Maps in the region and a typical building size was estimated to be 1,700 square feet. The AEA FY2022 PCE Statistical Report data was used to determine the number of commercial buildings in each community. Because energy efficiency measures target a reduction in both electricity and heating oil consumption, the calculations to estimate greenhouse gas and cost savings were quantified as electricity reductions or heating oil reductions.

The annual electricity consumption for commercial buildings in each community was estimated using the AEA FY2022 (PCE) Statistical Report data. It was estimated that energy efficiency measures could result in a 10% reduction in electricity consumption. Because nearly 100% of the electricity in the region is generated from diesel fuel, the reduction in electricity was converted to gallons of diesel fuel saved by the electric utility considering the utility's diesel efficiency; this resulted in an equivalent gallons of diesel fuel displaced for energy efficiency due to reduced electricity consumption. The displaced equivalent diesel gallons were converted to MTCO2e of greenhouse gases reduced. The cost savings for the reduced electricity consumption were calculated from the reduced annual kWh and the resulting reduction in diesel fuel usage for generating the electricity. The annual heating oil usage for commercial buildings was calculated using data from the 2014 AHFC Alaska Housing Assessment report that estimated 195,000 BTU/sq ft are used annually for heating buildings. Using the estimated commercial building size in the region, the annual heating oil usage for all commercial buildings was calculated. Based on past weatherization and energy efficiency retrofits to reduce heating oil usage, it was estimated that weatherization and energy efficiency could achieve a 20% reduction in heating oil consumption across all community buildings. The 20% reduction is measured in gallons of heating oil which were converted to reduced MTCO2e of greenhouse gas emissions.

The potential benefits of this measure were quantified as total greenhouse gas reductions for both electricity and heating oil consumption reductions. The simple payback was calculated by using an implementation cost of $25/square foot for each community building for weatherization and energy efficiency retrofits and dividing by the total cost savings to the building owners, resulting in a simple payback period in years.

Community	Baseline Annual GHG Emissions (MTCO2e)	Estimated Annual Cost Savings	Estimated Total Cost to Implement	Authority to Implement	Near Term / Long Term	Near Term - 2030 GHG Reductions (MTCO2e)	Long Term - 2050 GHG Reductions (MTCO2e)
Chignik Bay	598	$ 136,846	$ 2,082,500	Building Owner	Near Term	270	0
Chignik Lagoon	353	$ 59,095	$ 595,000	Building Owner	Near Term	79	0
Chignik Lake*	285	$ 27,300	$ 255,000	Building Owner	Near Term	36	0
Clarks Point*	363	$ 56,800	$ 765,000	Building Owner	Near Term	97	0
Curyung (Dillingham), Aleknagik	13,486	$ 1,582,975	$ 19,805,000	Building Owner	Near Term	3,057	0
Egegik	597	$ 83,834	$ 1,147,500	Building Owner	Near Term	157	0
Ekuk	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Igiugig	274	$ 80,602	$ 637,500	Building Owner	Near Term	81	0
Iliamna, Nondalton, Newhalen	3,102	$ 487,850	$ 4,632,500	Building Owner	Near Term	677	0
Ivanof Bay	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kanatak	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kokhanok*	490	$ 93,379	$ 850,000	Building Owner	Near Term	103	0
Levelock*	314	$ 142,126	$ 1,445,000	Building Owner	Near Term	177	0
Manokotak*	892	$ 143,490	$ 1,487,500	Building Owner	Near Term	219	0
Naknek, King Salmon, South Naknek	16,782	$ 1,853,886	$ 18,827,500	Building Owner	Near Term	3,110	0
New Koliganek	564	$ 46,375	$ 595,000	Building Owner	Near Term	73	0

New Stuyahok, Ekwok	1,484	$ 226,867	$ 2,507,500	Building Owner	Near Term	295	0
Pedro Bay	206	$ 78,544	$ 680,000	Building Owner	Near Term	87	0
Perryville	391	$ 105,321	$ 892,500	Building Owner	Near Term	125	0
Pilot Point	468	$ 69,661	$ 935,000	Building Owner	Near Term	121	0
Port Heiden*	520	$ 141,633	$ 1,572,500	Building Owner	Near Term	189	0
Portage Creek	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Togiak, Twin Hills	2,340	$ 326,415	$ 3,740,000	Building Owner	Near Term	466	0
Ugashik	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	**43,507**					**9,420**	**0**

**These communities have under reported kWh generation and diesel consumption. It is very likely Energy Retrofits or Renewable Energy Power Generation would reduce more GHG emissions than what is calculated.*

***Measures with "N/A" means the community currently exceeds the quantified methods for GHG emissions reductions or the area does not have a viable resource.*

Measure 3B - School Building Energy Efficiency

The proposed measure would provide weatherization and energy efficiency retrofits to school buildings in the Lake and Peninsula Borough that could benefit from improvements. School buildings stand as vital hubs of community activity, yet they operate similarly to commercial buildings in term of energy consumption and infrastructure requirements, particularly due to harsh winter climates and dated building construction. The energy efficiency opportunities for schools were only quantified for the schools served by the Lake and Peninsula Borough because there is a developed retrofit project, however, energy efficiency measures for all of the schools in the BBNA region are an important GHG reduction opportunity that is quantified above in the Commercial Building inventory.

Typical energy efficiency retrofits may include actions such as, increased insulation in walls, floors, and roofs, more efficient windows and doors, boiler replacement or maintenance, maintenance of heating distribution devices, woodstove changeouts, LED lighting retrofits, set-back thermostats, and replacement of appliances with more energy efficient appliances.

Methods for Quantifying the Measure

The Lake and Peninsula Borough has completed school energy efficiency audits at all of their community schools, and other regional schools are interested in this effort. The audits result in recommended energy efficiency retrofits, along with their expected capital cost and reduction in energy usage – both electrical and heating oil. The actual data from the audits were used to calculate baseline GHG emissions and the expected reduction in GHG emissions post implementation of the recommended energy efficiency retrofits. Cost savings and simple payback in years were calculated using the expected reduction in energy usage and the current local costs of electricity and heating oil.

Community	Baseline Annual GHG Emissions (MTCO2e)	Estimated Annual Cost Savings	Estimated Total Cost to Implement	Authority to Implement	Near Term / Long Term	Near Term - 2035 GHG Reductions (MTCO2e)	Long Term - 2050 GHG Reductions (MTCO2e)
Newhalen	271	$ 33,036	$ 726,605	School District	Near Term	45	0
Port Alsworth	93	$ 16,119	$ 217,100	School District	Near Term	17	0
Perryville	178	$ 46,915	$ 357,711	School District	Near Term	49	0
Nondalton	222	$ 38,034	$ 221,911	School District	Near Term	55	0
Chignik Lake	189	$ 16,196	$ 165,022	School District	Near Term	26	0
Port Heiden	125	$ 25,566	$ 329,216	School District	Near Term	29	0
Igiugug	75	$ 18,326	$ 211,268	School District	Near Term	16	0
Kokhanok	165	$ 32,946	$ 418,474	School District	Near Term	34	0
Levelock	57	$ 10,171	$ 163,451	School District	Near Term	12	0
Chignik Lagoon	92	$ 16,511	$ 249,521	School District	Near Term	20	0
Total	**1,468**					**302**	**0**

Sector - Electricity Generation & Distribution

The region is composed mostly of individual community electric utilities that are islanded microgrids that generate electricity primarily from diesel fuel. Electricity generation comes at a high cost and is one of the highest generators of greenhouse gas emissions in the region. It is also one of the largest opportunities for greenhouse gas reductions.

Within this sector, four opportunity areas or measures were identified: ***Diesel Utility Efficiency Upgrades, Reducing Line Loss, Heat Recovery, Renewable Energy Integration.*** These measures are detailed below.

Measure 4 - Diesel Utility Efficiency Upgrades

In remote communities, Diesel Utilities operate with diesel engines that power electric generators. These systems include switchgear for controlling and monitoring power generation, as well as transformers and distribution lines that deliver electricity to customers.

The efficiency of a power plant, especially in remote-Alaska communities, is effectively gauged by how much electricity (kWh) is produced per gallon of diesel fuel used. For these utilities, an efficiency rate ranging from 10.5 to 12.5 kWh/gallon is considered the minimum acceptable standard. Higher efficiency rates mean that less diesel fuel is needed to generate the same amount of electricity, which not only reduces fuel costs but also leads to lower electricity rates for customers. Moreover, generating more electricity with less diesel optimizes diesel efficiency, cutting down on both operating costs and greenhouse gas emissions. Conversely, low efficiency may signal maintenance needs or problems with equipment.

Older utilities tend to have lower diesel efficiencies because the engines are outdated and have maintenance needs; the switchgear and controls are not state-of-the-art. The outdated switchgear and controls mean that the process of choosing the best engines for efficiency is not as precise or effective as it could be, leading to less optimal energy use. Updating engines and installing automated switchgear and controls are opportunities for increased efficiency and reduced greenhouse gas emissions. Additionally, regular maintenance and good operating practices can help maintain high efficiency.

Many utilities have been able to achieve efficiencies above the minimum expectations, even with outdated equipment, by utilizing good operating and maintenance practices with highly skilled operators. However, many of these utilities with satisfactory efficiencies still require upgrades to state-of-the-art equipment and controls are still necessary for the implementation of renewable energy systems. These upgrades are not driven by reduced greenhouse gas emissions or efficiency improvements that will reduce diesel fuel usage.

Therefore, the recommendations fall into two categories:

1. *Utilities with low efficiency*
2. *Utilities with high efficiency*

Methods for Quantifying the Measure

To identify utilities with opportunities to upgrade diesel powerplant and distribution infrastructure to improve efficiencies and reduce diesel usage, the utilities were surveyed for current efficiency metrics. This data was extracted from the AEA FY2022 PCE Statistical Report.

According to PCE standards, for utilities that generate less than 499,000 kWh annually, efficiencies less than 10.5 kWh/gallon are considered deficient. For utilities generating 500,000 to 999,999 kWh annually, efficiencies less than 11.5 kW/gallon are deficient. For utilities generating more than 1,000,000 kWh per year, efficiencies of less than 12.5 kWh/gallon are opportunities. In all cases, the target efficiency for a well operating utility was set for a stretch goal of 14 kWh/gallon. Utilities were screened for current diesel efficiency, and all utilities operating less than 14 kWh/gallon were considered opportunities for infrastructure upgrade.

After the utilities were screened for efficiency related greenhouse gas reduction opportunities, diesel reduction was calculated based on the improvement to the targeted efficiency. The annual gallons were then converted to potential greenhouse gas reduction.

There are some utilities that are operating above the 14 kWh/gal but have infrastructure that is near the end of its useful life and are included in the measure.

Capital cost estimates were developed for each potential action based on the needs of the individual power plants identified in the region. Estimates were developed for engine replacements, generator controllers, system controllers, automated switchgear, control modules, high efficiency plant transformers, Supervisory Control and Data Acquisition (SCADA) monitoring and interface systems, and internet access.

> *Utilities with low efficiency*. The capital costs were combined with the annual diesel cost savings to calculate a simple payback for utilities that will see efficiency improvements for the work.
>
> *Utilities with high efficiency*. Capital costs were developed for the utilities that already have sufficient efficiencies but need equipment upgrades for future renewable energy projects. Simple Paybacks and Greenhouse Gas reductions were not calculated for these utilities.

Community	Baseline Annual GHG Emissions (MTCO2e)	Estimated Annual Cost Savings	Estimated Total Cost to Implement	Authority to Implement	Near Term / Long Term	Near Term - 2030 GHG Reductions (MTCO2e)	Long Term - 2050 GHG Reductions (MTCO2e)
Chignik Bay	598	$ 13,602	$ 1,160,000	Utility	Near Term	484	0
Chignik Lagoon	353	$ 10,827	$ 1,185,000	Utility	Near Term	317	0
Chignik Lake*	285	$ 37,168	$ 1,115,000	Utility	Near Term	168	0
Clarks Point*	363	$ 14,192	$ 2,085,000	Utility	Near Term	298	0
Curyung (Dillingham), Aleknagik	13,486	$ -	$ 2,085,000	Utility	Near Term	0	N/A
Egegik	597	$ 26,778	$ 1,010,000	Utility	Near Term	507	0
Ekuk	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Igiugig	242	$ 12,300	$ 305,004	Utility	Near Term	225	0
Iliamna, Nondalton, Newhalen	40	$ 1,243	$ 20,000	Utility	Near Term	37	0
Ivanof Bay	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kanatak	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kokhanok*	472	$ 31,436	$ 1,105,000	Utility	Near Term	385	0
Levelock*	314	$ 8,232	$ 2,085,000	Utility	Near Term	288	0
Manokotak*	892	$ 167,726	$ 1,963,000	Utility	Near Term	250	0

Naknek, King Salmon, South Naknek	16,782	$ -	$ 283,000	Utility	Near Term	0	N/A
New Koliganek	564	$ 17,883	$ 988,000	Utility	Near Term	506	0
New Stuyahok, Ekwok	1,484	$ 25,490	$ 1,623,000	Utility	Near Term	1,401	0
Pedro Bay	206	$ 17,409	$ 1,523,000	Utility	Near Term	158	0
Perryville	391	$ 28,161	$ 698,000	Utility	Near Term	304	0
Pilot Point	468	$ 33,330	$ 1,563,000	Utility	Near Term	351	0
Port Heiden*	520	$ 20,946	$ 610,000	Utility	Near Term	450	0
Portage Creek	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Togiak, Twin Hills	2,340	$ -	$ 238,000	Utility	Near Term	0	N/A
Ugashik	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	**40,395**					**6,129**	**0**

**These communities have under reported kWh generation and diesel consumption. It is very likely Energy Retrofits or Renewable Energy Power Generation would reduce more GHG emissions than what is calculated.*

Measure 5 – Reducing Line Loss

Line loss is an indicator of utility efficiency and performance and can be an opportunity to reduce diesel usage and greenhouse gas emissions. Line loss is defined by the Regulatory Commission of Alaska (RCA) as unaccounted kWh as a percentage of the Total kWh available for sale. On an annual basis, if the line loss value is greater than 12%, the RCA will reduce the utility's PCE rate[1]. Even though the maximum allowable loss by the RCA is 12%, line loss should be less than 6% to indicate good quality performance. Line loss above 6% can indicate excess loss in the distribution system from inefficient or oversized transformers, defective meters, or improper reading of meters.

Methods for Quantifying the Measure

To identify utilities with opportunities to upgrade distribution infrastructure to improve line loss and reduce diesel usage, the utilities were surveyed for current line loss metrics. This data came from the AEA FY2022 PCE Statistical Report.

Utilities were identified as a candidate for potential distribution improvements if their line loss is greater than 6%. A survey of the actual cause of the high line loss is required for the preparation of any funding requests. Some causes of line loss can be addressed with process and management changes and do not require capital spending. It is recommended that each utility that has line loss over 6% conduct a survey to determine the cause of high line loss and to develop a strategy to reduce line loss to 6% or less.

After the utilities were screened for line loss related greenhouse gas reduction opportunities, diesel reduction was calculated based on the improvement to the targeted lines losses. The annual gallons reduced were then converted to potential greenhouse gas reduction.

Capital cost estimates for line loss opportunities were estimated at $75,000 per utility based on recent costs of transformer replacements and upgraded meters. Because the actual cause of line loss must be identified, the actual cause of the line must be identified before pursuing funds.

Community	Baseline Annual GHG Emissions (MTCO2e)	Estimated Annual Cost Savings	Estimated Total Cost to Implement	Authority to Implement	Near Term / Long Term	Near Term - 2030 GHG Reductions (MTCO2e)	Long Term - 2050 GHG Reductions (MTCO2e)
Chignik Bay	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chignik Lagoon	43	$ 6,466	$ 75,000	Utility	Near Term	21	0
Chignik Lake*	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[1] The Power Cost Equalization (PCE) program is a subsidy designed to lower electricity costs in rural Alaska, making energy prices more comparable to those in urban centers. It provides financial support to offset the high costs associated with generating electricity in remote areas, benefiting residents and community facilities.

Clarks Point*	93	$ 15,783	$ 75,000	Utility	Near Term	22	0
Curyung (Dillingham), Aleknagik	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Egegik	44	$ 2,310	$ 75,000	Utility	Near Term	36	0
Ekuk	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ekwok	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Igiugig	52	$ 26,275	$ 75,000	Utility	Near Term	16	0
Iliamna, Nondalton, Newhalen	10	$ 1,151	$ 75,000	Utility	Near Term	7	0
Ivanof Bay	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kanatak	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kokhanok*	68	$ 13,801	$ 75,000	Utility	Near Term	29	0
Levelock*	67	$ 15,170	$ 75,000	Utility	Near Term	19	0
Manokotak*	184	$ 34,011	$ 75,000	Utility	Near Term	54	0
Naknek, King Salmon, South Naknek	1,628	$ 120,732	$ 75,000	Utility	Near Term	1,007	0
New Koliganek	44	$ 3,129	$ 75,000	Utility	Near Term	34	0
New Stuyahok, Ekwok	402	$ 96,537	$ 75,000	Utility	Near Term	89	0
Pedro Bay	18	$ 1,863	$ 75,000	Utility	Near Term	12	0
Perryville	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pilot Point	81	$ 15,108	$ 75,000	Utility	Near Term	28	0

Port Heiden*	96	$ 19,240	$ 75,000	Utility	Near Term	31	0
Portage Creek	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Togiak, Twin Hills	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ugashik	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	**2,828**					**1,405**	**0**

****These communities have under reported kWh generation and diesel consumption. It is very likely Energy Retrofits or Renewable Energy Power Generation would reduce more GHG emissions than what is calculated.***

Measure 6 – Heat Recovery

Heat recovery is a process of capturing and reusing heat that would otherwise be lost. In a heat recovery system, heat energy is a byproduct of diesel power generation, that is captured in cooling water from a diesel engine at the local power plant is transferred to heat local community buildings to displace heating oil usage. These energy efficiency projects reduce greenhouse gas emissions and provide significant cost savings for the community buildings and provide a revenue stream to the local utility to help defray operational costs.

Methods for Quantifying the Measure

Heat Recovery installations have been a high priority in remote Alaska for the last two decades. Most utilities have existing systems, but these systems require updates and maintenance to maximize the heating benefits to the community buildings. The size of a heat recovery system is based on the size of the gen-sets and the annual diesel electrical generation in the community. Based on the contractor's feasibility and design experience with existing heat recovery systems, it is assumed that a 10% reduction in the annual utility diesel usage is an achievable metric. For example, if a utility uses 100,000 gallons of diesel annually to generate electricity, 10,000 gallons of heating oil can be displaced with a well-designed and maintained heat recovery system. By performing upgrades and maintenance on existing heat recovery systems (estimated at $50,000, $75,000 or $100,000 depending on the size of the system), is it estimated that a 20% improvement in heat output and the resulting reduction in heating oil usage can be achieved with the upgrade work. Potential displaced fuel was converted to MTCO2e of greenhouse gas emissions and a simple payback was calculated using annual savings from the displaced heating oil in the community buildings.

Most local utilities without operating heat recovery systems have feasibility studies for installation in the communities they serve. Feasibility studies were reviewed for communities with potential for installations and the capital costs and predicted benefits of displaced heating oil were captured in the database. Potential displaced fuel was converted to MTCO2e of greenhouse gas emissions and a simple payback was calculated using an estimated capital cost of $2,000,000 and annual savings from the displaced heating oil.

Community	Baseline Annual GHG Emissions (MTCO2e)	Estimated Annual Cost Savings	Estimated Total Cost to Implement	Authority to Implement	Near Term / Long Term	Near Term - 2030 GHG Reductions (MTCO2e)	Long Term - 2050 GHG Reductions (MTCO2e)
Chignik Bay	598	$ 6,119	$ 2,000,000	Utility	Near Term	60	0
Chignik Lagoon	353	$ 5,300	$ 75,000	Utility	Near Term	7	0
Chignik Lake*	285	$ 4,533	$ 50,000	Utility	Near Term	6	0
Clarks Point*	363	$ 4,006	$ 50,000	Utility	Near Term	7	0
Curyung (Dillingham), Aleknagik	13,486	$ 126,471	$ 100,000	Utility	Near Term	270	0
Egegik	597	$ 5,864	$ 75,000	Utility	Near Term	12	0
Ekuk	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ekwok	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Igiugig	274	$ 5,381	$ 50,000	Utility	Near Term	5	0
Iliamna, Nondalton, Newhalen	3,102	$ 43,253	$ 100,000	Utility	Near Term	62	0
Ivanof Bay	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kanatak	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kokhanok*	490	$ 8,847	$ 75,000	Utility	Near Term	10	0
Levelock*	314	$ 4,925	$ 50,000	Utility	Near Term	6	0
Manokotak*	892	$ 13,837	$ 50,000	Utility	Near Term	18	0
Naknek, King Salmon, South Naknek	16,782	$ 163,151	$ 100,000	Utility	Near Term	336	0

New Koliganek	564	$ 7,198	$ 75,000	Utility	Near Term	11	0
New Stuyahok, Ekwok	1,484	$ 22,876	$ 100,000	Utility	Near Term	30	0
Pedro Bay	206	$ 3,727	$ 50,000	Utility	Near Term	4	0
Perryville	391	$ 6,318	$ 50,000	Utility	Near Term	8	0
Pilot Point	468	$ 5,330	$ 50,000	Utility	Near Term	9	0
Port Heiden*	520	$ 7,758	$ 75,000	Utility	Near Term	10	0
Portage Creek	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Togiak, Twin Hills	2,340	$ 32,628	$ 100,000	Utility	Near Term	47	0
Ugashik	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	**43,507**					**918**	**0**

**These communities have under reported kWh generation and diesel consumption. It is very likely Energy Retrofits or Renewable Energy Power Generation would reduce more GHG emissions than what is calculated.*

Measure 7 – Renewable Energy Integration (Community Scale Solar-Battery)

Community-scale solar projects in this plan are defined as high penetration, grid tied solar systems that generate electricity that flows through a meter to the utility grid. In remote Alaska, these systems are owned by the Utility or an Independent Power Producer that sells the solar generated power to the utility.

A Solar Screening analysis developed by the National Renewable Energy Lab concluded that there is a likelihood of high solar production predominantly from March through August, with a steep drop off in the shoulder months and little to no production in the winter. Solar PV production has been affirmed across the state and is now considered a commercially available and technically mature industry globally with continued growth across Alaska.

The size of solar PV systems can be described as high penetration and low penetration. Low penetration systems are smaller and displace a portion of a community's load when the PV panels are producing power. Low penetration systems do not have the capability to carry the entire load of a community.

High Penetration solar systems include PV panels for generating power and a battery system that will store and discharge power as required. These systems have the capability of shutting off diesel generators and supplying the entire load of a community for hours at a time.

High penetration community scale solar is uniquely tailored to provide a wide spectrum of community benefits, particularly in the areas of energy cost savings, climate resilience, and workforce development. Local generation of electricity at or near where it will be used can accelerate the deployment of reliable, renewable technologies and projects.

Methods for Quantifying the Measure

To identify utilities with opportunities to install community-scale solar PV systems to reduce diesel usage and reduce greenhouse gas emissions, the current community load data was extracted from the AEA FY2022 PCE Statistical Report, communities that already have renewable energy sources integrated were noted using the PCE Report, which notes how much energy comes from non-diesel sources (renewable energy sources).

Because high penetration solar has a stable resource and has proven to be easy to operate and maintain in remote communities, all communities are considered candidates for this technology.

A Helioscope model using the weather data from Dillingham, the largest community in the Bristol Bay region and the only community with available detailed weather information, yields a capacity factor of 12.01%. This capacity factor is used for all the communities in the region because it is representative of the Solar PV production for the region. Based on recent experience from the design of high penetration solar system in remote microgrids, a target displacement of 30% of the community load with solar and battery is an aggressive but achievable goal in the small remote communities. For large hub communities, an achievable goal of 10% of the community load was used. These assumptions were used to calculate the size of a potential high penetration solar PV system for each community.

The inverter was sized to be able to manage the peak load from the community as reported in the 2022 PCE report, and the battery is sized at 1.3 times the peak load to account for typical battery degradation over the 15-year life of the battery. This battery size should carry the full load of the community during an outage for 1.5 to 2 hours depending on the load at the time of the outage, greatly improving the energy resiliency of the community. The diesel fuel displaced was calculated using the utility generation efficiency and the expected power production of the solar battery system. The diesel gallons displaced were converted to MTCO2e of greenhouse gas emissions reduced.

Capital cost estimates were developed for each potential action based on the estimated sizes of the solar PV, battery, and inverter. Based on recent project experience of the contractor in remote Alaska, the installed cost of solar PV is $4000/kW, the battery installed cost is $1500/kWh, and the inverters' installed cost is $1000/kW. Capital costs were totaled and divided by the annual savings in diesel fuel usage to result in a simple payback metric.

Community	Baseline Annual GHG Emissions (MTCO2e)	Estimated Annual Cost Savings	Estimated Total Cost to Implement	Authority to Implement	Near Term / Long Term	Near Term - 2030 GHG Reductions (MTCO2e)	Long Term - 2050 GHG Reductions (MTCO2e)
Chignik Bay	598	$ 21,316	$ 1,813,947	Utility, IPP, Tribe	Near Term	179	0
Chignik Lagoon	353	$ 31,798	$ 885,075	Utility, IPP, Tribe	Near Term	106	0
Chignik Lake*	285	$ 27,196	$ 616,953	Utility, IPP, Tribe	Near Term	85	0
Clarks Point*	363	$ 24,034	$ 916,761	Utility, IPP, Tribe	Near Term	109	0
Curyung (Dillingham), Aleknagik	13,486	$ 252,942	$ 10,007,200	Utility, IPP, Tribe	Near Term	1,349	0
Egegik	597	$ 53,302	$ 1,831,485	Utility, IPP, Tribe	Near Term	179	0
Ekuk	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ekwok	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Igiugig	274	$ 61,583	$ 907,861	Utility, IPP, Tribe	Near Term	82	0
Iliamna, Nondalton, Newhalen	114	$ 12,330	$ 2,681,050	Utility, IPP, Tribe	Near Term	34	0
Ivanof Bay	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kanatak	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kokhanok*	472	$ 51,175	$ 1,044,889	Utility, IPP, Tribe	Near Term	142	
Levelock*	314	$ 29,551	$ 908,578	Utility, IPP, Tribe	Near Term	94	0
Manokotak*	892	$ 69,886	$ 1,613,066	Utility, IPP, Tribe	Near Term	268	0
Naknek, King Salmon, South Naknek	16,782	$ 326,302	$ 11,810,782	Utility, IPP, Tribe	Near Term	1,678	0

New Koliganek	564	$ 52,158	$ 1,232,370	Utility, IPP, Tribe	Near Term	169	0
New Stuyahok, Ekwok	1,484	$ 137,256	$ 2,622,577	Utility, IPP, Tribe	Near Term	445	
Pedro Bay	206	$ 22,360	$ 646,076	Utility, IPP, Tribe	Near Term	62	0
Perryville	391	$ 37,910	$ 923,594	Utility, IPP, Tribe	Near Term	117	0
Pilot Point	468	$ 40,111	$ 976,286	Utility, IPP, Tribe	Near Term	140	0
Port Heiden*	520	$ 46,547	$ 1,185,083	Utility, IPP, Tribe	Near Term	156	0
Portage Creek	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Togiak, Twin Hills	2,340	$ 194,387	$ 4,175,836	Utility, IPP, Tribe	Near Term	702	0
Ugashik	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	**40,502**					**6,097**	**0**

**These communities have under reported kWh generation and diesel consumption. It is very likely Energy Retrofits or Renewable Energy Power Generation would reduce more GHG emissions than what is calculated.*

***Measures with "N/A" means the community currently exceeds the quantified methods for GHG emissions reductions or the area does not have a viable resource.*

Measure 8 - Community Scale Wind

Community-scale wind generation projects produce electricity from the flow of wind that turns a wind turbine, and that electricity flows through a meter to the utility grid. The production of power from a wind turbine is dependent on the wind speed and the quality of the flow of the wind. Taller wind turbines are better equipped to take advantage of higher wind speeds at high altitudes.

The Department of Energy and Alaska Energy Authority have developed wind resource assessment maps for Alaska, which are used as a screening tool to determine if wind technology could be feasible for a community. The wind resource is denoted on a scale of 0 to 7 with 7 being the best wind resource. Project sites with wind resources of 3 or higher can have viable projects.

The size of wind systems can be described as high penetration and low penetration. Low penetration systems are smaller and displace a portion of a community's load when the wind turbines are producing power. Low penetration systems do not have the capability to carry the entire load of a community.

High Penetration wind systems include wind turbine(s) for generating power and a battery system that will store and discharge power as required. These systems have the capability of shutting off diesel generators and supplying the entire load of a community for hours at a time.

In remote Alaska, wind systems are owned by the Utility or an Independent Power Producer that sells the power generated to the utility. Potential Wind projects without existing feasibility studies should be considered long term projects. Without a detailed wind feasibility study, a project cannot be considered near-term or shovel ready.

Methods for Quantifying the Measure

To identify utilities with opportunities to install community-scale wind systems to reduce diesel usage and reduce greenhouse gas emissions, the wind data resource was retrieved from the Alaska Affordable Energy Community Dashboard. Communities with wind regimes of 4 and above were considered for potential wind projects, and these potential projects should be confirmed with a detailed wind assessment and feasibility study. The current community load was extracted from the AEA FY2022 PCE Statistical Report, and the utilities were surveyed to identify if they have existing renewable energy systems and/or battery systems.

The capacity factor was assumed to be 30%, an achievable estimate based on recent experience with wind turbine installations, such as Fire Island near Anchorage, which operates with a capacity factor of about 31%. Based on experience from the design of high penetration wind system in remote micro-grids, a target displacement of 40% of the community load with wind power and battery is an aggressive but achievable goal. These assumptions were used to calculate the size of the power production of a high penetration wind/battery system for each community.

Recently, wind projects have been oversized to produce "excess" wind energy beyond the needs of the utility power grid demand. This excess power is used to displace heating oil with electrical heating technology that can store the heat until it is needed. In remote Alaska, there are heating needs year-round and these projects are proving to improve the economic benefits to the utilities and community residences through reduced heating costs. To consider wind-to-heat opportunities, the final sizing of the wind turbine systems for utility power production were doubled and rounded to the nearest 100 kW.

The inverter was sized to be able to manage the peak load from the community as reported in the AEA FY2022 PCE Statistical Report, and the battery is sized at 1.3 times the peak load to account for typical battery degradation over the 15-year life of the battery. This battery size should carry the full load of the community during an outage for 1.5 to 2 hours depending on the load at the time of the outage.

The total turbine production based on capacity factor was calculated for both power production and excess wind production. Power production was converted to displaced diesel and excess wind was converted to displaced heating oil. These fuel displacements were then converted to reduced greenhouse gas production.

Communities with existing low penetration wind systems (wind systems without batteries to allow for diesels-off operation) were considered for additional wind turbines and battery storage systems to achieve higher wind usage, including displacement of heating needs with wind-to-heat systems.

Capital cost estimates were developed for each potential action based on the estimated sizes of the wind turbine(s), battery, and inverter. These costs are based on the contractor's recent project experience in regions across Alaska, the installed cost of 100 kW Northwind turbines is $10,000/kW. Above 500 kW, a 1MW EWT turbine is recommended at an installed cost of $1,000,000 per turbine. Battery installed cost is $1500/kWh, and inverters are $1000/kW. Although not specific to this region, cost estimates are based on recent projects completed by Kotzebue Electric Cooperative, Alaska Village Electric Cooperative, and Nome Joint Utility. Capital costs were totaled and divided by the annual savings in diesel fuel usage to result in a simple payback metric.

Community	Baseline Annual GHG Emissions (MTCO2e)	Estimated Annual Cost Savings	Estimated Total Cost to Implement	Authority to Implement	Near Term / Long Term	Near Term - 2030 GHG Reductions (MTCO2e)	Long Term - 2050 GHG Reductions (MTCO2e)
Chignik Bay	663	$ 61,755	$ 2,805,750	Utility, IPP	Long Term	0	304
Chignik Lagoon	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chignik Lake*	394	$ 122,696	$ 1,353,350	Utility, IPP	Long Term	0	223
Clarks Point*	387	$ 45,727	$ 1,448,900	Utility, IPP	Long Term	0	170
Curyung (Dillingham), Aleknagik	15,460	$ 1,937,530	$ 48,636,000	Utility, IPP	Long Term	0	7,369
Egegik	659	$ 101,459	$ 2,786,250	Utility, IPP	Long Term	0	301
Ekuk	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ekwok	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Igiugig	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iliamna, Nondalton, Newhalen	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ivanof Bay	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kanatak	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Kokhanok*	556	$ 222,023	$ 3,000,000	Utility, IPP	Long Term	0	488
Levelock*	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Manokotak*	923	$ 117,602	$ 1,971,500	Utility, IPP	Long Term	0	388
Naknek, King Salmon, South Naknek	19,269	$ 2,514,214	$ 72,239,550	Utility, IPP	Long Term	0	9,200
New Koliganek	626	$ 109,164	$ 2,439,150	Utility, IPP	Long Term	0	288
New Stuyahok, Ekwok	1,686	$ 338,937	$ 4,525,500	Utility, IPP	Long Term		796
Pedro Bay	250	$ 69,674	$ 1,398,200	Utility, IPP	Long Term	0	127
Perryville	420	$ 54,798	$ 1,446,950	Utility, IPP	Long Term	0	98
Pilot Point	551	$ 100,982	$ 2,425,500	Utility, IPP	Long Term	0	271
Port Heiden*	590	$ 114,182	$ 2,480,100	Utility, IPP	Long Term	0	278
Portage Creek	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Togiak, Twin Hills	2,669	$ 488,804	$ 6,175,500	Utility, IPP	Long Term	0	1,265
Ugashik	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total	**45,103**					**0**	**21,564**

**These communities have under reported kWh generation and diesel consumption. It is very likely Energy Retrofits or Renewable Energy Power Generation would reduce more GHG emissions than what is calculated.*

***Measures with "N/A" means the community currently exceeds the quantified methods for GHG emissions reductions or the area does not have a viable resource.*

Sector – Other

This sector presents measures captured from community outreach and engagement via the Community Outreach Survey (*see Appendix B*). The measures identified below were not quantified for GHG reduction and are merely listed as potential measures that could be quantified in the future:

Measure - Transportation Electrification

This measure refers to a set of strategies and actions aimed at promoting the adoption and use of electric vehicles as a means to reduce greenhouse gas emissions. This measure is crucial because transportation is often a major source of carbon emissions in rural Alaska. Examples of what this measure entails include:

- Fleet Electrification: Transitioning public and government vehicle fleets to electric models. This not only reduces emissions but also sets an example for private consumers and businesses.
- Infrastructure Development: Establishing a widespread and accessible charging infrastructure is vital. This includes the installation of public charging stations in strategic locations such as parking lots, workplaces, and high-traffic areas.
- Incentives and Subsidies: Offering financial incentives such as tax rebates, grants, or subsidies to individuals and businesses for purchasing electric vehicles. This strategy makes EVs more financially accessible.
- Awareness and Education Campaigns: Conducting public awareness campaigns to educate the community about the benefits of electric vehicles, both environmental and economic, thereby encouraging a shift in public perception and adoption.

Measure - Community Composting

By focusing on the transformation of organic waste into valuable compost, this strategy not only diminishes the volume of waste destined for landfills but also significantly mitigates the production of methane, a potent greenhouse gas released during the anaerobic decomposition of organic material in landfill environments. The process of community composting involves an organized collection of organic waste, including food scraps, yard debris, and other biodegradable materials, from residential areas, schools, businesses, and public spaces. This collected waste is then subjected to controlled aerobic decomposition, a method that accelerates the natural breakdown process, turning these materials into nutrient-rich compost.

Implementing community composting has multiple environmental and social benefits. Firstly, it contributes to soil health and fertility when the finished compost is applied to gardens, parks, and agricultural lands, thereby reducing the reliance on chemical fertilizers and enhancing the ability of soils to sequester carbon. Secondly, it promotes a circular economy approach by turning waste into a resource, encouraging sustainable practices among community members and fostering a sense of collective responsibility towards environmental conservation.

Moreover, community composting programs can serve as educational platforms, raising awareness about the importance of waste reduction and recycling. Through workshops, school programs, and community events, residents can learn about the benefits of composting, how to separate organic waste at the source, and the broader implications of their actions on global climate change and sustainability.

To maximize the impact of community composting, it is essential to tailor programs to the specific needs and characteristics of each community, considering factors such as the size of the population, available space for composting facilities, and the existing waste management infrastructure. Collaboration with local governments, environmental organizations, and businesses is critical to secure the necessary support, resources, and expertise to design, implement, and maintain successful community composting programs.

Measure - Community Resilience Hubs

Community Resilience Hubs initiative establishes multifunctional facilities equipped with renewable energy and storage to ensure reliability during disasters. These hubs offer critical services like shelter, emergency medical care, and food distribution in crises, and transition to provide community amenities and support local energy grid improvements in stable times. The strategic placement of these hubs targets the most vulnerable communities, enhancing preparedness and response to climate-related emergencies while fostering sustainability and equity. The success of these hubs relies on collaborative efforts among local governments, community organizations, utility companies, and residents, ensuring that they meet the specific needs of each community. Community Resilience Hubs represent a comprehensive approach to bolstering community resilience, emphasizing the importance of sustainable development and social equity in disaster preparedness and recovery strategies.

Community Resilience Hubs significantly contribute to the reduction of greenhouse gas (GHG) emissions through a multifaceted approach centered on renewable energy, energy efficiency, and sustainable community practices. By integrating grid-interactive, carbon-free distributed energy resources such as solar panels and wind turbines, these hubs not only generate clean energy but also diminish reliance on fossil fuels, directly cutting GHG emissions linked to traditional energy production. The incorporation of energy-efficient technologies alongside long-duration energy storage systems enables these facilities to optimize energy consumption and store excess renewable energy, thereby reducing the overall demand from the electrical grid, particularly during peak times when the most carbon-intensive power plants are in operation. Furthermore, resilience hubs aid in local grid improvements through services like demand response programs, enhancing grid reliability while decreasing the need for fossil fuel-based energy production during high demand periods. Beyond their operational benefits, these hubs serve as educational and engagement centers, promoting sustainable practices among community members—ranging from energy conservation to sustainable transportation and waste reduction—thereby encouraging environmentally friendly lifestyles. Additionally, by providing localized access to essential services, these hubs can reduce the necessity for long-distance travel, cutting down transportation-related emissions. Some hubs may also support circular economy practices, such as recycling and composting, further mitigating waste and the emissions from waste management and new material production.

Measure- Waste and Materials Management (e.g., recycling, backhaul)

Developing a comprehensive Waste and Materials Management plan is a crucial aspect of our broader strategy to combat climate change and reduce our environmental footprint. This measure focuses on enhancing recycling efforts and implementing backhaul practices to minimize waste and improve material efficiency across our community. The growing urgency to address waste management stems from the alarming rate at which landfills are expanding, the increasing greenhouse gas emissions from waste decomposition, and the loss of potentially recyclable materials. By prioritizing the segregation of recyclable and non-recyclable waste, promoting the use of materials with lower environmental impacts, and facilitating the return of unused or end-of-life products for recycling or proper disposal, this measure aims to significantly reduce the volume of waste sent to landfills. Furthermore, it seeks to create a circular economy where materials are reused and recycled to the greatest extent possible, reducing the demand for new resources and lowering greenhouse gas emissions. The successful implementation of this measure will not only contribute to environmental sustainability but also foster economic benefits through the creation of green jobs and the stimulation of innovation in waste management technologies and practices.

Measure - Restoration of degraded lands (e.g., brownfields, mine reclamation) and forested lands to enhance carbon sequestration

The measure focusing on the restoration of degraded lands, including areas previously utilized for industrial purposes such as brownfields or sites of former mining operations, along with the rehabilitation of forested territories, plays a crucial role in enhancing carbon sequestration capabilities. This involves several strategic actions:

1. Brownfield Restoration: Transforming brownfields—previously developed lands that are not currently in use due to the presence of hazardous substances, pollutants, or contaminants—into green spaces, parks, community gardens, or other productive uses. This not only revitalizes the land but also contributes to carbon capture as vegetation grows.
2. Mine Reclamation: Rehabilitating land disturbed by mining activities involves contouring the land surface, stabilizing soil, planting native vegetation, and restoring ecosystems. This process helps in the recovery of the area's natural carbon-absorbing capacity, reducing the overall carbon footprint.
3. Forested Land Rehabilitation: Focusing on forested lands, this measure includes reforestation (planting trees on land that has lost its forest cover), afforestation (planting trees on land that has never been forested), and forest management practices aimed at increasing biomass density, diversity, and health. Healthy, well-managed forests are significant carbon sinks, absorbing carbon dioxide from the atmosphere during the process of photosynthesis.

These actions not only contribute to carbon sequestration but also provide numerous co-benefits, including biodiversity enhancement, improved soil health and water quality, economic development opportunities from reclaimed lands, and enhanced community recreational spaces. By restoring these lands to their natural or new productive states, significant amounts of carbon can be sequestered annually, making this measure a pivotal component of climate action plans aimed at reducing greenhouse gas emissions and combatting climate change.

Measure – Development, Repair and Upgrade of Hydroelectric Facilities

Some communities in the BBNA region have existing hydroelectric facilities that could benefit from major maintenance and/or upgrades to their equipment and controls, resulting in increased diesel generation displacement and reductions in GHG emissions. Additionally, emerging technology is making hydroelectric power generation viable in locations previously not considered as a suitable candidate. This measure will identify potential projects for existing systems and continue to monitor technology developments to identify viable hydroelectric projects.

Implementation Milestones and Schedule

GHG Measures - Implementation Milestones and Schedule

Project Tasks																																
Years	2025				2026				2027				2028				2029				2030				2031				2032			
Quarters	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Residential Energy Efficiency Retrofits																																
Identify detailed scope for building retrofits	■																															
Identify Funding for Project Implementation	■	■	■	■	■	■																										
Competitively Procure Implementation Contractor							■	■																								
Procure materials and implement retrofits									■	■	■	■	■	■	■	■	■	■	■	■												
Verify Proper Operation and Track Metrics																					■	■	■	■								
Close-out Project																								■								
Community Building Energy Efficiency Retrofits																																
Identify detailed scope for building retrofits	■																															
Identify Funding for Project Implementation	■	■	■	■	■	■																										
Competitively Procure Implementation Contractor							■	■																								
Procure materials and implement retrofits									■	■	■	■	■	■	■	■	■	■	■	■												
Verify Proper Operation and Track Metrics																					■	■	■	■								
Close-out Project																								■								
Commercial Building Energy Efficiency Retrofits																																
Identify detailed scope for building retrofits	■																															
Identify Funding for Project Implementation	■	■	■	■	■	■																										
Competitively Procure Implementation Contractor							■	■																								
Procure materials and implement retrofits									■	■	■	■	■	■	■	■	■	■	■	■												
Verify Proper Operation and Track Metrics																					■	■	■	■								
Close-out Project																								■								
Utility Efficiency and Infrastructure Upgrades																																
Identify Funding for Project Implementation	■	■	■	■																												
Competitively procure engineering contractor and complete Final Design					■	■	■																									
Procure Equipment (Competitive or Sole Source Qualified)							■	■	■	■																						
Competitively procure an installation contractor									■	■																						
Complete project installation											■	■	■																			
Complete commissioning and monitor key metrics														■	■	■	■															
Close-out Project																		■														
Utility Line Loss Improvements																																
Identify Line Loss Cause and Detailed Scope of Work	■	■																														
Identify Funding for Project Implementation			■	■	■	■																										
Competitively procure engineering contractor and complete Final Design - if required							■	■	■																							
Procure Equipment (Competitive or Sole Source Qualified)										■	■	■	■																			
Competitively Procure Implementation Contractor													■																			
Complete project installation														■	■	■																
Complete commissioning and monitor key metrics																	■	■	■	■												
Close-out Project																					■											
Utility Heat Recovery Upgrades																																
Develop Detailed Scope of Work	■	■																														
Identify Funding for Project Implementation			■	■	■	■																										
Competitively procure engineering contractor and complete Final Design - if required							■	■	■																							
Procure Equipment (Competitive or Sole Source Qualified)										■	■																					
Competitively Procure Implementation Contractor											■																					
Complete project installation												■	■	■																		
Complete commissioning and monitor key metrics															■	■	■	■														
Close-out Project																			■													
Community Scale Solar PV Construction																																
Identify Funding for Project Implementation	■	■	■	■																												
Competitively procure engineering contractor and complete Final Design - if required					■	■	■																									
Competitively Procure Equipment Supply and Implementation Contractor								■	■	■																						
Procure Equipment (Competitive or Sole Source Qualified)											■	■	■																			
Complete project installation														■	■																	
Complete commissioning and monitor key metrics																■	■	■	■													
Close-out Project																				■												
Community Scale Wind System Construction																																
Complete 1-year Minimum Wind Assessment and Feasibility Study	■	■	■	■	■	■	■	■																								
Identify Funding for Project Implementation									■	■	■	■																				
Competitively procure engineering contractor and complete Final Design - if required													■	■	■	■																
Procure Equipment (Competitive or Sole Source Qualified)																	■	■	■	■	■											
Competitively Procure Implementation Contractor																					■											
Complete project installation																						■	■	■	■							
Complete commissioning and monitor key metrics																										■	■	■	■			
Close-out Project																														■		

Methods for Tracking Progress

General metrics for measuring progress towards reducing greenhouse gas emissions were contemplated broadly for each measure. These metrics are intended to measure effectiveness of the measure once implemented and do not consider interim, pre-implementation milestones.

Measure 1 – Residential Energy Efficiency

- Post implementation electrical usage will be derived either on a community-wide level from PCE data or billing and usage data will be collected from the electric utility or the utility customer directly.
- A survey of heating fuel usage will be conducted post retrofit and compared to pre-retrofit data.

Measure 2 – Community Building Energy Efficiency

- Post implementation electrical usage will be derived either on a community-wide level from PCE data or billing and usage data will be collected from the electric utility or the utility customer directly.
- A survey of heating fuel usage will be conducted post retrofit and compared to pre-retrofit data.

Measure 3 – Commercial Building Energy Efficiency

- Post implementation electrical usage will be derived either on a community-wide level from PCE data or billing and usage data will be collected from the electric utility or the utility customer directly.
- A survey of heating fuel usage will be conducted post retrofit and compared to pre-retrofit data.

Measure 4 – Diesel Utility Efficiency Upgrades

- Community PCE Reports include data on the amount of diesel fuel used on an annual basis to generate electricity. This data will be used in addition to generator efficiency, to determine the effectiveness of the efficiency retrofits at reducing fuel consumption and thereby reducing GHG emissions.

Measure 5 - Reducing Line Loss

- Community PCE Reports include data on the line loss by utility. This data will be used in and compared to pre-implementation line loss data reported.

Measure 6 – Heat Recovery

- Building or system heating oil usage will be derived from surveys.

Measure 7 – Community Scale Solar-Battery

- Diesel usage will be analyzed post implementation. Community PCE Reports include data on the amount of diesel fuel used on an annual basis to generate electricity. We will analyze the reduction in diesel fuel used to generate electricity between pre-implementation and post-implementation.
- Renewable Energy Generated – Community PCE Reports include data on the amount of non-diesel generated electricity. We will analyze the change in non-diesel generated electricity between pre-implementation and post-implementation.

Measure 8 – Community Scale Wind

- Diesel usage will be analyzed post implementation. Community PCE Reports include data on the amount of diesel fuel used on an annual basis to generate electricity. We will analyze the reduction in diesel fuel used to generate electricity between pre-implementation and post-implementation.
- Renewable Energy Generated – Community PCE Reports include data on the amount of non-diesel generated electricity. We will analyze the change in non-diesel generated electricity between pre-implementation and post-implementation.

Benefits Analysis

This section explores each of the measures that were laid out in the previous section and expands on the additional benefits of the measures if implemented including a list of additional benefits not captured elsewhere.

The implementation of the measures included in this PCAP are anticipated to have a broad range of benefits beyond GHG emission reductions. Emission reductions in the built Residential Energy and Commercial Facilities & Community Facilities sector are primarily due to reducing diesel fuel for building heating uses and electricity. Likewise, reductions in the Community-Scale Electricity Generation and Distribution sector are primarily improving efficiency of diesel power generation and distribution or integration of high penetration renewable energy, thereby reducing diesel fuel usage for electricity. While the benefits are difficult to quantify without specific activity and location information, some broad benefits are likely, based on regional patterns and activities. Diesel fuel combustion for building heat does not have a detectable or uniquely identifiable impact on criteria and toxics pollutant concentrations in our region. Instead, any benefit would primarily be identifiable as reductions in the overall emissions inventory. A reduction in diesel fuel consumed will reduce the fine particulate, NOx, black carbon, and VOC emissions and ambient concentrations near those activity locations.

Note: Quantified co-pollutant reductions were omitted from the Benefits Analysis section per the guidance from the EPA's Climate Pollution Reduction Grants Program: Technical Reference Document, Benefits Analyses: Co-Pollutant Impacts (May 30, 2023) which states "Tribes and territories are not expected to quantify co-pollutant impacts associated with non-industrial GHG reduction measures." None of the proposed measures were considered "industrial." All of the proposed measures are "non-industrial" encompassing a range of sectors and activities beyond traditional heavy industrial processes. It includes various aspects of energy consumption and emissions reduction measures associated with four primary sectors including community-scale electricity generation, residential energy consumption, commercial facilities energy consumption, and community facilities energy consumption. Here are definitions for each of these sectors:

Community-Scale Electricity Generation and Distribution: This refers to the generation of electricity at a scale smaller than large industrial power plants, including generated and distributed energy from sources including diesel, solar, wind turbines, or microgrids. It typically serves the energy needs of a community, such as a neighborhood, town, or local area.

Residential Energy Consumption: Residential energy consumption refers to the energy used by households for heating, cooling, lighting, appliances, and other domestic purposes. It includes the electricity, heating oil, and other energy sources consumed within individual homes.

Commercial Facilities & Community Facilities Energy Consumption: This pertains to the energy consumption of public facilities, local businesses and non-industrial buildings, such as Tribal & City offices, schools, retail stores, restaurants, and other business establishments. Proposed measures include retrofits to reduce the energy used in these structures, primarily to reduce energy used for electricity and heating.

Authority to Implement

Many of the entities in the region work together to carry out projects in communities within the region. This is explained in more detail in the *Entities in the Region* section within the *Introduction* to this report. For a particular measure, the identified authority may be required to get permission from the building or system owner through a formal document such as a Cooperative Project Agreement.

The tables above (by measure) capture current authorities to implement proposed measures based on ownership or historical project development and implementation and lines of formal or informal responsibility of the entities in the region. Broadly this climate action plan identified the entity in the region or in the community that has authority to carry out a proposed measure such as the City, the Tribe, the Power Utility, the Housing Authority, etc.

Identification of Funding Sources

The financing strategy and funding opportunities for implementing the proposed measures is detailed in the section titled "Intersection with Other Funding Availability" which mostly contemplates federal grants. A non-federal match is often required, which refers to the portion of project funding that comes from non-federal sources, which is a common stipulation for securing federal grant money. This requirement ensures that local or regional stakeholders have a vested interest in the project's success and that the financial burden is not solely borne by federal funding.

The sources for non-federal matches are diverse, allowing for flexibility in financial planning and the opportunity to create a robust funding model. Potential sources include:

System or Building Owner Contributions: Owners of the systems or buildings that will benefit from the project may contribute a portion of the necessary funds. This investment reflects their direct interest in the project's success and the expected benefits to their properties, such as increased resilience and energy efficiency.

Regional Partnerships: Collaboration with regional partners, such as neighboring municipalities, regional development organizations, or consortia of local governments, can provide a significant source of matching funds. These partners may share a common interest in the project's objectives, such as enhancing regional resilience to climate change or improving local infrastructure.

State Funding: State-level grants or loans represent another critical source of non-federal matching funds. Many states offer financial assistance programs for projects that align with state priorities, such as sustainability, disaster preparedness, and community development.

Non-federal Grants or Loans: Beyond state-specific programs, other non-federal grants or loans may be available from philanthropic foundations, non-profit organizations, or private sector partners interested in supporting sustainability and resilience efforts. These sources often seek to fund projects that demonstrate innovation, community benefit, and potential for scalability.

Intersection with Other Funding Availability

The table below aims at identifying likely Federal, State and other funding sources that cover a majority of the proposed measures including energy efficiency, electric utility upgrades, and renewable energy integration.

FUNDING OPPORTUNITY	ELIGIBLE PROJECTS
Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) Tribal Energy Program Various grants available for energy efficiency and renewable energy projects: https://www.nrel.gov/docs/fy13osti/54396.pdf http://www.energy.gov/indianenergy/office-indian-energy-policy-and-programs	Biomass, energy efficiency, geothermal, hydropower, solar photovoltaics, solar water heat, wind, and other renewable energy projects.
Department of Energy Office of Indian Energy (DOE-OIE) Federal agencies provide grant, loan, and technical assistance programs to support Tribal energy projects: https://www.energy.gov/indianenergy/current-funding-opportunities	Weatherization, technical assistance, economic development, community facilities, community water, energy audits, renewable energy development, and energy efficiency.
Department of Energy (DOE) – Other Grants available for energy efficiency, renewable energy, technical assistance, pilot projects, and Tribal government energy projects: https://www.energy.gov/energy-economy/funding-financing	Weatherization, biomass, energy efficiency, geothermal, hydropower, solar photovoltaics, solar water heat, wind, other renewable energy projects, and education & outreach.
Denali Commission Grants Improve the effectiveness and efficiency of government services, to develop a well-trained labor force employed in a diversified and sustainable economy, and to build and ensure the operation and maintenance of Alaska's basic infrastructure: https://www.denali.gov/grants/ https://www.denali.gov/funding-requests/	Energy reliability, bulk fuel safety, infrastructure protection, transportation, sanitation, health facilities, housing, broadband, and economic development.
Alaska Energy Authority (AEA) Supports the State's communities and energy infrastructure by administering grant funding programs and a loan program:	Solar water heat, photovoltaics, landfill gas, wind, biomass, hydroelectric, geothermal

http://www.akenergyauthority.org/What-We-Do/Grants-Loans AEA Renewable Energy Grant Fund: http://www.akenergyauthority.org/What-We-Do/Grants-Loans/Renewable-Energy-Fund	electric, fuel cells, geothermal heat pumps, combined heat and power/cogeneration, hydrothermal, waste heat, transmission or distribution infrastructure, anaerobic digestion, tidal energy, wave energy, fuel cells using renewable fuels, and geothermal direct-use.
Alaska Housing Finance Corporation (AHFC) Financing for permanent energy-efficient improvements to public buildings owned by regional educational attendance areas, by the University of Alaska, by the state or by municipalities in the state: Alaska Energy Efficiency Revolving Loan Program: https://www.ahfc.us/efficiency/non-residential-buildings/energy-efficiency-revolving-loan-fund-aeerlp/	Borrowers obtain an Investment Grade Audit as the basis for making cost-effective energy improvements, selecting from the list of energy efficiency measures identified.
USDA Rural Development High Energy Cost Grant: https://www.rd.usda.gov/factsheet/high-energy-cost-grants	Funds may be used to acquire, construct, extend, upgrade, or otherwise improve energy generation, transmission, or distribution facilities and to establish fuel transport systems that are less expensive than road and rail.
Rasmuson Foundation Capital projects and technology upgrades for eligible Alaska organizations: Tier 1 Grants: https://www.rasmuson.org/grants/tier-1-grants/	Capital projects, technology updates, capacity building, program expansion and creative works, including building construction/renovation/restoration, technology upgrades in community facilities, and capacity building grant support.
Housing and Urban Development (HUD) http://portal.hud.gov/hudportal/HUD?src=/topics/grants	Energy efficiency and housing weatherization.
Bureau of Indian Affairs (BIA) Energy and Mineral Development Program Grant (EMDP): https://www.bia.gov/service/grants/emdp/what-energy-and-mineral-development-program-emdp-grant	Resource assessment, exploration studies, feasibility studies, market, studies, engineering studies, economic evaluation, and defining potential targets for development.

Bureau of Indian Affairs Tribal Energy Development Capacity Grant (TEDC): https://www.bia.gov/service/grants/tedc	Developing the legal infrastructure to create any type of Tribal energy business. Establishing an energy-focused corporation under Tribal or state incorporation codes. Establishing an energy-related Tribal business charter under federal law.
Bureau of Indian Education http://bie.edu/Programs/index.htm	School energy programs.
The Honnold Foundation Grid Alternatives Tribal Program: https://www.honnoldfoundation.org/	Unrestricted grant funding to organizations or projects that use solar energy to increase social and economic equity and reduce environmental impact.
USDA Rural Development Many various grants. Listed below. www.rd.usda.gov/ak	Diverse eligible activities.
Bipartisan Infrastructure Law – Clean Energy & Power 1. Delivering Clean Power ($21.3 billion) 2. Clean Energy Demonstrations ($21.5 billion) 3. Energy Efficiency & Weatherization ($6.5 billion) 4. Funding for Clean Energy Manufacturing & Workforce Development ($8.6 billion) https://www.whitehouse.gov/build/guidebook/ https://www.whitehouse.gov/wp-content/uploads/2022/05/BUILDING-A-BETTER-AMERICA-V2.pdf#page=152	Delivering clean energy, clean energy demonstrations, energy efficiency, clean energy manufacturing and workforce. May be limited in ability to fund upgrades and improvements to existing diesel electric utility systems. This gap may better fit into an EPA Implementation grant.
Bipartisan Infrastructure Law - Electric Vehicles, Buses and Ferries 1. National Electric Vehicle Infrastructure Formula Program ($5 billion) 2. Discretionary Grant Program for Charging and Fueling Infrastructure ($2.5 billion) 3. Clean School Bus Program ($5 billion)	Building a network of electric vehicle chargers and supporting the transition to electrification across all types of vehicles is critical to reduce emissions and help to combat the climate crisis.

4. Low- and No-Emission Transit Bus Program ($5.6 billion) 5. Electric or Low Emitting Ferry Program ($250 million)	

Workforce Planning Analysis

This Workforce Planning Analysis addresses the unique challenges and opportunities faced by the region. Our goal is to ensure that the communities in our region are not only prepared to participate in, but also benefit from, the initiatives outlined in the PCAP & CCAP.

The primary objective of this analysis is to identify skills and training essential for the successful implementation of PCAP and CCAP measures. This includes understanding the specific needs for Electric Utility Upgrades, Building Energy Efficiency Retrofits, and High Penetration Renewable Energy Integration. By identifying these needs, we aim to develop targeted strategies for workforce development or by importing this labor to the region.

The Workforce Planning Analysis takes a cursory look at the distinct categories for the priority projects identified in the PCAP and CCAP. Priority Projects Identified in the PCAP & CCAP largely fall into a few distinct categories: 1) Electric Utility Upgrades; 2) Building Energy Efficiency Retrofits; 3) High Penetration Renewable Energy Integration.

The table below explores these priority project categories, the analysis considered required workforce competencies, potential training and development needs, potential partnerships and collaborations, and the estimated time to develop local labor.

Table 1 Workforce Planning Analysis Table

Priority Project Category	Required Workforce Competencies	Potential Training & Development Needs	Potential Partnerships & Collaborations	Est. Time Needed to Develop Local Labor
Electric Utility Upgrades	Electrical Engineering Knowledge: Understanding of electrical systems, generation equipment, and distribution networks. Knowledge of diesel generators and their integration with power grids.	Technical training in electrical engineering and power systems. Hands-on workshops for diesel generator maintenance and electrical distribution management. Courses in renewable energy integration for diesel systems. Certification programs in energy management and system optimization.	Partnerships with vocational training centers for specialized technical training. Collaborations with the University of Alaska for research and academic support. Joint programs with Alaska Native Corporations and regional non-profits focusing on sustainable energy and workforce development. Cooperative initiatives with local government for compliance and regulatory training.	Short-term training and certifications: 6-12 months. Comprehensive skill development programs: 1-2 years. Ongoing education and advanced training for system optimization and management: 2-3 years.
Electric Utility Upgrades	Maintenance and Repair Skills: Intensive training in the maintenance and repair of diesel generators and associated equipment. Programs to enhance skills in diagnosing and fixing issues in electrical distribution systems.	Technical vocational programs for diesel generator maintenance, advanced diagnostics training for electrical systems.	Vocational schools, technical institutes, equipment manufacturers for specialized training modules.	6-12 months for basic proficiency, ongoing for specialized expertise.
Electric Utility Upgrades	Renewable Energy Integration: Training in solar, wind, and hydroelectric system technologies. Workshops on integrating renewable energy sources with existing diesel power systems.	Renewable energy certification courses, practical workshops on system integration, field experience with renewable technologies.	Renewable energy firms, environmental NGOs, government energy departments.	1-2 years for foundational knowledge and integration skills.

Electric Utility Upgrades	Energy Storage and Management: Educational sessions on various energy storage technologies, including battery systems. Skills development in energy distribution management to optimize efficiency and reliability.	Specialized training on energy storage solutions, perhaps on specific energy storage systems (brands) being used within the region or across Alaska.	Energy storage solution providers, engineering colleges, grid management consultants.	1-2 years for comprehensive understanding and application.
Electric Utility Upgrades	Regulatory Compliance: Sessions on understanding and adhering to local, state, and federal regulations governing electric utilities. Training in environmental and safety standards relevant to power plant operations.	Compliance workshops, safety standards training, regulatory affairs seminars.	Regulatory bodies, safety organizations, legal firms specializing in energy regulations.	3-6 months for initial training, ongoing for updates in regulations.
Electric Utility Upgrades	Project Management: Opportunities for Project Management Professional (PMP) certification or similar credentials. Workshops on planning, executing, and monitoring electric utility upgrade projects.	PMP certification prep courses, project management software training, leadership and management workshops. On the job training with an employer that manages energy projects in rural Alaska.	Project Management Institute (PMI), corporate training firms, business schools. ANTHC, AEA, ANCs, Village Corporations, others engaging in project management in the region.	6-12 months for certification, additional time for practical experience.
Electric Utility Upgrades	System Optimization: Courses on optimizing power generation and distribution for efficiency and reliability. Training sessions on using specific software and tools for system analysis and optimization.	Systems/controls engineering courses, software training for energy controls systems, optimization technique workshops.	Tech companies, software developers, engineering consultancies. AVEC, Electric Cooperatives, for-profit companies specializing in controls for rural diesel-renewable hybrid installations.	1-2 years for proficiency in systems optimization and software utilization.

Building Energy Efficiency Retrofits	Basic knowledge of weatherization techniques and materials. Skills in air sealing and insulation to improve building envelope efficiency. Competency in installing setback thermostats and other basic energy-saving controls. Ability to retrofit lighting to more efficient options, such as LED. Familiarity with the use of basic hand and power tools safely and effectively.	Hands-on training programs in weatherization and air sealing techniques. Workshops on the installation of setback thermostats and basic electrical safety. Practical sessions on efficient lighting retrofitting, including safe handling and disposal of old fixtures. Basic tool safety and operation courses, including measures to prevent workplace injuries.	Partnerships with energy efficiency organizations for the provision of up-to-date training materials and best practices. (RurAL CAP, ANTHC, Housing Authority) Community workshops on energy-saving practices and safe installation procedures. Cooperative programs with local trade schools or adult education centers offering entry-level courses in home retrofitting and energy efficiency.	Basic competency in tool use and safety: 1-2 months. Proficiency in basic retrofitting tasks like weatherization and thermostat installation: 2-4 months. Training and application of energy-efficient lighting retrofitting: 1-2 months.
High Penetration Renewable Energy Integration	Renewable Energy Systems Knowledge: Fundamental understanding of renewable energy technologies, such as solar and wind power systems.	Educational courses on the principles of renewable energy and high-penetration systems.	Collaborations with renewable energy firms and educational institutions for curriculum development and guest lectures.	3-6 months for foundational knowledge.
High Penetration Renewable Energy Integration	Technical Installation Skills: Ability to install high-penetration renewable energy systems, including solar panels and wind turbines.	Vocational training in the mechanical and electrical aspects of installing renewable energy systems.	Partnerships with technical and trade schools for hands-on installation training programs.	6-12 months for basic to intermediate installation skills.
High Penetration Renewable Energy Integration	System Integration and Interconnection: Skills in integrating renewable energy systems with existing power grids and infrastructure.	Workshops on grid interconnection standards, smart grid technologies, and distributed energy resource management.	Joint programs with energy utility companies to provide training on grid integration and smart grid technologies.	1-2 years for advanced integration skills and grid interconnection proficiency.

High Penetration Renewable Energy Integration	Energy System Monitoring: Competency in the use of monitoring equipment to ensure system performance and reliability.	Training in data analysis and the use of software tools for monitoring renewable energy system performance.	Alliances with software and analytics companies specializing in energy system monitoring solutions.	6-12 months for effective system monitoring and data analysis skills.
High Penetration Renewable Energy Integration	Maintenance and Troubleshooting: Knowledge of maintenance procedures for renewable energy installations and the ability to troubleshoot common issues.	Regular upskilling sessions on maintaining renewable energy equipment and diagnosing technical faults.	Cooperative agreements with equipment manufacturers or specialized contractors for ongoing technical support and training.	Ongoing, with initial training taking 3-6 months and periodic updates as technology advances.

Appendices

Appendix A: Community Dashboards

These standalone summaries are intended to be community specific PCAPs. They include all measure information sections, tabulated, including Quantified GHG Reduction Measures, Benefits Analysis, Authority to Implement, and Non-Quantified "Other" Measures. Community Level PCAPs do not include GHG Inventory Baseline, GHG Emissions Projections, GHG Reduction Targets, Intersection with Other Funding, or Workforce Planning Analysis, as this information is reported regionally.

Appendix B: Community Surveys

Community surveys were administered from January 11 – February 5, 2024. A total of 31 responses were received. All survey responses were anonymized, and the results aggregated for the region. Community specific measures reported in the surveys were added to the Community Dashboards.

Appendix C: Technical References

These spreadsheets are a comprehensive technical reference showing all calculations and assumptions that were used to develop the baseline GHG estimates and the recommended measures. These are provided as an Excel spreadsheet.