Bering Strait Regional

Energy Plan

Serving the communities of:

Brevig Mission
Council
Diomede
Elim
Gambell
Golovin
King Island
Koyuk
Mary's Igloo
Nome
Savoonga
Shaktoolik
Shishmaref
Saint Michael
Solomon
Stebbins
Teller
Unalakleet
Wales
White Mountain

Bering Straits DEVELOPMENT Co.

ALASKA ENERGY AUTHORITY

June 2015

WHPacific

Bering Strait Regional

Energy Plan

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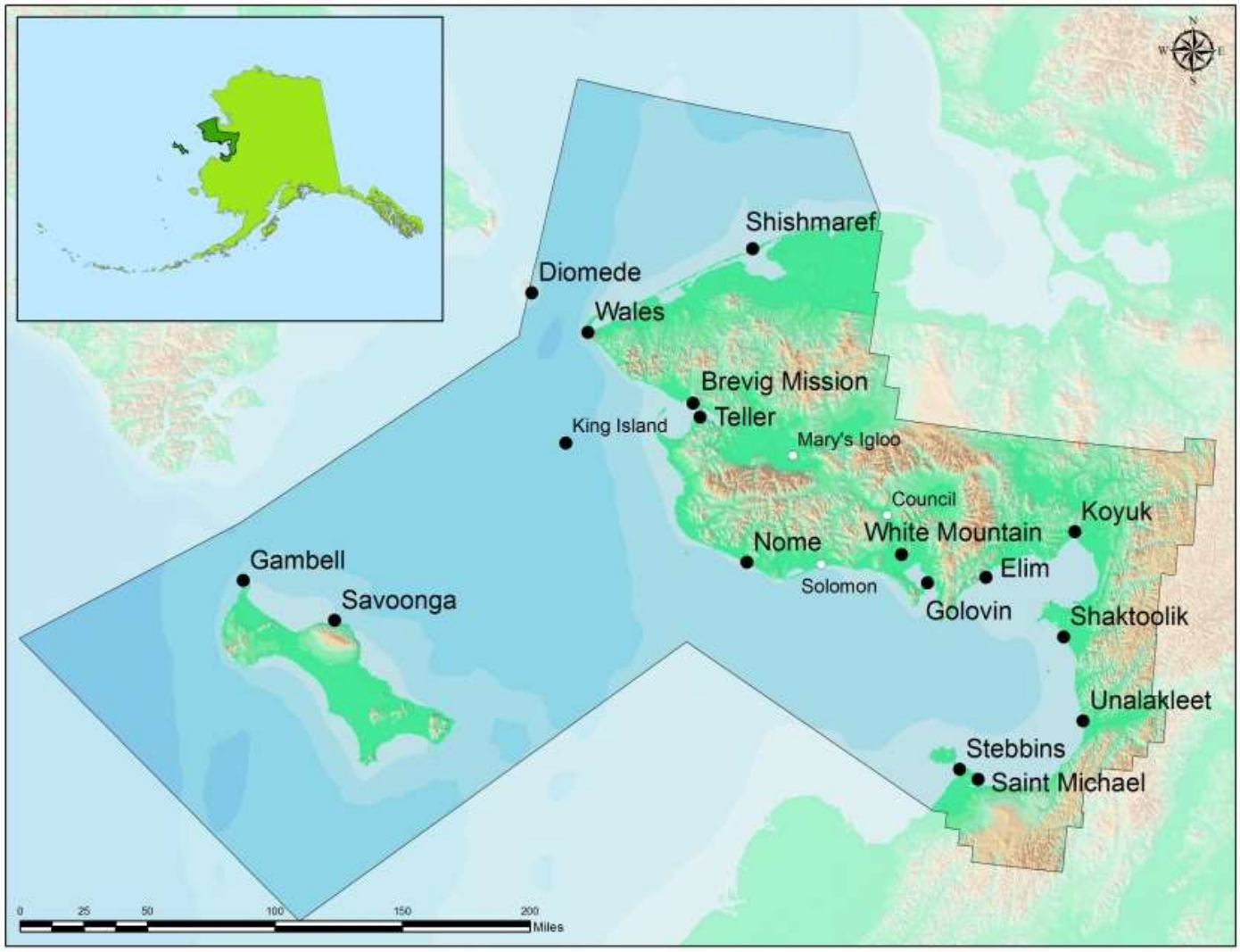
Bering Straits DEVELOPMENT Co

ALASKA ENERGY AUTHORITY

WHPacific

Bering Strait Region: Planning Area



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Acknowledgements

All rate-payers are stakeholders in the energy planning for the region's future. Stakeholders with current or proposed industrial-size energy loads, as well as organizations and agencies who otherwise control or manage energy resources and policies are included below along with others who assisted in the preparation of this document.

Bering Straits Energy Steering Committee

Community Members

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- Warren Rock, City of Brevig, Mayor
- Reggie Barr, Brevig Native Corporation
- Toby Anugazuk, City of Golovin
- Jason Righthiemier, Nome Eskimo Community
- Joe Garney, Mary's Igloo
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Acronyms and Abbreviations

ACEP	Alaska Center for Energy and Power
AEA	Alaska Energy Authority
AHFC	Alaska Housing Finance Corporation
AIDEA	Alaska Industrial Development and Export Authority
AMR systems	Automated Meter Reading systems
ANCSA	Alaska Native Claims Settlement Act
ANGDA	Alaska Natural Gas Development Authority
ANTHC	Alaska Native Tribal Health Consortium
ARDOR	Alaska Regional Development Organizations
ARECA	Alaska Rural Electric Cooperative Association
ARIS	Alaska Retrofit Information System
ARRA	American Recovery and Reinvestment Act
ARUC	Alaska Rural Utility Collaborative
AVEC	Alaska Village Electric Cooperative
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BSDC	Bering Straits Development Company
BSNC	Bering Strait Native Corporation
CDR	Conceptual Design Report
CETF	Community Energy Task Force
CFL	Compact Fluorescent Light
CIAP	Coastal Impact Assistance Program
CIP	Capital Improvement Program
EfW	Energy From Waste
DCCED	Department of Commerce, Community and Economic Development
DOE	U.S. Department of Energy
DOL	Alaska Department of Labor (and Workforce Development)
DOT&PF	Alaska Department of Transportation and Public Facilities
EEM	Energy Efficiency Measures
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
ETF	Energy Technology Fund
EUI	Energy Use Index
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
HUD	U.S. Department of Housing and Urban Development
HVDC	High Voltage Direct Current
ICDBG	Indian Community Development Block Grant
IGA	Investment Grade Audit

IPP	Independent Power Producer
ISER	Institute for Social and Economic Research
kW	Kilowatt
kWh	Kilowatt hour
Mcf	One thousand cubic feet
MWh	Megawatt hours
NAHASDA	Native American Housing and Self Determination Act
NIST	National Institute for Standards and Technology
NOAA	National Oceanic and Atmospheric Administration
NRECA	National Rural Electric Cooperative Association
NREL	National Renewable Energy Laboratory
ORC	Organic Rankine Cycle
PFD	Permanent Fund Dividend
PCE	Power Cost Equalization
PD&R	Policy Development and Research
PV	Photovoltaic
PWS	Prince William Sound
PWSEDD	Prince William Sound Economic Development District
REAP	Renewable Energy Alaska Project
RUBA	Rural Utility Business Advisor
SNC	Sitnasuak Native Corporation
TED	The Energy Detective
UAF	University of Alaska Fairbanks
UCG	Underground Coal Gasification
USACE	United States Army Corps of Engineers
WtE	Waste to Energy
WTP	Water Treatment Plant

Executive Summary

This plan documents the current status of energy resources in the Bering Strait Region and presents a prioritized list of projects and strategies for reducing energy costs while maintaining or improving the current level of service. The plan, funded by the Alaska Energy Authority (AEA) and developed by Kawerak and the Bering Straits Development Company builds upon the 2009 Bering Strait Energy Report and analysis created by state and regional energy specialists. It also relied heavily on the assistance of the utility companies in the region, local energy "champions," as well as federal, state and regional participants. Together, these stakeholders verified background data, prepared goals and prioritized energy projects. It is AEA's intent to empower a team of these stakeholders and energy champions to continue the work of improving energy resources and sustainability in the Bering Strait Region well into the future.

Local community and energy profiles for each of the 16 communities in the Bering Strait region show a "snap shot" in time of the current energy demands and infrastructure. The energy platform holds the connection to current energy infrastructure, water and sewer systems, landfills, housing and the extremely high cost of energy for transportation. The goal is for this plan to become a living document that provides a tool for current and future generations on energy-related projects. It is one of ten Regional Energy Plans designed to address the regions' energy needs for transportation, electricity and heat.

The energy planning efforts were based on a local, grassroots perspective. Each community was visited and each provided their input to the community and energy profiles, as well as providing the basis of future energy projects for the Bering Strait region. This process was a way for the residents of the region to determine their energy priorities and formulate a concrete, implementable and fundable plan to achieve those priorities.

Table ES-1: Summary of issues, goals and potential energy projects

ENERGY ISSUES	ENERGY GOALS	POTENTIAL PROJECTS*
Energy Efficiency & Conservation		
Lack of education in energy-efficiency and conservation, no tracking of energy costs, inefficient housing design for Arctic climate and no present best practices in place. Lack of LED street lighting and consistent auditing of housing stock. Lack of energy-efficiency upgrades on systems: water/sewer, power generation, home heating.	Provide adequate energy education in all levels and areas, calculate life-cycle costs for all energy systems, set standards and best practices for Arctic climate appropriate design and construction. Implement energy-efficiency recommendations generated by audits and current infrastructure and systems.	▪ Energy-wise educational visits to all residential homes ▪ Data metering and collection for all energy systems ▪ Design and build for Arctic climate and set standard for all construction in the Bering Strait region ▪ Implement through an ESCO program all recommendations on energy audits
Maintenance and Operations		
Lack of trained workforce in energy-related systems at the local level, causing high maintenance and operations expenses.	Continue to train and develop a local workforce of operators and repair technicians for all energy systems. Train local workforce to do construction upgrades for efficiency.	▪ Institute a curriculum on energy-related jobs with local secondary and college educators to promote and design Arctic appropriate approach
Energy Financing		
Outside funding for energy projects is limited and highly competitive. Lack of collaboration of funding sources.	Seek Federal and State technical assistance for planning of future energy projects, collaborate funding efforts, develop comprehensive financial strategy for maximizing energy funding.	▪ Create a funding database for collocation of federal, state, local and private funds for energy projects
Energy Infrastructure		
Inappropriately designed energy systems have led to very high M&O costs, failing systems (due to design flaws and climate change) continue to drive the costs up on all infrastructure – roads, water and sewer, housing stock, transmission lines. Energy systems rely heavily on diesel and need upgrades to accept renewable systems.	Assess current infrastructure and develop an implementation plan for upgrades, assess housing stock conditions, upgrade systems to accept renewable energy, diversify energy sources through use of alternatives. Implement alternative energy projects where appropriate – such as solar, wind, hydro.	▪ Implementation plan for current needs ▪ Energy audits on all commercial/public buildings ▪ Assess current energy systems for upgrades to be more efficient

ENERGY ISSUES	ENERGY GOALS	POTENTIAL PROJECTS
Planning		
Lack of effective planning efforts for implementation of recommendations for energy savings and projects.	Incorporate community level comprehensive planning in all villages throughout the Bering Strait region.	▪ Local level comprehensive and energy planning
Communication		
Logistics of the Bering Strait communities hinders effective communication between entities and project partners, general public lacks understanding of current systems, conservation measures and available programs. Lack of communication with educational institutes and lack of sharing of information and successes regarding potential pilot projects.	Utilize communication structure in place to continue to educate and bring awareness and resources to the Bering Strait residents, educate energy users on energy consumption, energy systems and resources available. Implement and engage with local educators, both secondary and higher, to bring energy-related topics to the current curriculum.	▪ Implement an "EnergyWise" program to help Bering Strait regional consumers understand energy systems, distribution costs, usage and conservation ▪ Encourage and implement the AK EnergySmart curriculum into the local schools region wide

* These projects are given more details throughout the plan.

1 Introduction

Bering Straits Development Company (BSDC) prepared this document to serve as the foundation of the Bering Strait Region's Energy Strategy. It builds upon other earlier reports and stakeholder input and is intended to present strategies to lower energy costs in the region, which includes 15 small, isolated communities and the City of Nome.

The Alaska Energy Authority (AEA) provided the funds to complete this plan. It joins other regional energy plans done or in process throughout the state of Alaska. Bering Straits hired WHPacific to assist with the plan's development. The previous *Bering Strait Strategic Energy Report*[1] provided background data that was used in this plan but was updated and formatted to meet AEA guidelines which they developed to create uniformity in the regional plans throughout the state.

The *Bering Strait Regional Energy Plan* is a dynamic, living document. It must be reviewed and updated as projects are completed, technology evolves and stakeholders contribute to regional energy understanding. By building on past actions, plans and research; moving forward with practical current solutions; and continually working to maximize new and more beneficial technology, the *Bering Strait Energy Plan* will continue to be a practical and useable document.

The Energy Plan is intended to accomplish the following:

- Provide a regional and community energy profile that clearly identifies energy data, opportunities and energy priorities.
- Provides direction for reducing operational expenses for energy in the face of increasing fuel and transportation costs and tight budgets.
- Outline a process for educating residents about energy conservation measures.
- Assist in obtaining grants that reduce energy costs.
- Develop guidance for sound alternative resource development.
- Help to identify and set energy priorities.
- Save costs and increase comfort for residents resulting from energy efficiency improvements.

The Energy Plan is not intended to:

- Remain a static document. The plan should evolve as time passes to reflect current economic realities, political constraints and opportunities, and technology.
- Serve as a design document. The plan is not intended to capture a high level of detail surrounding energy projects, and most recommended projects will require standard pre-design and design documentation.

[1] Kawerak Inc., *Bering Strait Strategic Energy Report*, 2009.

1.1 Methodology

This plan follows the AEA recommended regional methodology outline and presents a summary of local and regional conditions, energy use, and priority energy projects in communities within the Bering Strait Region. Projects include those focused on energy efficiency and alternative energy options. The top priority projects were ranked using the methodology developed by AEA for the renewable energy projects and tailored for the region.

The data collected for this report was gathered from existing data in published reports including the *Bering Strait Regional Energy Report*, 2009, Alaska Energy Authority *Energy Pathways* and *End Use Survey*, the AHFC Alaska Retrofit Information System (ARIS), Alaska Home Energy Rebate Program, Power Cost Equalization Reports, Institute of Social and Economic Research (ISER) information and data collected by numerous stakeholders. A bibliography of resources used in the preparation of the energy plan is included in Appendix A.

The plan is being developed in three phases; the first phase resulted in a draft energy plan; phase II involved public outreach where energy information was presented in meetings throughout the region; and phase III will include a technical and economic analysis of potential projects and a final document. Kawerak completed Phase I in 2013, along with assistance from WHPacific; while phase II was completed by BSDC and WHPacific in 2015. The overall approach is shown graphically with a general timeline inExhibit 1-1.

Exhibit 1-1: Energy Plan Project Approach

This plan is organized into the following chapters:

1. Introduction – an overview of the regional energy vision, regional energy issues and challenges, the goals of the plan, methodology, and stakeholders involved
2. Regional Background – presenting the physical, demographic, and energy use characteristics of the region
3. Regional Energy Analysis – a detailed look at the energy resources and opportunities of the region
4. Sub-regional Summaries – a closer look at the five sub-regions, their communities, resources and potential energy-related projects
5. Implementation Plan – project tables, partners, funding sources and timelines

1.2 Issues

Energy issues in the region were identified through interviews with stakeholders and energy providers in the Bering Strait Region including Nome Joint Utilities, Diomede Electrical Utilities, Golovin Power Utilities, White Mountain Utilities, Unalakleet Valley Electrical Cooperative and Alaska Village Electric Cooperative (AVEC). Below is a list of the primary energy concerns.

Energy Management

- Effective energy management, tailored to each community, is lacking resulting in inefficient and costly energy systems.
- Data gaps include a lack of accurate fuel data by building, energy audits and space heating data. There is also concern about the lack of standardized data and there is no consistent repository for this information.
- There is an absence of current "best practices" for efficiently operating energy systems in areas of rural Alaska like Bering Straits, and there is no strategy for who should catalog and distribute this information.
- There are no project coordinators to help manage energy audits and other projects in a community which could help to reduce costs.
- There are untrained and low paid power plant operators and high turnover among project managers.

Inadequate Infrastructure

- Aged infrastructure, deferred maintenance (due to lack of funding and trained work force), construction without concern for energy use, antiquated technologies, shrinking state and federal subsidies, extreme construction costs and other conditions contribute to high energy and delivery costs in the Bering Strait Region.
- There are limited commercial building and home energy audits which limit opportunities to make significant improvements to the energy systems.

Energy Financing

- Funding for energy projects and for properly maintaining existing energy systems is inadequate
- Funding eligibility criteria based on median income limits can create inequity between rural and urban Alaska in weatherization assistance programs.
- There is a lack of grant writers at the village level which limit energy efficiency and development opportunities.

Education

- There is a general lack of understanding among most homeowners in the region about how to effectively reduce energy costs.

- The concept of “energy champions” who can help to educate and keep energy projects on track on a local level, is not fully developed and many communities have not identified appropriate individuals to fill that role.
- Alternative energy opportunities are poorly understood in many communities in the Bering Strait Region.

1.3 Vision and Goals

1.3.1 Vision

The Bering Strait Regional Energy plan vision is - *Affordable and Sustainable Energy throughout the Bering Strait Region*.

1.3.2 Goals

To support the vision the following energy goals were developed.

Energy Management

- Develop and maintain a system to collect relevant energy data.
- Reduce energy consumption 15% by 2020 through energy conservation and energy efficiency measures.
- Work to establish committed energy champions in each village to participate in on-going energy planning, collect missing energy data and coordinate local energy projects.
- Retain power plant operators and project managers through improved employment conditions and training.
- Work with appropriate agencies to develop ‘best practices’ that can assist in the energy development process.

Inadequate Infrastructure

- Implement safe and reliable infrastructure projects that consider energy efficiency and alternative energy sources.

Energy Financing

- Train and develop at least two grant writers per community that have the skills to write energy and related grants.
- Seek grants to complete investment grade residential and commercial energy audits and their recommendations.

Education

- Educate users on how their actions impact energy consumption, how their energy heating system operates and what energy resources are available to them.
- Institutionalize energy education in the school curriculum.

1.4 Stakeholders

Stakeholders contacted during the development of this energy plan included local city, tribal and corporation personnel, regional energy providers, agency staff and the general public. Near the beginning of the project, stakeholders were interviewed to enable a number of industry participants to provide information and input into a wide array of energy related issues. In addition to individual interviews conducted by phone, in person and through emails, two stakeholder advisory group meetings were held in 2013 with 39 and 25 participants respectively in Phase I.

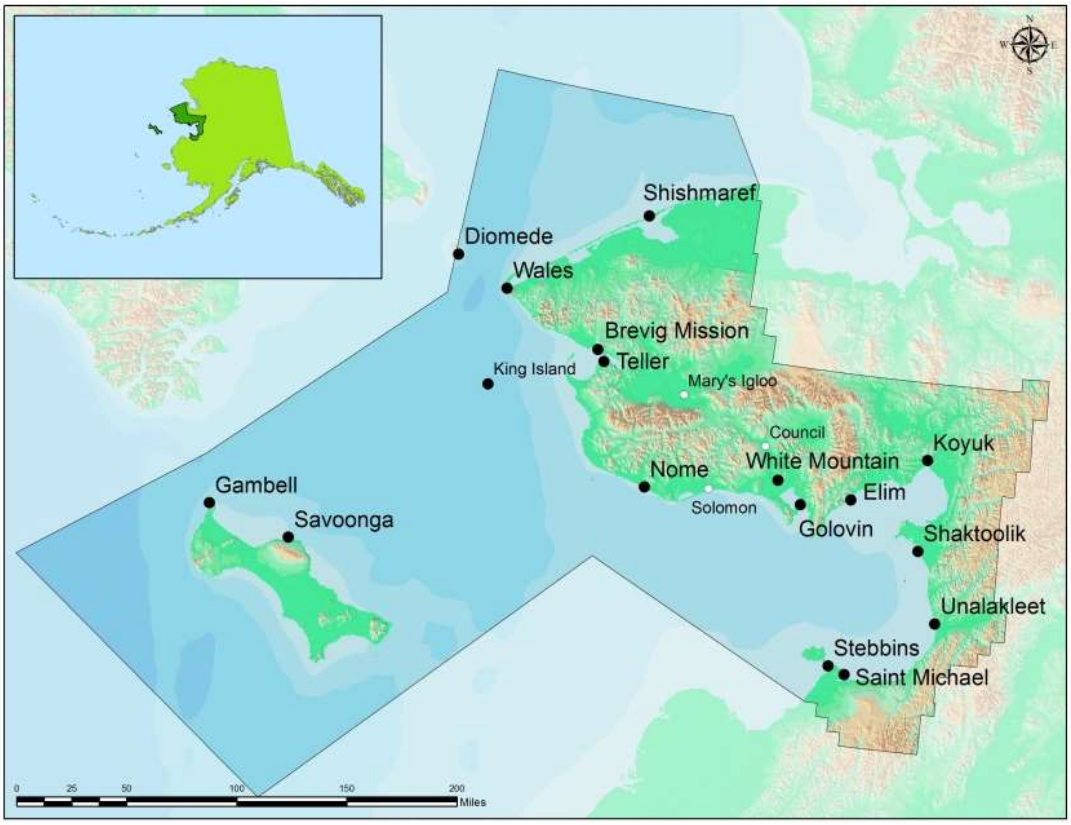
2 Regional Background

This section provides regional background information and describes current energy supply and demand benchmarks and projects for the region and individual communities.

2.1 Location

The Bering Strait Region contains 2.28 million acres[2] and lies between latitude 63 30' and 66 30' with 570 miles of coastline extending from Shishmaref in the north to Stebbins in the south. It also includes three islands; Saint Lawrence, Little Diomede and King Island. Nome is the transportation and economic hub of the region. There is no road system or unified electrical grid. The ocean is ice-free and passable for barge freight for only four to five months a year. The remainder of the year, air travel becomes the only viable way to transport goods, including fuel.

Figure 2-1: Bering Strait Region Map



[2] U.S. General Accounting Office. Regional Alaska Native Corporations Status 40 Years after Establishment, and Future Considerations. Report to Congressional Requesters, Washington, D.C.: GAO, 2012.

2.1.1 Hydrology

The Seward Peninsula lies at the southern boundary of continuous permafrost. In this environment, slight changes will cause long lasting alterations to the permafrost and consequently the quality and availability of freshwater. The arctic hydrologic system is particularly sensitive to changes in permafrost, rainand snowfall, the timing of freezeup and breakup, and the intensity of storm activity (UAF/IARC, 2003).

2.1.1 Climate

Communities in the Bering Strait Region primarily experience a transitional climate with the Bering Sea moderating the climate throughout the year. Normal average summer temperatures range from around 40-60 degrees F and normal average winter temperatures range from about -10 to +10 degrees F. Precipitation averages about 14 inches with an average snowfall of 48 inches. While the more northern communities experience slightly colder winters, the weather is essentially the same throughout the region. Daylight extends for almost 24 hours a day during the summer and in the winter the sun is barely seen.

Table 2-1: Average Climate Data in Bering Strait Region

-	Minimum	Maximum
Summer temperature	40 degrees	60 degrees
Winter temperature	-10 Degrees	10 Degrees
Snowfall	33 inches	80 inches
Wind	10 knots	15 knots
Average annual rainfall	14”	
Average Freeze up	November	
Average Break up	May-June	

Permafrost is mostly continuous through the region but is thinner than in areas further north.[3] Historically, permafrost is thawed only near deep lakes or major streams; however, there are recent reports of permafrost thawing in many communities. There are no glaciers in the region.

Heating Degree Days

The outside temperature plays a big role in how much energy it will take to keep a structure warm. Heating degree days are one way of expressing how cold a location is and can help in understanding how much fuel might be required at the village level. Heating degree days are a measure of how much (in degrees), and for how long (in days), the outside air temperature was below a certain level. They are commonly used in calculations relating to the energy consumption required to heat buildings. The higher the number the more energy will be required. The figure in Table 2-2 indicate average heating

[3] Department of Community and Economic Development website, community profiles, www.commerce.state.ak.us/dca

degree days in the Bering Strait region using available data from Nome, Golovin, Unalakleet and White Mountain. In comparison, New York averages about 5,000 heating degree days and therefore needs much less energy to heat their buildings.[2]

Table 2-2: 2012 Bering Strait Region Average Heating Degree Days

JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
366	436	716	1086	1538	1886	1651	1794	1709	1414	983	480	14,057

Source: http://www.weatherdatadepot.com/

Climate Change

Climate change describes the variation in the Earth's global and regional atmosphere over time. The impacts of climate warming in Alaska are already occurring. Some of these impacts include coastal erosion, increased storm effects, sea ice retreat and permafrost melt.[4]

The Arctic has heated up twice as fast as the rest of the planet in the past three decades. By August 2013, sea ice had lost 76 percent of its volume compared to 1979, according to the University of Washington's Polar Ice Center.[5] The effects of climate change can potentially exacerbate natural phenomena. For example, thawing permafrost can cause structural failure in buildings, airports, and roads. This leads to increased maintenance costs and disruption in services.[6] It is important that planning efforts factor these potential effects into future design of energy infrastructure.

2.2 Demographics

2.2.1 Current Population

According to the 2010 U. S. Census the total population of the Bering Strait Region was about 9,500 with Nome residents making up about a third of the total people living in the region followed by Unalakleet (688), Gambell (681) and Savoonga (671) respectively. Population by community is listed in Table 2-3.

[2] Kawerak, Bering Strait Region Energy Report, 2009, page 34-35.
[4] http://www.arctic.noaa.gov/reportcard/
[5] http://www.adn.com/2013/10/05/3111739/alaska-worlds-laboratory-for-climate.html#storylink=cpy
[6] Steenbergen, Geurts, Van Bentun, Climate change and its Impact on Structural Safety, HERON, Vol. 54, No. 1. 2009.

Table 2-3: 2010 Population by Community

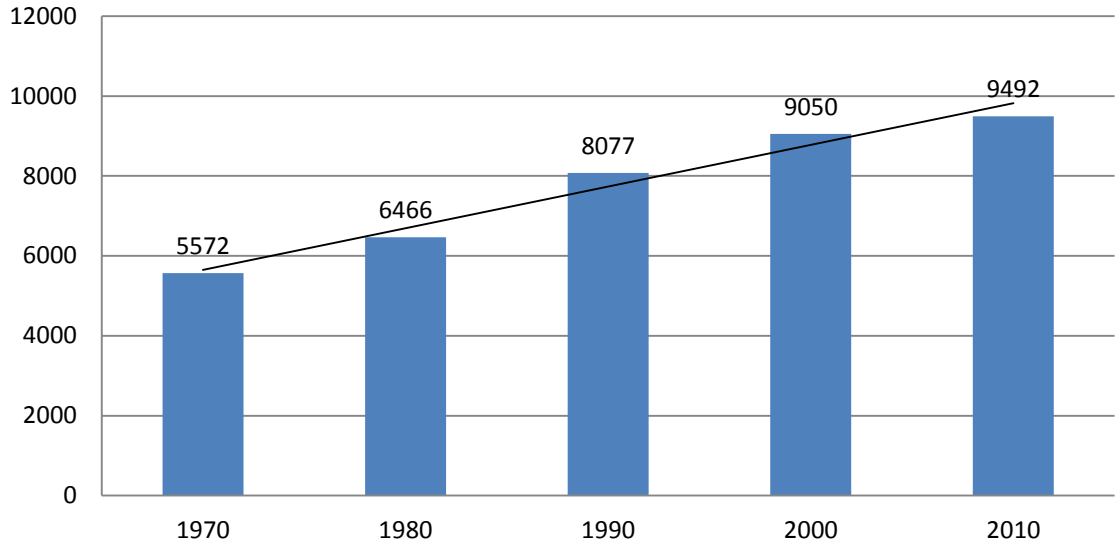
Community	2010 Population
Brevig Mission	388
Diomede	115
Elim	330
Gambell	681
Golovin	156
Koyuk	332
Nome	3598
Savoonga	671
Shaktoolik	251
Shishmaref	563
Saint Michael	401
Stebbins	556
Teller	229
Unalakleet	688
Wales	145
White Mountain	190

Source: 2010 U.S. Census

2.2.2 Trends

Historical population for the region reveals that between 1970 and 2010 the population in the region almost doubled from 5,572 to 9,492. However, from 2000 to 2010 five villages in the region (Diomede, Teller, Unalakleet Wales and White Mountain) experienced a small decline in population, which follows a statewide trend for rural Alaska.

Exhibit 2-1: Bering Strait Region Historical Population 1990-2010



Between 1990 and 2010 the Bering Strait regional population increased at a rate of 0.8 percent. If the regional trend from the past 20 years continues at its current population growth rate the population of the region would be 10,279 by 2020 and 11,132 by 2030. As the population increases, so does the demand for energy. Some or all of this additional energy need could be offset by a successful energy efficiency program.

2.2.3 Housing

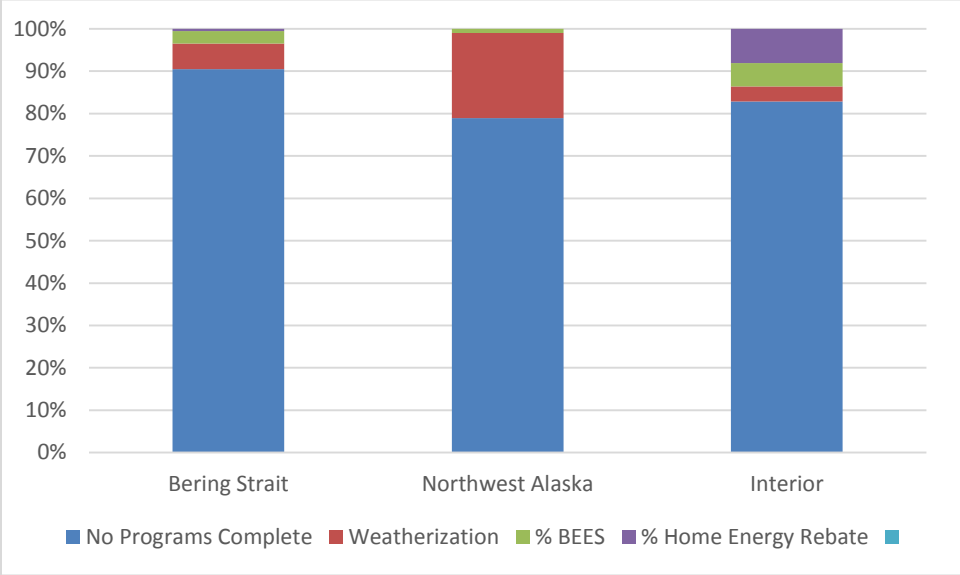
Regional Housing Assessment

The 2014 AHFC Alaska Housing Assessment used a variety of sources to provide statewide and regional housing information. Below is a summary of the housing assessment for houses in the Bering Strait region.

Housing Units: There are currently 3,975 housing units in the Bering Straits region. Of these, 2,756 are occupied, 241 vacant units are for sale or rent, and the remaining 978 are seasonal or otherwise vacant units. The average home size in the Bering Straits region is 1,136 square feet.

Energy Programs: Approximately 10% of the occupied housing units have completed either the Home Energy Rebate or Weatherization programs, or have received Alaska Building Energy Efficiency Standards (BEES) certification since 2008, compared to 21% statewide.

Exhibit 2-2: Comparison of Percent of Occupied Housing Completing Energy Programs



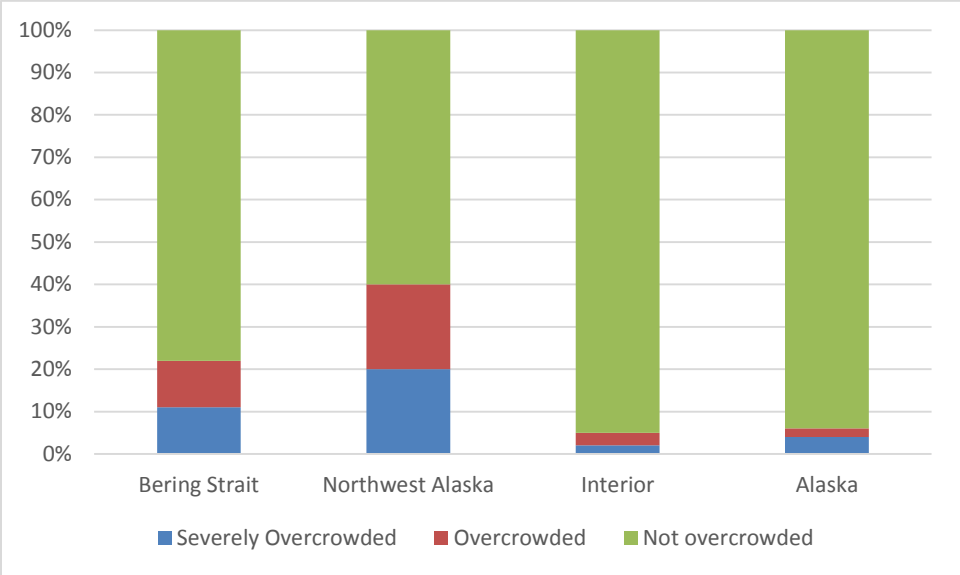
Energy Use. The average home uses 195,000 BTUs of energy per square foot annually. This is 42% higher than the statewide average.

Energy Cost. Using AKWarm estimates, average annual energy cost for homes in the region is $7,900, which is approximately 2.8 times more than the cost in Anchorage, and 3.7 times more than the national average.

Home Air-tightness and ventilation: An estimated 887 occupied housing units (or 32%) are relatively air-tight and lack a continuous ventilation system. These houses are at higher risk of moisture and indoor air quality-related issues.

Overcrowding: Twenty two percent of occupied units are estimated to be either overcrowded (11%) or severely overcrowded (11%). This is roughly 7 times the national average, and makes the Bering Straits region the third most overcrowded ANCSA region in the state.

Exhibit 2-3: Comparison of % of Houses Overcrowded



Affordability: According to American Community Survey (ACS) data, approximately 24% of households in the Bering Straits Native Corporation region spend 30% or more of total income on reported housing costs, including rent, water and sewer utilities, and energy costs. Using AKWarm estimates, the average annual energy costs constitute 15% of census median area income for occupied housing.

Housing Agencies

The Bering Straits Regional Housing Authority (BSRHA), headquartered in Nome, Alaska, is a primary service provider of affordable housing projects including new construction, modernization, rehabilitation and weatherization of current homes, and the acquisition of homes throughout the Bering Straits Region. Currently they have an inventory of over 400 units in 17 villages.

2.2.1 Economy

The Bering Strait Region is a sparsely populated, geographically dispersed region with many small remote communities whose cash employment opportunities are limited. Year-round jobs are primarily limited to the School District, Norton Sound Health Corporation, city and tribal employment, Kawerak, transportation services and retail sales. Most communities have part-time or seasonal jobs (such as construction or firefighting) and unemployment is high. Although cash employment opportunities are limited, residents have a robust subsistence economy.

Nome is the regional hub that acts as the supply, service and transportation center of the Bering Strait Region. Funding from local, state and federal government agencies provides approximately 40% of the employee wages in Nome. Other employment opportunities occur in tourism, retail, legal, medical, construction, transportation, fishing and mining.

Low educational attainment levels and limited job opportunities have contributed to high unemployment levels in rural parts of Alaska including the Bering Strait region. One means of determining poverty levels in the region is through the Denali Commission's Distressed Community List. Eleven of the 16 communities in the region meet the criteria for distressed community status. Not meeting the criteria for distressed community are Golovin, Nome and Unalakleet. [7] The price of energy in the region impacts the economy directly and is an important factor in business decisions. High fuel prices cause transportation costs to rise which can limit economic growth.

2.3 Energy Use

2.3.1 Electricity

Residents in the Bering Strait region use diesel fuel to generate electricity. Residential uses include lighting, appliances, consumer electronics, and water heating. Cities' uses include lighting and electronics for city buildings, street lighting, municipal water, and washers and dryers at the washeteria. Schools are the largest electricity user in most villages. Schools use power for classroom electronics, ventilation equipment and lighting, electric ovens and stoves.

The cost of electricity production varies from a low of $0.50 per kWh to a high of $0.65 per kWh in the region. [8] The costs to residents are offset by the AEA's Power Cost Equalization (PCE) program which provides economic assistance to residential customers in rural areas of Alaska where the kilowatt-hour charge for electricity can be three to five times higher than the charge in more urban areas of the state.[9]

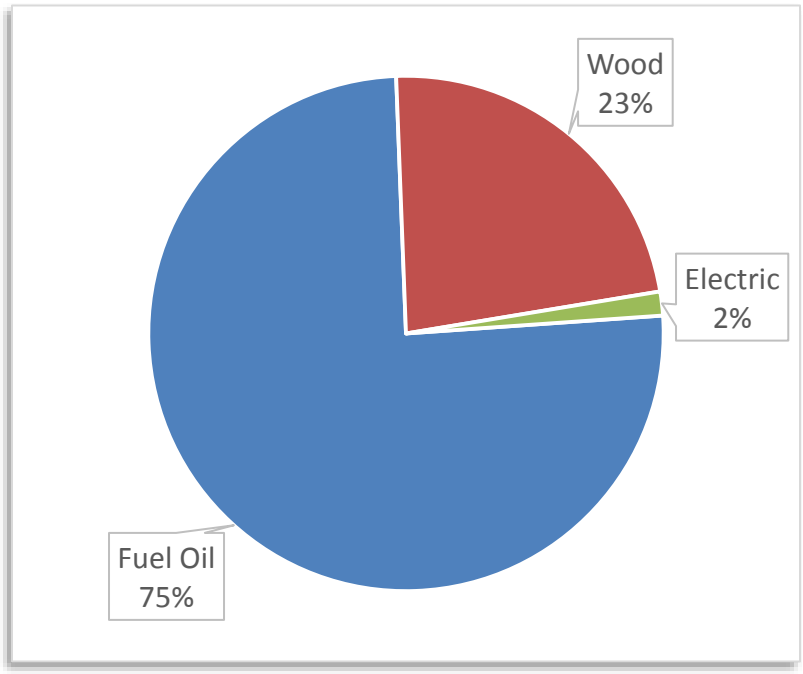
Power utility companies include Nome Joint Utilities, Diomede Electrical Utilities, Golovin Power Utilities, White Mountain Utilities, Unalakleet Valley Electrical Cooperative and AVEC.

2.3.2 Heat

Space heating is the most fuel intensive activity in the region. The majority of housing units in the Bering Straits region use fuel oil for space heating. This is especially the case in Nome, the region's largest community, where 95% of space heating needs are met with fuel oil. Some communities rely, in part, on nearby wood resources (driftwood and spruce) to heat their homes in the region. Wood fuel is generally used more to supplement fuel oil as evidenced by a 23% usage of wood fuel for space heating region-wide. [10] Exhibit 2-4: Percent Space Heating Energy Used by Fuel Type in Bering Strait Region illustrates the type of fuel in the region used for heating.

[7] Kawerak, Bering Strait Comprehensive Economic Development Strategy 2013-2018, July 2013.
[8] Alaska Energy Authority, Power Cost Equalization Report, 2013.
[9] Alaska Energy Authority, http://www.akenergyauthority.org/programspce.html
[10] Alaska Housing Finance Corporation, 2014 Alaska Housing Assessment, Bering Straits Region, 2014

Exhibit 2-4: Percent Space Heating Energy Used by Fuel Type in Bering Strait Region



Source: AHFC 2014 Alaska Housing Assessment

The price of heating fuel varies considerably from village to village. It depends on many things including the village's credit worthiness, the amount and cost of fuel already in the village's bulk storage tanks, whether or not the village was able to take advantage of a multi-village bulk purchase effort, and on the timing of the village's fuel purchase.

Villages typically purchase bulk heating fuel during the summer; a time when world petroleum prices are high. Village harbors are generally shallow and not equipped to safely accommodate larger barges; fuel is shipped to Nome and then transferred to smaller craft for delivery. In the village, fuel is transferred from bulk tanks to smaller storage tanks at residences, businesses, and community facilities. Each time fuel is moved a surcharge is added to the costs. By the time it reaches its destination, regardless of the price of fuel on world markets, heating fuel is expensive in the Bering Strait region.

2.3.3 Propane

Propane is more efficient than diesel, but the cost to transport propane into the Bering Strait communities remains high and is its use in the region has declined. There are many advantages to propane over diesel such as the following:

- Propane and natural gas can be used in many of the same appliances and facilities, without major modifications.
- Propane condenses to a liquid under relatively little pressure, so it can be transported more easily by truck or barge than natural gas.

- Propane reverts to a gas when released from pressure, so spills are not a problem, as they are with fuel oil.
- Propane burns cleaner than fuel oil

Disadvantages of propane are that it takes more space to transport and store than an equivalent amount of energy in fuel oil. That's because liquid propane produces less energy, per gallon, than fuel oil (132,000 Btu/gal versus 92,000 Btu/gal). Propane requires pressurized storage tanks, and more of them. Another disadvantage is that because propane is heavier than air, it can be a fire threat if accidentally released. Residential propane tanks and lines need to be well-insulated from the cold, because at very cold temperatures, propane turns from gas to liquid —meaning whatever was fueled by the propane would stop working.

Indicates the costs of propane per 100 pounds and how much household use there is in the community if known.

Table 2-4: Propane Use and Costs in Bering Straits Communities

COMMUNITY	COST (100#)	HOUSEHOLD USAGE
Brevig Mission	$284.69	15 Households
Diomede	Unknown	Unknown
Elim	$290.00	Unknown
Gambell	$383.00	50 bottles a year
Golovin	$350.00	Unknown
Koyuk	$346.25	Unknown
Nome-Bonanza	$194.25	To local households
Nome-Crowley	$187.95	Bulk to village Native Stores
St. Michael	$214.00	25 Households
Savoonga	$391.00	Unknown
Shishmaref	$387.00	Unknown
Shaktoolik	$358.80	Unknown
Stebbins	$214.00	25 Households
Teller	$300.00	Unknown
Unalakleet	$299.25	Unknown
Wales	$350.00	8 bottles / year
White Mountain	$378.75	all but 8 Households

Source: Kawerak phone survey, July, 2013

2.3.4 Diesel Fuel

Because of the cost of transporting and storing diesel fuel in the remote locations of Bering Straits, retail fuel costs are very high creating correspondingly high electricity prices. Rising fuel costs impacts are magnified if one considers the additional costs associated with the limited logistical options for bulk fuel shipping, the poor economies of scale in fuel transportation, power generation and distribution, and

possible reduction and/or elimination of Alaska's Power Cost Equalization (PCE) program and the Community Revenue Sharing programs.

Many rural bulk fuel tank farms were constructed more than 20 years ago and are in poor condition. The most common problems are the piping systems to, from and within the tank farms. With substantial contributions from the Denali Commission, the bulk fuel upgrades program provided funding for the design/engineering, business planning and construction management services to build code-compliant bulk fuel tank farms in rural communities.

Bering Strait communities receive fuel for heating, generation of electricity, vehicles and other uses only during summer months when coastal areas and rivers are ice free. There are fuel-buying options which offset some of the high costs of fuel in Western Alaska.

> "The Western Alaska Fuel Group (WAFG) is another buying group that negotiates the purchase of fuel for its members. Both AVEC and WAFG select the supplier of their fuel as a result of bidding. Once selected, the successful bidder enters a two- or three- year contract for supplying fuel. Contract terms generally include a cost for the fuel that is indexed to a specific market and a transportation charge. Historically, the fuel cost has been tied to a reported rack price published by the Oil Price Information Service (OPIS) for the Northwest, typically Seattle. More recently, some bids are using spot price indexes as reported in Platt's, a global company that publishes daily market data for energy resources.
>
> The Norton Sound Economic Development Council (NSEDC) also provides fuel-purchase assistance to its members….Through this program, NSEDC acts as a purchasing agent on behalf of participants by coordinating orders, issuing the request for proposals to fuel suppliers, evaluating the proposals, and awarding the contract. NSEDC staff then serves as a single point of contact between the fuel supplier and the participants."
>
> *Source: Rural Fuel Pricing in Alaska: A supplement to the 2008 attorney general's gasoline pricing investigation, February 18, 2010.*

Another bulk fuel buying option is through the Alaska Department of Commerce, Community and Economic Development's Community and Regional Affairs division. Their loan program effective January 1, 2013 is intended to assist communities, utilities, and fuel retailers purchase bulk fuel to generate power or supply the public with fuel for use in rural communities. The new program replaces bulk fuel loan programs previously administered by the Alaska Energy Authority (AEA) and DCRA.

2.3.5 Transportation Access

Air travel and freight transportation provide the only efficient year round access to the Bering Strait region. During the ice-free months between June and November, barges are able to deliver freight and fuel to the communites in the region. Roads outside of the community transportation network are limited and most are seasonal. There are state highways that extend north, east, and west from Nome, connecting the Taylor mining area, Council, and Teller, respectively. Other roads include a road between

Stebbins and St. Michael, Wales and Tin City, and there are roads that serve as evacuation roads from Shaktoolik and Gambell.

Figure 2-2: State highways near Nome

The Alaska Department of Transportation and Public Facilities (DOT&PF) has studied a proposed road from the Dalton Highway to Nome. The first phase would connect to Tanana. The DOT&PF is not currently planning to go beyond Tanana. Given high shipping costs to Nome by barge and air, surface access to Nome would likely reduce freight and energy costs.

The residents of the Bering Strait region use fossil fuel powered snow machines, four wheelers, and boats for subsistence hunting and fishing activities and for inter-village travel. Barge delivery of fuel and deck freight and the aviation-based bypass mail systems are critical transport services in the region. In in the summer months, Teller, Solomon and Council are connected to Nome via the state highways.

With the exception of Diomede, each community in the Bering Strait region has a year-round runway. Most runways are gravel and owned by the State of Alaska. Diomede has a concrete heliport at the edge of the village. When the sea ice becomes thick enough, the village maintains an ice runway in the strait between Little and Big Diomede Islands.

Photo 1. Ice Runway at Diomede

The limited transportation options impact costs of goods and energy as indicated in Table 2-5. This table illustrates the costs to get 2,000 pounds sent to Nome versus the villages which is generally about twice as much.

Table 2-5: Bering Strait Region Shipping Costs

	Costs to ship 2,000 pounds Via			
	Ocean Barge		Air Cargo	
	Total Cost	*Cost/Lb*	*Total Cost*	*Cost/Lb*
Anchorage to Nome	$973	$0.49	$2,164	$1.08
To Average Village	$1,496	$0.97	$4,366	$2.18

2.3.6 Water and Wastewater

Large amounts of energy are needed to operate water and wastewater systems in the Bering Straits region. Water needs to be heated with fuel oil and kept constantly circulated with electric pumps to keep from freezing in the winter. The sewer mains and service lines are also heated during parts of the year with electrical heat trace or glycol circulation loops. As a result, energy costs associated with sewer and water utilities place a huge burden on the operator.

With the exception of teacher housing, there are no water and sewer services available in the communities of Diomede, Wales, Shishmaref, Stebbins, and Teller. Residents do laundry at the washeteria and haul water for use in their homes. In the other villages there remains several homes without water and sewer service. Buried systems use less energy than above ground systems. Table 2-6 shows the types of water and sewer systems in the communities in the region.

Table 2-6: Types of Community Water and Sewer Systems and Cost to Residents

Community	Water		Sewer		Monthly Water and Sewer Costs
Brevig Mission	Circulating	Buried	Gravity	Buried	$100
Diomede	Washeteria	None	Honey Bucket	None	
Elim	Circulating	Buried	Gravity	Buried	$68
Gambell	Circulating	Buried	Gravity	Buried	$95
Golovin	Circulating	Buried	Gravity	Buried	$160
Koyuk	Circulating	Buried	Gravity	Buried	$65
Nome	Circulating	Buried	Gravity	Buried	$80
Saint Michael	Circulating	Above Ground	Vacuum	Above Ground	$160
Savoonga	Circulating	Above Ground	Vacuum	Above Ground	$150
Shaktoolik	Circulating	Buried	Gravity	Buried	$60
Shishmaref	Community Haul	None	Community Haul	None	-
Solomon	Individual Haul	None	Honey Bucket	None	-
Stebbins	Washeteria	None	Honey Bucket	None	-
Teller	Washeteria	None	Honey Bucket	None	-
Unalakleet	Circulating	Buried	Gravity	Buried	$65
Wales	Washeteria	None	Honey Bucket	None	-
White Mountain	Circulating	Buried	Gravity	Buried	$100

Source: Bering Strait Regional Comprehensive Economic Development Plan

3 Regional Energy Analysis

The following sections describe the potential energy resources and energy efficiency opportunities across the region and regional energy priorities.

3.1 Oil and Gas

In the 1980s, off-shore drilling in the Norton Basin was conducted. Based on this and other research the U.S. Department of the Interior does not project undiscovered crude oil resources in the basin, although small amounts of liquid condensate are inferred to be present [11] Unconventional gas potential in Bering Straits Region such as coal bed methane, tight gas sands and gas hydrates is considered low.

3.2 Coal

Coal deposits are present in the region and along a number of riverbanks the eroded remnants of coal deposits can be found among the river gravels. Generally, the coal beds are thin and low grade and often in irregularly-shaped lenses rather than lateral continuous coal seams. There is some evidence to suggest thicker layers may be present at depth on the Seward Peninsula east of the Darby Mountains.

3.3 Geothermal

Central and eastern Seward Peninsula has areas with shallow thermal waters. Known hot springs (surface temperatures greater than 122 degrees F) include Lava Creek, Clear Creek, Serpentine and Pilgrim Hot Springs. Many of the potential geothermal resources are isolated from population and not economically feasible to develop. However Pilgrim Hot Springs, located 60 road miles north of Nome, has seen a long history of drilling, mapping and feasibility studies and exploration is ongoing at that site. The Alaska Center for Energy and Power (ACEP), in collaboration with the Geophysical Institute, is testing an innovative remote sensing technique that could reduce the cost of geothermal exploration for low and moderate temperature geothermal sites around the world. By testing and verifying this technique at the Pilgrim Hot Springs site and hopefully locating the source of the geothermal water, ACEP will be able to assess the feasibility of developing this site to benefit the region and its residents.

Figure 3-1: Pilgrim Hot Springs Map

Match funding for the project has been provided by AEA through the Renewable Energy Fund. Preliminary cost estimates indicate that a transmission line from the hot springs to Nome is estimated to cost $30 million and development at the site is

[11] Minerals Management Service (MMS) 2006, Undiscovered Oil and Gas Resources, Alaska Federal Offshore: U.S. Department of the Interior Minerals Management Service Alaska OSC Region.

estimated to be another $30 million. Pilgrim Hot Springs is now owned by Unaatuq, LLC, a consortium consisting of BSNC; Sitnasuak Native Corporation; Kawerak, Inc.; Norton Sound Economic Development Corporation; White Mountain Native Corporation; Teller Native Corporation; and Mary's Igloo Native Corporation (MINC).

Other known geothermal springs include the Elim Hot Springs or Kwiniuk Hot Springs, located approximately eight miles directly inland from the community, and Clear Creek Hot Springs located approximately 15 miles northwest of the community.

3.4 Hydroelectric

Hydroelectric power does not pose significant opportunities in the Bering Strait Region. Utility grade hydroelectric requires a significant change in elevation; most of this region is relatively flat. Additionally, rivers in this region are frozen solid much of the time; for these reasons and others the region is generally not well suited for hydroelectric. A pre-reconnaissance evaluation was completed in 1982 for a hydroelectric project in the Elim Area. It concluded that the potential is limited due to either flat stream gradients or marginal water supply.

3.5 Biomass

Alaska's primary biomass fuels are wood, sawmill wastes, fish byproducts, and municipal waste. In the Bering Strait region, wood, driftwood and fish oil are the most prevalent biomass resources. Biomass is a viable energy source in several communities in the Bering Strait including Elim, Golovin, Nome, Shaktoolik, Saint Michael, Stebbins, Teller, Unalakleet, and White Mountain. Wood stoves are already installed in many of the homes and when fuel oil is expensive, residents have historically found it cost effective to gather and burn wood to heat their homes.

Although no official inventory has been done, there are regional wood resources in the driftwood from the Yukon River. Fishermen confirm that some years, this driftwood can clog portions of Norton Sound and create a hazard to navigation in the spring. Large amounts wash up along the Seward Peninsula with each big storm. However, in some communities, such as Shaktoolik, the driftwood provides a breakwater that reduces erosion to the community and according to their hazard mitigation plan should be left in place.

Carefully planned harvesting of wood is needed to have a sustainable woody biomass project. Funding ($50,000) is available through the Department of Natural Resources to prepare forest stewardship plans. To date this funding has not been applied for and no forest stewardship plan has been completed for the region.

One of the primary monetary benefits of using biomass as a fuel source is that the money spent on heating fuel will remain in the local economy. This will promote economic sustainability in communities that have struggled to maintain healthy local economies. In addition, using biomass for heat will stabilize heat energy costs with future costs rising much less than projected oil costs. Other benefits of using wood as an energy resource include that it can provide wildfire mitigation, cause a reduction in fuel spills and navigation hazards and enhance wildlife habitat if managed correctly.

Challenges of biomass include:

- Lack of access to the wood resource;
- Harvested wood takes time to cure;
- Requires planning and management of resources;
- Permission is needed to cut wood;
- Driftwood may be saltwater saturated presenting additional challenges; and
- Space must be allocated for boiler, wood processing, and resource storage.

In Elim, ANTHC recently installed a Garn cordwood boiler to offset heating costs at the water treatment plant. The project will enable Elim to utilize locally available wood resources to offset an average of 4,000 gallons of fuel per year and reduce the water utility's operating costs by over $12,000 annually[12]. One of the advantages of this system is that money spent on wood stays in the community. ANTHC reports that, if used correctly, this boiler could provide all the energy needed to heat and circulate water. However, it is important to realize that it is not like a residential wood stove. Logs must be split for short, clean, hot burns rather than the slower sustained burn achieved with whole logs in a wood stove. These short burns only need to occur about three times a day. Additional operator training may be needed to optimize the process. ANTHC staff reports that the system is liked by most and other water treatment plants and other infrastructure should be considered for similar projects.

Wood pellet manufacture in increasing in Alaska, with both small and large scale operations in place in the state. The largest facility, Superior Pellets of North Pole has an estimated production capacity of 30,000 tons per year. A group of individuals have expressed interest in developing wood pellet accessibility and distribution in Nome. As there are currently no local sources of pellets in the Bering Strait Region, the group is evaluating shipping costs and bulk orders from elsewhere in Alaska and the lower 48. It is unknown whether the group will pursue a cooperative or for-profit business model in the future.

3.6 Wind

The Bering Strait Region has abundant wind resources available for energy development. Costs associated with fossil fuel-based generation and improvements in wind power technology make this clean, renewable energy source attractive to primarily the coastal communities where strong winds prevail. Several communities in the region already have wind systems constructed and others are being assessed for feasibility as shown in Table 3-1.

The quality of a wind resource is key to determining the feasibility of a wind project. But other important factors to consider include the size of a community's electrical load, the price of displaced

[12] Hanssen, Eric, LCDR, P.E., LEED AP. "Energy Efficiency in the Arctic: ANTHC Engineers Reduce Energy Costs for Rural Alaskan Communities." Machinatores Vitae: United States Public Health Service Engineer and Architect Newsletter, July 2012: 4-9.

fuel such as diesel, turbine foundation costs, the length of transmission lines, and other site-specific variables. Potential wind power is rated on a scale of one to seven with seven being strongest. [13]

Each of the communities in the Bering Strait region that has been rated for wind potential has a Wind Power Class of 3-7 indicating a high potential for wind power in the region. Table 3-1 lists the communities and their power class ratings along with the best potential wind areas identified.

Table 3-1: Bering Strait Region Community Wind Power Class Ratings

Community	Estimated Wind Power Class (Location)	Project and Status (if any)
Brevig Mission	7 (Port Clarence)	Wind Study identified
Diomede	7 (Area wide)	Wind Study identified
Elim	6 (Hill 744), 4 (more easily accessed western ridge)	Feasibility study (2013)
Gambell	7 (Airport)	AEA and AVEC constructed 3-turbine 300KW system. (2010)
Golovin	6 (Point 712), 4 (ridge east of town), 3+ (Airport)	Met Tower pending
Koyuk	5 (Hill 418 four miles SW), 4 (Hill 408 four miles NE of town)	Feasibility study on hold
Nome	7 (Newton Peak), 6 (Banner, Anvil and Newton Peaks)	Constructed 18-turbine, 2.97 MW system, plus intertie. (2010, 2012) 2 additional turbines two EWT 900 Kilowatt units installed in 2013
Saint Michael	6 (Saint Michael Mountain), 4 (1.5 miles NW)	Wind resource conceptual design currently underway for site 1.5 miles NE of Stebbins on rd. to St. Michael.(2013)
Savoonga	6, 5 (Airport)	AEA and AVEC constructed 2-turbine 200KW system. (2008)
Shaktoolik	4 (one mile NW), 3 (in town)	AEA and AVEC constructed 2-turbine 200KW system. (2012). Native Store has 3 Skystreams.
Shishmaref	5 (1.5 miles SW), 4 (Airport)	Wind resource study proposed
Stebbins	6 (one mile N at Cape Stephens, one mile S at Hill 225)	Wind resource conceptual design currently underway for site 1.5 miles NE of Stebbins on rd. to St. Michael (2013)
Teller	6 (Hill 519 3.5 miles SW, also along the road to Nome at 700 feet elevation about 7 miles S of town.	Wind resource study currently underway (2013)
Unalakleet	4 (Airport)	AEA and Unalakleet Valley Electric Cooperative constructed a 6-turbine system, with boiler and heat recovery loop. (2009)
Wales	7 (much of region)	AEA and Kotzebue Electric constructed 2-turbine system with battery storage. (1998, currently being dismantled)
White Mtn.	3 (Hill 396, E of town)	MET Tower Pending

[13] Alaska Energy Authority. *2011 Power Cost Equalization Data.* Anchorage: State of Alaska, 2012.

One identified potential project was a combined wind power project for Stebbins and Saint Michael, with the turbines to be located at Saint Michael Mountain. It is anticipated that wind power generation will reduce fuel needs for power generation. The USFWS has determined that turbines generally should be located 1/2 mile from the ocean and ¼ to ½ mile (1/2 mile preferred) from a raptor nest to avoid bird impacts. A consultation early in the process with USFWS could be beneficial. A Federal Aviation Administration (FAA) permit is also required to avoid potential airspace conflicts.

3.7 Solar

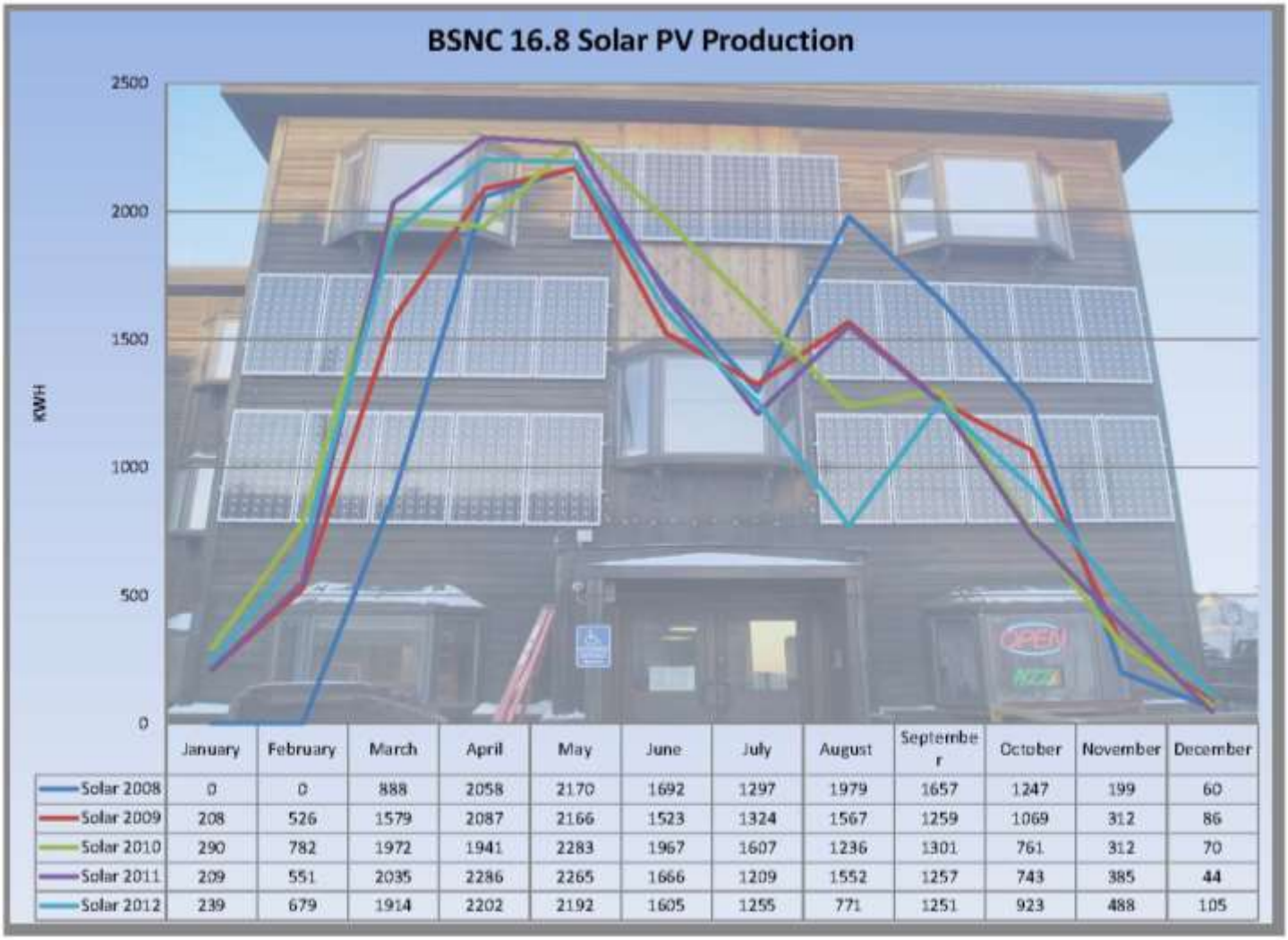
Solar technologies such as photovoltaic and solar thermal heating systems are well-established and proven in many applications world-wide and have recently become a reliable source of power in many arctic and sub-arctic communities in Alaska. Solar energy can tap both direct and reflected sunlight. This makes April the most productive time of year for solar collection, even though days are longer in the summer. Insolation is a measure of the amount of solar radiation received on a given surface area. Most of the communities in the Bering Strait region have an Annual Average Solar Insolation of less than 3.5 kWh/m^2/day. (BSDC)

"Solar thermal" heating systems use pumps or fans to move energy to a point of use and are generally used for small projects such as domestic hot water. A larger role for solar thermal hot water systems is emerging as advances in heating systems allow solar-heated fluid to supply in-floor systems currently heated by conventional fuel boilers.

A solar PV heating project is underway in Nome.[14] In 2008, solar collectors were installed on the BSNC office building to provide 16.8 kW of power displacing 1,000 gallons of diesel fuel per year. BSNC has also installed solar water heaters for two of their apartment buildings. Nome is experimenting with the use of evacuated tube solar collectors which, in Nome's climate, are more efficient and more cost effective than panels. The following exhibit shows five years of Solar PV production at the BSNC office building. It shows a spike in Solar PV production in the late winter and early spring months when the sun returns and the air temperature is cool.

[14] (Alaska Energy Authority 2011)

Exhibit 3-1: Solar PV Production at Bering Strait Native Corporation Office Building



	January	February	March	April	May	June	July	August	September	October	November	December
Solar 2008	0	0	888	2058	2170	1692	1297	1979	1657	1247	199	60
Solar 2009	208	526	1579	2087	2166	1523	1324	1567	1259	1069	312	86
Solar 2010	290	782	1972	1941	2283	1967	1607	1236	1301	761	312	70
Solar 2011	209	551	2035	2286	2265	1666	1209	1552	1257	743	385	44
Solar 2012	239	679	1914	2202	2192	1605	1255	771	1251	923	488	105

Source: Robert Bensin, Bering Strait Development Company

In 2013 a pilot solar project was completed in Ambler in the Northwest Arctic Borough. The project included the installation of a solar array to power the water plant and sewer system. On sunny days the utilities are wholly powered by solar generated electricity. In March, production was about 800 kWh per month providing an estimated savings of $6,500 to $7,500 a month off the operation of the plant, offsetting approximately 750 gallons of fuel. For a lifetime of about 25 years, it will give a savings of a minimum $230,000 and an

Ambler pilot solar project

offset of 27,000 gallons of fuel. At a cost of $75,000 the payback for the solar array system is 11.4 years[15].

The UAF Chukchi Campus in Kotzebue operates a solar array for power generation. It has produced 1.02 megawatt hours of energy in the first four months of 2013. In April alone, the solar production was 597 kWh. These pilot projects may open the door to further solar projects in the Bering Strait Region.

3.8 Other

Another potential power source in Alaska is Ocean and River Hydrokinetic. Alaska's long coastline and extensive river networks provide potential to meet some of the state's energy needs. Ocean and river energy projects convert the kinetic energy of the moving water into electricity via hydrokinetic devices. Hydrokinetic power is supplied by tidal waters, waves, and river flow.[16]

There is a potential hydrokinetic resource in the channel between Brevig and Teller. In 2011, AVEC did bathymetric surveys as part of other research in the area and discovered bottom scouring from ice. AVEC chose not to go further with the project because of the difficulty of finding a weather window suitably long enough to complete their work. Brevig Mission or Teller could apply for a permit and go forward with the project; however, residents fear that the hydrokinetic devices may interfere with subsistence activities.

3.9 Energy Efficiency

Energy efficiency plays a critical role in decreasing energy costs. Particularly In the arctic regions, energy efficiency is important in order to get the most benefit while expending the fewest resources. Improving the energy efficiency of structures saves money, conserves fuel and materials, and reduces pollution.

There are several weatherization and energy efficiency programs available to rural Alaska residents including the following:

- Housing Authority Weatherization (AHFC Service Providers – i.e. Bering Straits Regional Housing Authority) – combined state and federal dollars used to provide weatherization to residential homes in Alaska. This is an income based program.

Energy Efficiency for Regional Planning

…The benefits of efficiency are many; reduced capital costs by not overbuilding energy generation systems, reduced annual operating and resource costs by not generating more energy than a community actually needs, decreased impact of emissions associated with the non-renewable resources, and increased comfort and control in buildings.

AEA Regional Planning Methodology Guidelines

[15] Ambler Water Treatment Plant statistics may be accessed at https://easyview.auroravision.net/easyview/index.html?entityId=1311617

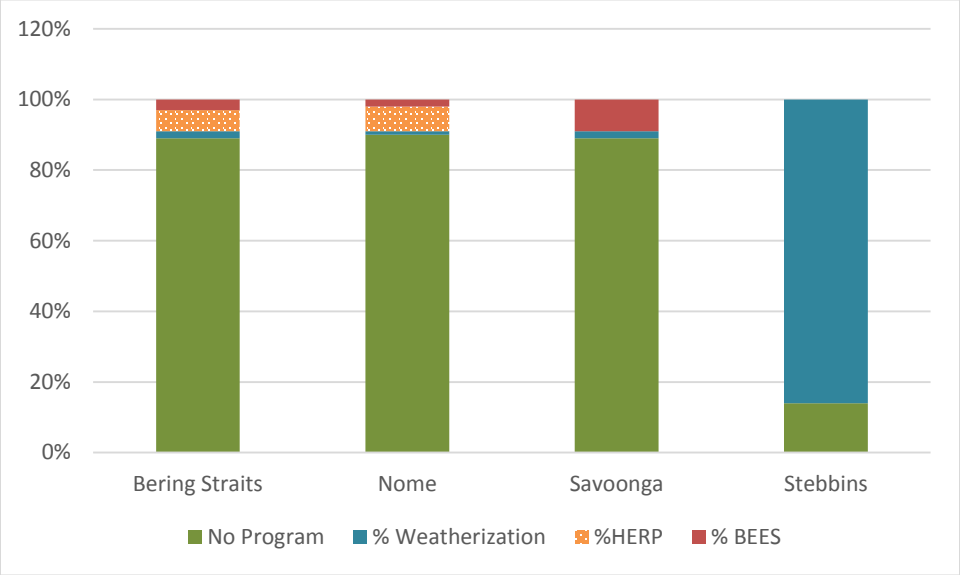
[16] Triplett, Barbara. "Ocean and River Energy." Update: Alternative Energy & Energy Efficiency, Summer 2011: 1.

- RurAL CAP Weatherization – homes weatherized by AHFC service providers do not qualify. These are both private and federal funds. Like the Housing Authority Weatherization program, this is an income based program.
- RurAL CAP Energy Wise –no income restrictions. This program provides education on behavior change and energy-efficiency.
- AHFC Home Energy Rebate Program – State of Alaska funded program that reimburses homeowners when energy-efficiency ratings are improved and energy conservation projects are completed. The program has no income restrictions. Participants cannot participate in both the Weatherization and Home Energy Rebate Programs.
- AHFC New Home Efficiency Rebate Program – for new construction. No income restrictions. This is a loan reduction program.
- AKEnergySmart Curriculum http://www.akenergysmart.org/ is an educational tool available through a collaboration from AHFC, Renewable Energy Alaska Project (REAP) and Alaska Center for Energy and Power (ACEP).

There have been several energy audits and energy efficiency improvement programs that were implemented in the past 10 years including investment grade energy audits by AHFC, and energy audits in public buildings through the State of Alaska or the U.S. Department of Energy's Energy Efficiency Community Development Block Grant program . This resulted in energy audits throughout the Bering Straits Region.

According to AHFC, approximately 10% of housing units in the Bering Straits region have participated in the Weatherization or Home Energy Rebate program, or have received BEES certification since 2008. The Bering Straits region has the second lowest participation of all the regions with approximately 6% of housing units in the region completing the Home Energy Rebate or Weatherization programs, with an additional 3% certified to meet BEES. Participation varies widely by community, from an estimated zero housing units in Gambell participating to a high of 86% of housing units in Stebbins completing one of the programs. The highest participation in the BEES program occurred in Savoonga where 8% of homes have been certified to meet BEES. Regionally, only 1% of housing units have participated in the Home Energy Rebate Program. The Weatherization program has varying levels of participation by community, from an estimated 0% participation in Savoonga to a high of 86% in Stebbins completing a weatherization retrofit. Exhibit 3-2 illustrates the percentage of occupied housing that completed an energy efficiency energy program such as weatherization, Home Energy Rebate Program and the Building Energy Efficiency program and the percentage of homes that did not benefit from those programs.

Exhibit 3-2: Percent of Occupied Housing Completing Energy Program



Source: AHFC 2014 Housing Assessment

3.9.1 Weatherization

AHFC administers weatherization programs that have been created to award grants to non-profit organizations for the purpose of improving the energy efficiency of low-income homes statewide. These programs also provide training and technical assistance in the area of housing energy efficiency. Funds for these programs come from the U.S. Department of Energy as well as AHFC; however, state money makes up the bulk of the funding (Weatherization Programs 2013).

The focus of weatherization is to increase the energy efficiency, safety, comfort and life expectancy of the homes. Typical improvements include the caulking and sealing of windows and doors, adding insulation to walls, floors and ceilings, and improving the efficiency of heating systems. By making homes more energy-efficient, families spend less for heating, freeing up more household income for other basic necessities and expenditures which help support local economies[17].

3.9.2 Benchmarking

Using American Recovery & Reinvestment Act (ARRA) funds through the State Energy Program, the AHFC conducted an extensive benchmarking program that included 1,200 public facilities statewide including several in the Bering Strait region. By benchmarking a facility, owners and managers can identify trends in a building's energy use and compare use and operating costs to other buildings. Also

[17] Weatherization Services. n.d. http://www.ruralcap.com/index.php?option=com_content&view=article&id=170&Itemid=85 (accessed January 10, 2013).

by benchmarking, facility owners become more aware of how their decisions on design, construction and operations dramatically affect energy usage and costs throughout the life of the building. In 2011 and 2012 AHFC also funded 327 audits statewide using ARRA funds through the State Energy Program.

In the Bering Strait Region, AHFC conducted audits primarily on schools and a few other public buildings as shown in Table 3-2.

Table 3-2: AHFC Energy Audits in the Bering Strait Region

School Audits	Brevig Mission, Gambell , Elim, Teller, Koyuk, Shaktoolik, Savoonga, Shishmaref, Stebbins, Unalakleet and Unalakleet School office building, and Wales
Nome Public Building Audits	City Hall, Recreation Center, Public Works building, Volunteer Fire Station, Icy View Fire Station

3.9.3 Water and Wastewater Improvements

The Alaska Native Tribal Health Consortium (ANTHC), Division of Health and Engineering also has an active program to increase energy efficiency focusing on decreasing energy costs in the water and wastewater systems, which have a great potential for energy efficiency improvements. Communities with above ground systems experience the greatest heat loss and are the most inefficient. In 2009, ANTHC formed the Energy Projects Group to help address energy sanitation issues in rural Alaska.

According to Alaska Native Tribal Health Consortium (ANTHC) sanitation systems account for between 10-35% of a community's total energy use (Gavin Dixon, 2013). According to recent studies done nearby in the Northwest Arctic, electric energy makes up approximately 30 to 33 percent of the annual utilities energy requirement, while heating requirements account for the remaining 67 to 70 percent of the load (Mitchell, 2013). Improvements can be made to insure reliability and to reduce energy use. Significant energy savings can occur through the capture of waste heat, incorporating the use of alternative energy and carefully calibrating the operating system, such as operating pressures and temperatures and pumping flow rates.

In the Bering Strait Region, ANTHC has conducted energy audits for public buildings particularly in the water treatment plants and health clinics. They have also completed heat recovery studies to identify opportunities to capture waste heat, and thus reduce energy costs, and have successfully applied for funding and completed several energy projects in the region including heat recovery projects. A list of the Heat Recovery and Energy Audits are shown in Table 3-2. Each community facility audited has a detailed energy improvement plan with the most cost effective interventions recommended. In general the audits revealed poor insulation, inadequate sealing of doors and windows and lack of energy efficient lighting.

Table 3-2: ANTHC Heat Recovery Study and Energy Audit Status

Community	Heat Recovery Study	Energy Audit
Brevig Mission	X	

Community	Heat Recovery Study	Energy Audit
Savoonga	X	Water Treatment Plant
Shaktoolik		Tribal Office
		Health Clinic
		Water Treatment Plant
Shishmaref	X	
Stebbins	X	
Teller		Water Treatment Plant
		Health Clinic
White Mtn.	X	

In Saint Michael, ARUC is completing installation of energy saving boilers, electrical upgrades, and vacuum sewer pumps. They have recently applied for AEA money for a recovered heat system in Savoonga which, when installed, is estimated to save 8,800 gallons of fuel per year. In Golovin, a brand new water treatment plant is under construction along with a new piped water system for half the town. After construction of the new water plant, energy saving projects there will be assessed.

3.9.4 Village Energy Efficiency Program (VEEP)

The AEA received authorization from the State of Alaska to Establish the Village Energy Efficiency Program (VEEP) under AS 44.83.080. Title 3 of the Alaska Administrative Code, 3AAC 108.400 - 3AAC 108.499 shows the regulations for this program. In the 2014 funding cycle, the state Legislature made $900,000 available for small, high-energy cost communities to implement energy efficiency and conservation measures in their public buildings and facilities. Eligible applicants include municipalities, cities, school districts, unincorporated villages, Alaska Native regional and village corporations, 501(c)3 tribal consortiums, regional housing authorities and traditional councils.

3.10 Regional Energy Priorities

The following table contains regional energy priorities. Local energy projects are identified in the contained in the next chapter. The regional projects were identified through capital projects lists and discussions with utility operators, AEA and stakeholders. They are broken down into the following time tables:

- Immediate projects which are currently underway or expected to begin in the next 12 months,
- Short range, expected to start within 1-5 years,
- Medium range projects expected to take place between 5-10 years, and
- Long range projects which are expected to occur beyond 10 years and can be more speculative in nature.

Table 3-3: Regional Energy Priorities

Time frame	Project	Estimated Costs
Data Collection		

Immediate 0-1 year	▪ Seek funding for Energy Audits –residential, public and commercial buildings	$5,000 per grant
Short 1-5 years	▪ Collect community wide energy end use data for electricity and space heating	$15k per Community
Medium 5-10 years	▪ Complete Energy Audits –residential, public and commercial buildings	Varies
Training and Education		
Short 1-5 years	▪ Implement K-12 Alaska Smart Energy curriculum.	Unknown
	▪ Conduct grant training specific to energy projects.	Approx. $5,000 class
	▪ Provide training to prepare workforce for near term jobs in the energy sector and to improve operator knowledge to operate energy systems more efficiently	Approx. $2,500-$10,000/class
	▪ Conduct Village Energy Planning workshops	$5k per Community
Collaboration		
Immediate 0-1 year	▪ Collaborate with regulatory agencies to overcome energy project development hurdles	N/A
	▪ Participate in discussions regarding long term projects that could benefit energy users such as Western Access Road, Natural Gas pipeline, Nome Regional Port, etc.	N/A
	▪ Maintain an on-going dialogue with higher education institutions and agencies regarding potential pilot energy projects	N/A
Energy Efficiency		
Immediate 0-1 year	▪ Replace street lights with LED street lights	$5k per Community for inventory
	▪ Seek funding for an appliance replacement program	$5,000 per grant
	▪ Encourage use of 'green', climate appropriate, building technology in all new construction including schools and housing.	N/A
Medium 5-10 years	▪ Complete Energy Audits –residential, public and commercial buildings	Varies

Maintenance and Operations

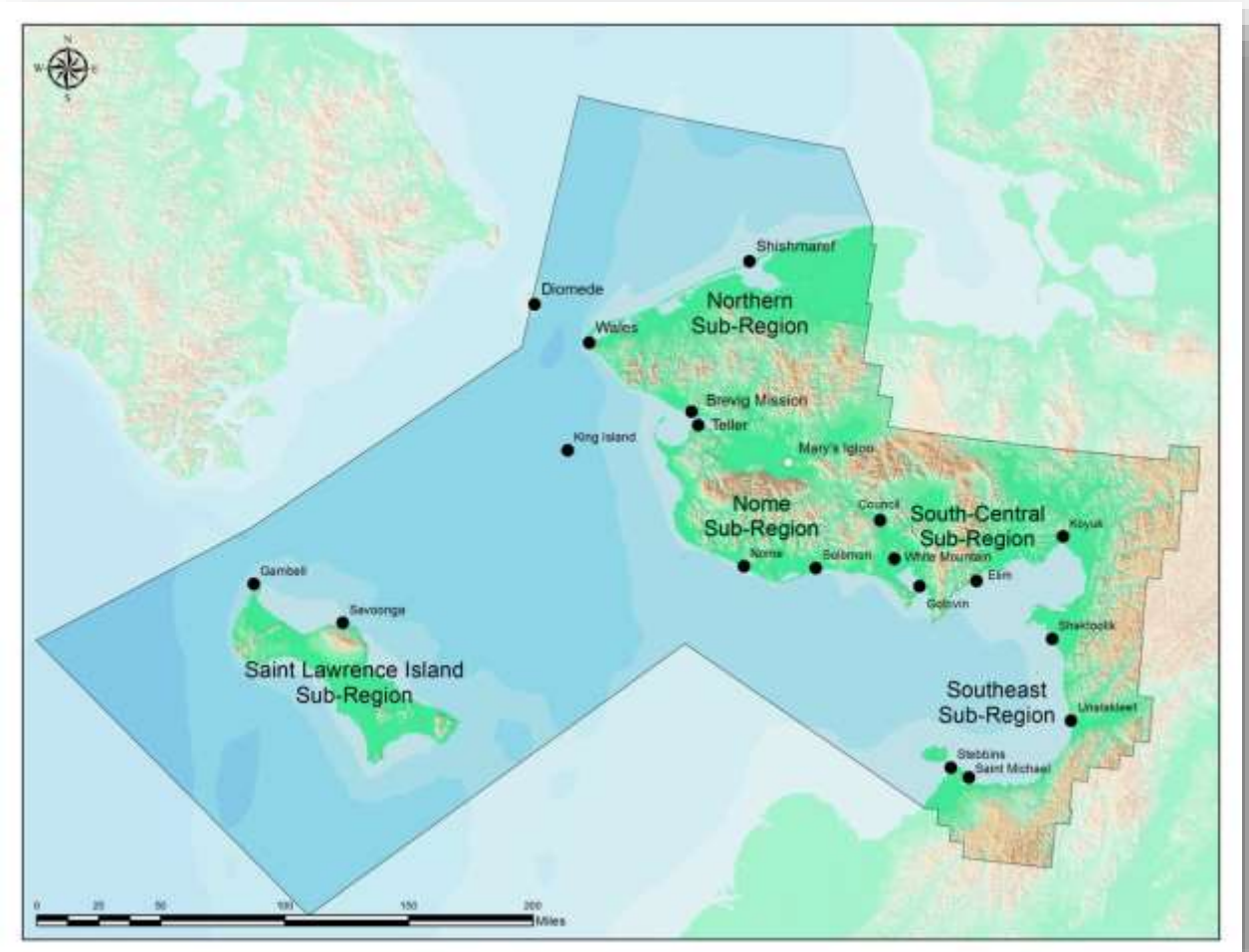
Immediate 0-1 year	▪ Train employees for new systems, including water and sewer, housing and power generation. ▪	▪ TBD
Energy Infrastructure		
	▪ Upgrade fuel tanks for safety and capacity.	
	▪ Perform upgrades to power generation systems throughout the region.	
	▪ Invest in wind generation and solar power wherever feasible.	
	▪ Upgrade village power distribution grids.	
	▪ Upgrade electric metering.	
	▪ Upgrade fuel heater containments.	
	▪ Upgrade to more efficient street lighting across the region.	
Long >10 years	▪	
Planning		
Immediate 0-1 year	▪ Adopt an energy element into the local and regional comprehensive plans.	TBD
	▪	TBD
Medium 5-10 years	▪ Update the Bering Strait Regional Energy Plan on a regular basis.	TBD
	▪	TBD

4 Community Sub-Regional Summaries

The Bering Strait Region has sixteen communities occupied year round and is divided into five sub-regions that coincide with the sub-regions used by Bering Straits Development Council and Kawerak Incorporated. Most of the communities do not have interconnected energy systems, but some of the communities in the sub-regions can be considered energy clusters because of potential or existing interties and similar energy resources.

The sub-regions include the Northern, South-central, Southeast, Saint Lawrence Island and Nome sub-regions. The communities within each sub-region are described below and shown in the overview map in Figure 4-1.

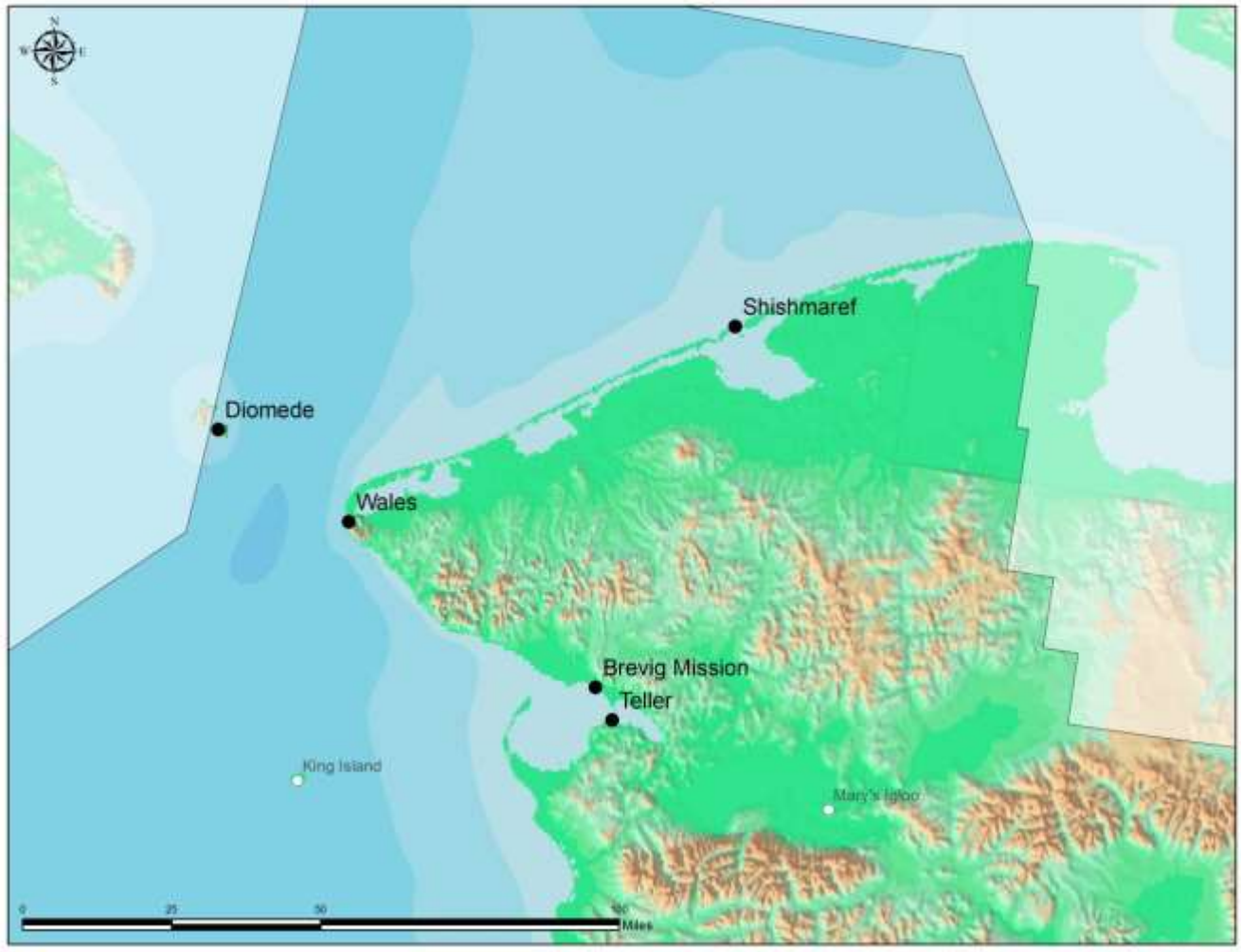
Figure 4-1: Bering Strait Region, Sub-Regions and Communities



4.1 Northern Sub-Region Profile

The Northern Sub-Region includes Brevig Mission, Diomede, Shishmaref, Teller and Wales. The 2010 U.S. Census reports a total population of 1,440. Teller is 57 miles from Nome and is connected to Nome by road from about June through November. Diomede is located on the island of Little Diomede located 80 miles northwest of Teller and 130 miles northwest of Nome. Figure 4-2 shows the communities in the Northern sub-region.

Figure 4-2: Northern Sub-Region



Brevig Mission

Community and Energy Profile

COMMUNITY PROFILE - Brevig Mission

Location: Brevig Mission is located at the mouth of Shelman Creek on Port Clarence, 5 miles northwest of Teller and 65 miles northwest of Nome.

Longitude/Latitude: -166 27'56.6"/65 19' 52"

ANCSA Region: Bering Straits Native Corporation

AEA Region: Bering Strait

Cultural Resources: Brevig Mission is predominantly Inupiat Eskimo with a subsistence lifestyle.

Alaskan Native Name and Definition: N/A

Incorporation: 2nd Class City, 1969

Elevation: 38.1'

Historical Setting: A Lutheran mission was constructed at the present site in 1900, and the village became known as "Teller Mission. In 1903, the Brevig Mission post office was established, named after the Rev. T.L. Brevig, an early pastor at the mission. Reindeer were the economic base of this community until 1974.

Community Plans: Bering Strait Comprehensive Economic Development Strategy 2013-2018, Brevig Mission Local Economic Development Plan 2007-2012, Local Economic Development Plan 2004, Brevig Mission Land Use and Capital Plan 2003

Economy: The people of Brevig Mission subsist upon fish, moose, reindeer, seal, walrus, and beluga whales. Primary employers are the city and school district. Year-round jobs are scarce, unemployment is high, and seasonal jobs limited. Arts and crafts provide some cash income. 153 residents employed: 53 in private sector, 98 in local government, and 2 in state government.

Local Contacts

City of : City of Brevig Mission, PO Box 100, Brevig Mission, AK 99785; Phone: 907-642-3051; Fax: 907-642-2194; Email: mayor_kts@yahoo.com

Tribal: Native Village of Brevig Mission; P.O. Box 85039; Brevig Mission, AK 99785; Phone: 907-642-4301, Fax: 907-642-2099, Email: tc.kts@kawerak.org

Demographics

	2000	2010		2000	2010
Total Population	276	388	Median Household Income	21,875	34,375
Median Age of Total Population	19.6	22	Rate of Unemployment	46.4	32.9%
Average Household Size	4.06	5	Total Number of Occupied Housing Units	68	93

Infrastructure

	Description	Notes
Housing	76 dwelling units, 5 individuals/household	Bering Straits Regional Housing Authority
Water/Wastewater	Above ground circulating water system, 2 underground wells. Water treated and stored in 100,000-gallon tank at Washeteria. Gravity buried sewer system and honey bucket haul.	Water is piped into the school from the city's water mains. Water tank filled monthly.
Power Generation	Alaska Village Electric Cooperative (AVEC)	Diesel Powered
Landfill	Brevig Mission 2 Mile southeast Landfill, Class 3, permitted	
Access	Brevig Mission Airport—gravel runway, cargo barge visits annually.	Teller 5 minutes by boat. State maintains 72 mile road from Teller to Nome in summer.

Non-Residential Buildings and Facilities Energy Information – (21 buildings)

Name	Notes	Name	Notes
DOT shop		Mechanical Building	
Lutheran Church		Multipurpose Building	
Brevig Mission K-12 School	AHFC Audit/2012	Other Garage	
Store		Portable Storage	
City office		School Garage	
Clinic		W&S Camp	
Community Hall		Storage Building BIA	
Garage		Storage Building	
Voc Ed Wood Shop		Voc Ed Metal Shop	
VPO Office		Water Treatment Plant	

ENERGY PROFILE – Brevig Mission

Power Production

Utility owner/operator			
	Make/model	**Size**	**Condition/Hours**
Generator	Detroit/60	200	Fair
Generator	Detroit/60	325	Fair
Generator	Cat/3456	500	Excellent
Heat recovery	Y		
Alternative energy integration ready	Y		
Back Up system			
Peak electrical load	288		
Annual community load (kwh)	141		

Electrical Rates

Production cost (kwh)	.54
Residential rate	.58
Rate with pce subsidy	.19
Commercial rate	
Fuel per kwh	.27

Retail Fuel Prices

	Commercial	**Residential**	**Senior**
Diesel		3.53	N/a
Gasoline			N/a
Propane 100# tank		284.69	N/a
Coleman 16.4 oz. Disposable bottle	N/a	N/a	N/a

Alternative Energy

Source	**Potential**	**Projects**
Wind diesel	High	Wind study identified
Solar	Medium	Solar PV at water treatment plant
Coal	Low	
Hydroelectric	Low	
Geothermal	Low	
Biomass	Low	
Emerging technologies	Unknown	

Bulk Fuel Tank Farm Inventory

Tank owner	**Tank capacity/# of tanks/type of fuel/condition**
AVEC	112,400/13 vertical tanks/Diesel
Brevig Mission School (BSSD)	101,000/14 vertical tanks/Diesel
Brevig Mission Native Corporation	111,800/9 tanks/Diesel and Gasoline
Brevig Mission Native Corporation	26,800/4 horizontal tanks/Gasoline
Unknown	3,000/Diesel

Water & Sewer Infrastructure

System type	**Number of homes**
Piped Water and Sewer	Approximately 350 customers

Diomede

Community and Energy Profile

COMMUNITY PROFILE - Diomede

Location: Diomede is located on the west coast of Little Diomede Island in the Bering Straits, 135 miles northwest of Nome. It is only 2.5 miles from Big Diomede Island, Russia.

Longitude/Latitude: -168.9531/65.7586

ANCSA Region: Bering Straits Native Corporation

AEA Region: Bering Strait

Alaskan Native Name and Definition: Inalik, "the other one"

Incorporation: 2nd Class City, 1970

Elevation: 20 ft.

Historical Setting: Early Eskimos on the islands worked on the ice and sea and had a culture with elaborate whale hunting ceremonies. The islands were named in 1728 by Vitus Bering in honor of Saint Diomede. The 1880 Census counted 40 people, all Ingalikmiut Eskimos, The city was incorporated in 1970. Some residents are interested in relocating the village.

Cultural Resources: Seal, polar bear, blue crab, and whale meat are the preferred foods. Mainland Natives come to Diomede to hunt polar bears. Seal and walrus hides are used to make parkas, hats, mukluks, furs, and skins for trade.

Community Plans: Bering Strait Regional Energy Plan 2014, Diomede Local Economic Development Plan 2012-2017, Bering Strait Comprehensive Economic Development Plan 2013-2018GF

Economy: Diomede is a traditional Ingalik Eskimo village with a subsistence lifestyle. The sale and importation of alcohol is banned in the village. 51 residents employed: 7 in private sector, 44 in local government and 0 in state government.

Local Contacts

City of Diomede PO BOX 7039, Little Diomede, AK 99762; Phone: 907-686-3071 Fax: 907-686-2192; Email: dio.city@yahoo.com; Website: http://www.kawerak.org/communities/diomede.html

Native Village of Diomede: Native Village of Diomede; P.O. Box 7079; Diomede, AK 99762; Email: fozenna@kawerak.org Website: http://www.kawerak.org

Demographics

	2000	2010		2000	2010
Total Population	146	115	Median Household Income		$41,667
Median Age of Total Population	23	14	Rate of Unemployment		20.6%
Average Household Size	4	4	Total Number of Occupied Housing units	38	38

Infrastructure

	Description	Notes
Housing	47 housing units, 4 individuals/household	Bering Straits Regional Housing Authority
Water/Wastewater	Small treated water supply, distributed using access hydrants, sewage haul system	Self-haul during winter; tank capacity insufficient during spring, residents thus melt snow and ice for drinking water
Power Generation	Diomede Joint Utilities	Diesel Generator
Landfill	Diomede Landfill, Class 3, not permitted	
Access	Diomede Heliport –good condition, Ice runway in winter when conditions permit	General Aviation Airport13

Non-Residential Buildings and Facilities Energy Information

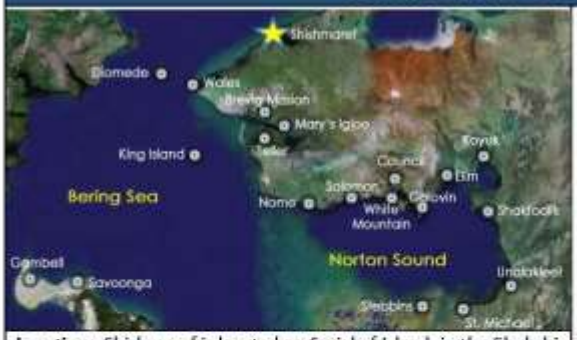
Name	Notes	Name	Notes
City Office Building		Tribal Office	
Clinic		Power Plant	
Diomede Catholic Church		Recreation Building	
Diomede Native Corp. bldg.		Shack	
Diomede Native Store		Storage Building	
Elem. School Building		Utility Office	
High School Building		Water Treatment Plant	
Mechanical Building			

ENERGY PROFILE – DIOMEDE			
Power Production			
Utility owner/operator			
	Make/model	**Size**	**Condition/Hours**
Generator	Unknown	100	
Generator	Unknown	180	
Generator	Unknown	180	
Heat Recovery	Y		
Alternative Energy integration ready			
Back Up System			
Peak Electrical Load			
Average Electrical Load	109		
Minimum Electrical Load	49		
Electrical Rates			
Production Cost (kwh)	.52		
Residential Rate	.60		
Rate with PCE subsidy	.46		
Commercial Rate			
Fuel per kWh	.47		
Retail Fuel Prices			
	Commercial	**Residential**	**Senior**
Diesel		8.65	N/A
Gasoline		8.63	N/A
Propane 100# tank			N/A
Alternative Energy			
Source	**Potential**	**Projects**	
Wind diesel	High		
Solar	Medium		
Coal	Low		
Hydroelectric	Low		
Geothermal	Low		
Biomass	Low		
Emerging Technologies	Unknown		
Bulk Fuel Tank Farm Inventory			
Tank owner	**Tank capacity/# of tanks/Fuel type**	**Condition**	
City Of Diomede	160,900		
City of Diomede	7,900		
Water & Sewer Infrastructure			
System Type	**Residential**	**Commercial**	
Little Diomede Water Supply Water System, Small Treated	184		

Shishmaref

Community and Energy Profile

COMMUNITY PROFILE – SHISHMAREF



Location: Shishmaref is located on Sarichef Island, in the Chukchi Sea, just north of the Bering Strait. Shishmaref is 5 miles from the mainland, 126 miles north of Nome, and 100 miles southwest of Kotzebue. The village is surrounded by the 2.6 million-acre Bering Land Bridge National Reserve. It is part of the Beringian National Heritage Park.

Longitude/Latitude: -166.0719/66.2567

ANCSA Region: Bering Straits Native Corporation

AEA Region: Bering Strait

Alaskan Native Name and Definition: Kigiktaq meaning "the island"

Incorporation: 2nd Class City, 1969

Elevation: 13'

Historical Setting: In 1816, Lt. Otto Von Kotzebue named the inlet "Shishmarev," after a member of his crew. Shishmaref has an excellent harbor, and around 1900 it became a supply center for gold mining activities to the south. The village was named after the inlet, and a post office was established in 1901. During October 1997, a severe storm eroded over 30 feet of the north shore, requiring 14 homes and the National Guard Armory to be relocated. Five additional homes were relocated in 2002. Other storms have continued to erode the shoreline an average of three to five feet per year on the north shore. In July 2002 residents voted to relocate the community.

Cultural Resources: Excavations at "Keekiktuk" by archaeologists around 1821 provided evidence of Inuit habitation from several centuries ago. Subsistence hunting includes: fishing, seals, walrus, beluga, fowl, caribou, reindeer, moose, mush ox and berry picking.

Community Plans: Shishmaref Local Economic Development Plan 2013-2018

Economy: Shishmaref is a traditional Inupiat village with a fishing and subsistence lifestyle. 222 Residents employed: 91 in private sector, 128 in local government, and 3 in state government.

Local Contacts

Native Corp: Shishmaref Native Corporation, P.O Box 72151, Shishmaref, AK 99772; Phone: 907-649-3751 Fax: 907-649-3731

City: City of Shishmaref, PO Box 83, Shishmaref, AK 99772, Phone 907-649-3781 Fax 907-649-2131; Email cityofshhclerk@gci.net

Tribal: Native Village of Shishmaref, P.O. Box 72110, Shishmaref, AK 99772; Phone 907-649-3821 Fax 907-649-2104; Email: tc.shh@kawerak.org Website: http://www.kawerak.org

Demographics

	2000	2010		2000	2010
Total Population	562	602 (City)	Median Household Income		$37,500
Median Age of Total Population	25	19	Rate of Unemployment		17.2%
Average Household Size	4	4	Total Number of Housing Units	148	151

Infrastructure

	Description	Notes
Housing	151 housing units, 4 individuals/household	Bering Straits Regional Housing Authority
Water/Wastewater	95% honey buckets, 5% flush system	City Office, School and Clinic only plumbed buildings
Power Generation	AVEC	Class 2 Wind - 3 Wind Turbines installed
Landfill	Shishmaref Landfill, Class 3, permitted	
Access	Shishmaref Airport, Asphalt	Commercial service

Non-Residential Buildings and Facilities Energy Information

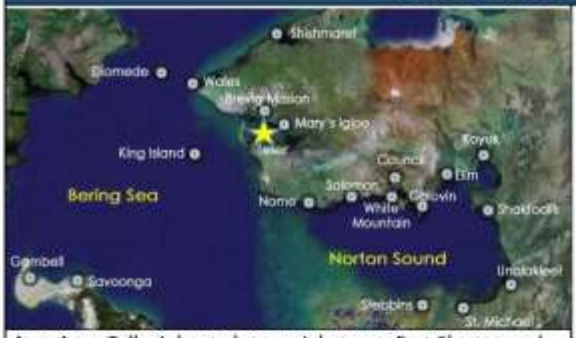
Name	Notes	Name	Notes
City Office	EECBG, VEEP	The Learning Center	
Fire Hall	EECBG	Covenant church	
Friendship Center	EECBG	Community Hall	
Shishmaref School	AHFC	Clinic	
DOT shop		Nayukpuk Store	
Native Corporation		Native Store	
Tannery		School Shop	
Tribal Office		Washeteria	
Power Plant		CATV building	
Headstart Building		Pump House	
Tel Alaska Building			

ENERGY PROFILE – SHISHMAREF			
Power Production			
Utility owner/operator	AVEC		
	Make/model	**Size**	**Condition/Hours**
Generator	Detroit/60	376	
Generator	Cat/D133E	300	
Generator	Cummins/ KTA-19-G2	400	
Generator	Cummins/ QSX15-G9	500	
Heat Recovery	Yes		
Alternative Energy Integration ready			
Back Up System	Yes		
Peak Electrical Load	524		
Average Electrical Load			
Annual community load (kwh)	1,646,878		
Electrical rates			
Production Cost (kwh)	.65		
Residential Rate	.60		
Rate with PCE subsidy	.19		
Commercial Rate			
Fuel per kWh	.37		
Retail fuel prices			
	Commercial	**Residential**	**Senior**
Diesel		5.79	
Gasoline		6.50	
Propane 100# tank		386.00	
Coleman 16.4 oz. Disposable Bottle			
Alternative Energy			
Source	**Potential**	**Projects**	
Wind diesel	High	2 Wind Turbines Installed (inop)	
Solar	Medium		
Coal	Low		
Hydroelectric	Low		
Geothermal	Low		
Biomass	Low		
Emerging Technologies	Unknown		
Bulk Fuel Tank Farm Inventory			
Tank owner	**Tank capacity**	**Condition**	
City of Shishmaref	87,500		
Shishmaref Native Store	55,800		
Shishmaref Native Store	68,200		
Nayokpuk General Store	27,000		
Nayokpuk General Store	54,000		
Water & Sewer Infrastructure			
System type	**Residential**	**Commercial**	
Shishmaref Water Treatment System		3	
Shishmaref Wastewater Treatment System		3	

Teller

Community and Energy Profile

COMMUNITY PROFILE – TELLER



Location: Teller is located on a spit between Port Clarence and Grantley Harbor, 72 miles northwest of Nome, on the Seward Peninsula.

Longitude/Latitude: -166.3608/65.2636

ANCSA Region: Bering Straits Native Corporation

AEA Region: Teller is a traditional Kawerak Eskimo village with a subsistence lifestyle. Seals, beluga whales, fish, reindeer, and other local resources are utilized. A herd of reindeer roam the area. The sale and importation of alcohol is banned. 103 residents employed: 29 in private sector, 73 in local government, and 1 in state government.

Economy: Bering Strait

Alaskan Native Name and Definition:

Incorporation: 2nd Class City, 1963

Elevation: 294'

Historical Setting: A Western Union Telegraph expedition wintered at the present site in 1866 and 1867; it was then called "Libbyville" or "Libby Station." The Teller Reindeer Station was operated by the U.S. Government at a nearby site from 1892 to 1900. The station was named in 1892 by Sheldon Jackson for U.S. Senator and Secretary of the Interior Henry Moore Teller. Teller Mission, a Norwegian Evangelical Lutheran mission, was built in 1900 across the harbor at the current site of Brevig Mission. Present-day Teller was also established in 1900 after the Bluestone Placer Mine discovery 15 miles to the south. During these boom years, Teller had a population of about 5,000 and was a major regional trading center, attracting Natives from Diomede, Wales, Mary's Igloo, and King Island.

Cultural Resources: Many residents today were originally from Mary's Igloo.

Community Plans: Teller Local Economic Development Plan 2013-2018

Local Contacts

Borough: Teller Native Corporation; P.O. Box 649, Teller, AK 99778; Phone: 907-642-6132 Fax: 907-642-6133

City: City of Teller; PO Box 548, Teller, AK 99778; Phone: 907-642-3401 Fax: 907-642-2051; Email: cityofteller@gmail.com

Tribal: Native Village of Teller; P.O. Box 567, Teller, AK 99778; Phone: 907-642-3381 Fax: 907-642-2072 Email: cisabell@kawerak.org Website: http://www.kawerak.org/tribalHomePages/teller/index.html

Demographics

	2000	2010		2000	2010
Total Population	268	229	Median Household Income		$27,250
Median Age of Total Population	24	23	Rate of Unemployment		15.06%
Average Household Size	4	4	Total Number of Housing Units	87	86

Infrastructure

	Description	Notes
Housing	86 Total, 72 Occupied, 14 Vacant	Bering Straits Regional Housing Authority
Water/Wastewater	Bering St SD - Teller School/Wash Water System, small treated	Population Served: 295
Power Generation	AVEC	Diesel Generator
Landfill	Teller Landfill, Class 3, permitted	
Access	Teller Airport, gravel, fair condition	General Aviation Airport

Non-Residential Buildings and Facilities Energy Information

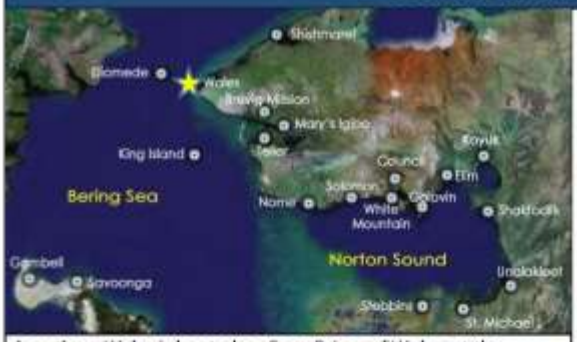
Name	Notes	Name	Notes
City Community Hall	EECBC	Duplex Teacher Housing	VEEP
City Office	EECBC	Teller Trad. Council Office	VEEP
City Maintenance Garage	EECBC	New Clinic	VEEP
BSSD Maintenance	VEEP	Storage Building	VEEP
Old Elementary 4-plex	VEEP		
Washeteria	EECBC		
School Bus Garage	VEEP		

ENERGY PROFILE – TELLER			
Power Production			
Utility owner/operator	AVEC		
	Make/model	**Size**	**Condition/Hours**
Generator	Cat/3304	124	
Generator	Cat/3208	156	
Generator	Cat/2406 DTTA	297	
Generator	Cat/3306 PC	150	
Generator	Cat/3304	87	
Generator	Detroit/60	236	
Heat Recovery	Y		
Alternative Energy integration ready			
Back Up System			
Peak Electrical Load	186		
Average Electrical Load			
Annual community load (kwh)	99		
Electrical rates			
Production Cost (kwh)	.60		
Residential Rate	.64		
Rate with PCE subsidy	.20		
Commercial Rate			
Fuel per kWh	.33		
Retail fuel prices			
	Commercial	**Residential**	**Senior**
Diesel		5.13	
Gasoline		5.81	
Propane 100# tank			
Coleman 16.4 oz. Disposable Bottle			
Alternative Energy			
Source	**Potential**	**Projects**	
Wind diesel	High	3 Wind Turbines	
Solar	Medium		
Coal	Low		
Hydroelectric	Low		
Geothermal	Low		
Biomass	Low		
Emerging Technologies	Unknown		
Bulk Fuel Tank Farm Inventory			
Tank owner	**Tank capacity**	**Condition**	
AVEC	199,400		
James C. Isabell School, Bering Strait School District	66,400		
Teller Native Corporation	66,500		
Teller Native Corporation	16,000		
Water & Sewer Infrastructure			
System type	**Residential**	**Commercial**	
Bering St SD - Teller Sc/Wash Water System	295		
Honey-Bucket	42		

Wales

Community and Energy Profile

COMMUNITY PROFILE – WALES



Location: Wales is located on Cape Prince of Wales, at the western tip of the Seward Peninsula, 111 miles northwest of Nome.

Longitude/Latitude: -168.0875/65.6092

ANCSA Region: Bering Straits Native Corporation

AEA Region: Bering Strait

Economy: Wales is a traditional Kawerak Eskimo village with a subsistence lifestyle. Seals, beluga whales, fish, reindeer, and other local resources are utilized. A herd of reindeer roam the area. The sale of alcohol is banned in the village.

Incorporation: 2nd Class City, 1964

Elevation: 294'

Historical Setting: A burial mound of the "Birnirk" culture (500 A.D. to 900 A.D.) was discovered near Wales and is now a national landmark. In 1827 the Russian Navy reported the Eskimo villages of "Eidamoo" near the coast and "King-a-ghe" further inland. In 1890 the American Missionary Association established a mission here, and in 1894 a reindeer station was organized. A post office was established in 1902. Wales became a major whaling center due to its location along migratory routes, and it was the region's largest and most prosperous village, with more than 500 residents. The influenza epidemic in 1918-19 claimed the lives of many of Wales' finest whalers.

Cultural Resources: Wales people refer to themselves as Kingikmiut, "the people of Kingigin." Wales was also one of the largest villages in the region in pre-historical and post-contact times with population estimates between 500 - 600 people. The village population was decimated by epidemics of disease over the years. The Spanish Influenza epidemic of 1918 reduced the population by approximately one-half.

Community Plans: Economic Development Plan 2004-2009

Local Contacts

Village Corporation: Wales Native Corporation Box 529 Wales, Alaska 99783 Phone: 907-664-3641

City: City of Wales Box 489 Wales, Alaska 99783 Phone: 907-664-3501 Fax: 907-664-2359 Email: cityofwalesclerk@yahoo.com

Tribal: Native Village of Wales Box 549 Wales, Alaska 99783 Phone: 907-664-362 Email: tc.waa@kawerak.org

Demographics

	2000	2010		2000	2010
Total Population	152	145	Median Household Income		$31,250
Median Age of Total Population	26	24	Rate of Unemployment		25%
Average Household Size	4	4	Total Number of Housing Units	59	51

Infrastructure

	Description	Notes
Housing	51 total, 43 occupied, 8 vacant	Bering Straits Housing Authority
Water/Wastewater	Small treated, operated by Wales Water System	
Power Generation	AVEC owned and operated, PCE subsidized	3 wind turbines installed (inoperable – owned by KEA)
Landfill	Wales Landfill, Class 3, not permitted	
Access	Wales Airport, gravel, good condition	General aviation airport

Non-Residential Buildings and Facilities Energy Information

Name	Notes	Name	Notes
School		Church storage	
Clinic		AVEC Powerhouse	
Native Store (ANICA)		Washeteria and City Bldg.	
Native Corp Store		DOT shop	
Multi-purpose Building		Erickson Helicopter Connex	
Post Office			
Geo Dome (vacant w/ w/s, elec.)			
Church			
Teacher Housing (4-plex)			

ENERGY PROFILE – WALES			
Power Production			
Utility owner/operator	AVEC		
	Make/model	**Size**	**Year**
Generator – Kato 6P4-1088	Cummins LTA10	168	
Generator – Newage HC1634GIL	Detroit Series 60	236	
Generator – Kato 6P4-1050	Cummins LTA10	168	
Heat Recovery	Installed but not operable		
Alternative Energy integration ready	Yes – 2 AOC 50 wind turbines inoperable		
Back Up System	Yes		
Peak Electrical Load	152 (2005)		
Annual community load (kwh)	620,579		
Minimum Load	71 Average Load		
Electrical rates			
Production Cost (kwh)	.64		
Residential Rate	.69		
Rate with PCE subsidy	.20		
Commercial Rate			
Fuel per kWh	.36		
Retail fuel prices			
	Commercial	**Residential**	**Senior**
Diesel		$6.00	
Gasoline		$7.15	
Propane 100# tank			
Coleman 16.4 oz. Disposable Bottle			
Alternative Energy			
Source	**Potential**	**Projects**	
Wind diesel	High – Class 6-7	2 AOC 50 wind turbines inoperable	
Solar	Medium		
Coal	Low		
Hydroelectric	Low		
Geothermal	Low		
Biomass	Low		
Emerging Technologies	Unknown		
Bulk Fuel Tank Farm Inventory			
Tank owner	**Tank capacity/# tanks/type of fuel/condition**		
AVEC	62,827/Diesel		
Water & Sewer Infrastructure			
System type	**Residential**	**Commercial**	
Wash water haul system	Approximately 150		
Honey-Bucket	Approximately 150		
Piped drinking water		3 - Clinic, School, City office	
Septic system		2 – School, Clinic/City/Housing unit	

4.1.1 Energy Issues

In 2011, AVEC completed a 6.5-mile intertie between Brevig Mission and Teller. Before AVEC was able to energize the line, an epic storm damaged the cable making the system inoperable. AVEC requested Federal Emergency Management Administration (FEMA) funds to replace the cable and is awaiting approval for funding.

Another energy issue is that the wind turbines in Wales are no longer functioning. The wind turbines were oversized for the community. AVEC provides the electrical services in Wales but the wind turbines are owned by Kotzebue Electric Association. AVEC is coordinating with KEA to discuss removing the old turbines and eventual replacement with turbines better suited for the application.

Diomede has wind energy potential but has challenges due to sensitive bird habitat. Diomede faces the greatest transportation challenges in the Bering Strait Region due to its lack of an airstrip and poor weather. Cargo barge stops are irregular. This impacts the community's ability to respond to energy (and other) emergencies.

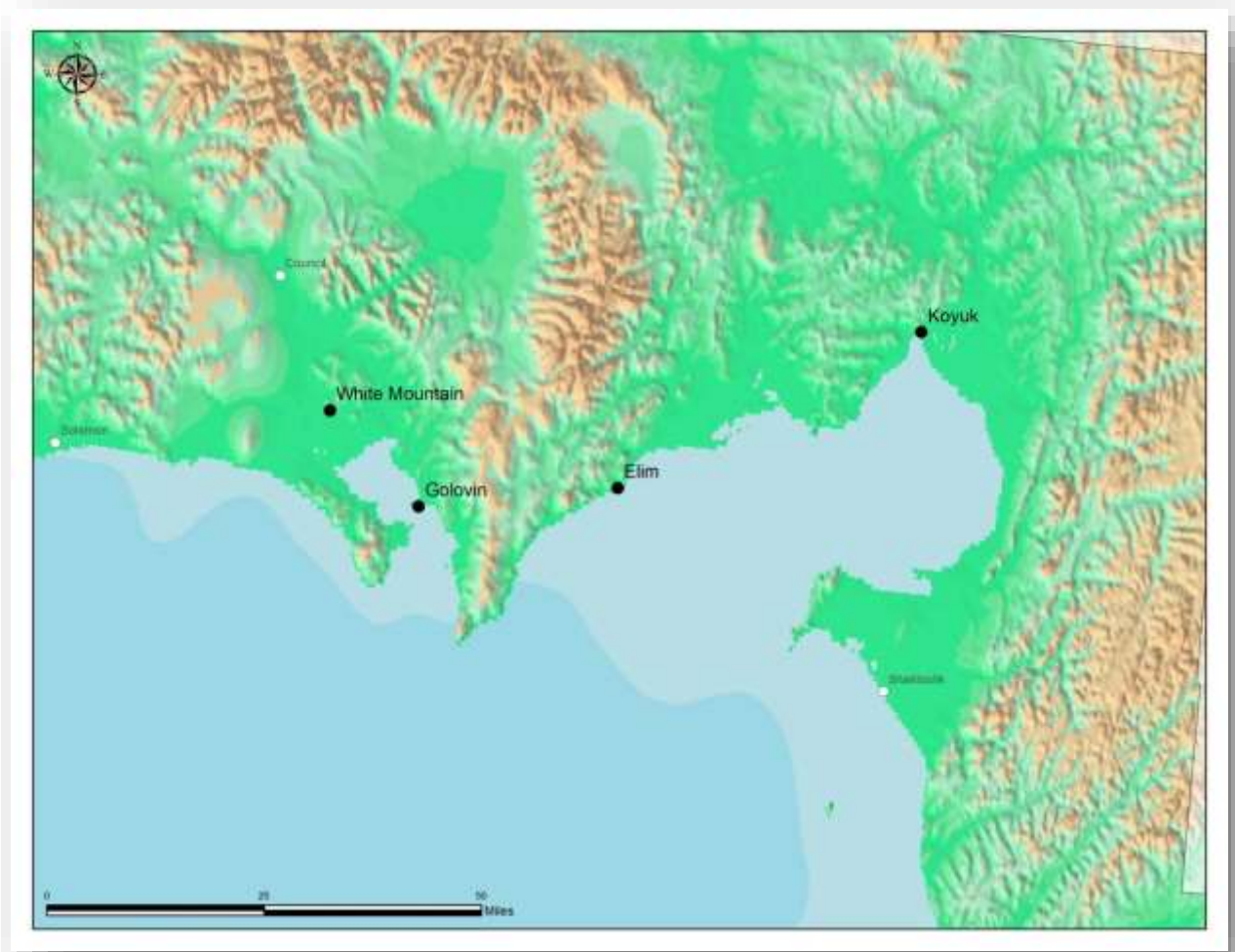
The energy champions in this sub-region stated in the SAG meetings that there is a lack of energy efficient housing, home energy audits and energy efficiency education. SAG representatives also indicated a need to build the capacity of energy project / proposal development and administration skills in the region. Currently, community entities separately employ individuals to develop grant proposals to fund priority projects. Typically these positions are created and staffed as needed; however, funding is unavailable to ensure full-time employment. Continual turnover and lack of job security both contribute the underdeveloped capacity of local skill sets in project development and administration.

4.2 South-Central Sub-Region Profile

The South-Central sub-region includes Elim, Golovin, Koyuk and White Mountain. This sub-region has rolling hills and small stands of trees. The four communities that make up this sub-region are on the north side of Norton Sound and are either on the coast or near it. Koyuk is the furthest to the east at the head of Norton Bay. Winter trails connect these villages and include part of the Iditarod Trail race checkpoint system. The communities have no roads between them and range from 62 miles (White Mountain) to 130 miles (Koyuk) from Nome which is accessed by air.

Figure 4-3 shows the communities in the South central sub-region.

Figure 4-3: South-Central Sub-Region



Elim

Community and Energy Profile

COMMUNITY PROFILE – ELIM

Location: Elim is located on the northwest shore of Norton Bay on the Seward Peninsula, 96 miles east of Nome. It lies 460 miles northwest of Anchorage.

Longitude/Latitude: -162.2606/64.6175

ANCSA Region: Bering Straits Native Corporation

AEA Region: Bering Strait

Economy: Elim is a Yupik Eskimo village with a fishing and subsistence lifestyle. 138 residents employed: 43 in private sector, 93 local government, and 2 in state government.

Alaskan Native Name and Definition:

Incorporation: 2nd Class City, 1970

Elevation: 162'

Historical Setting: This settlement was formerly the Malemiut Inupiat Eskimo village of Nuviakchak. The Native culture was well-developed and well-adapted to the environment. Each tribe possessed a well-defined subsistence harvest territory. The area became a federal reindeer reserve in 1911. In 1914, Rev. L.E. Ost founded a Covenant mission and school, called Elim Mission Roadhouse. When the Alaska Native Claims Settlement Act (ANCSA) was passed in 1971, Elim decided not to participate and instead opted for title to the 298,000 acres of land in the former Elim Reserve. The Iditarod Sled Dog Race passes through Elim each year.

Cultural Resources: Solomon is currently a subsistence-use area used by descendants of the families that once resided here. Subsistence activities include: fishing, seals, walrus, beluga, crab, halibut, salmon, fowl, caribou, reindeer and moose.

Community Plans: Elim Local Economic Development Plan 2012-2017

Local Contacts

Native Corporation: Elim Native Corporation Box 39010 Elim, Alaska 99739 Phone: 907-890-3741 Fax: 907-890-3091
City of: City of Elim, PO Box 39009, Elim, AK 99739; Phone: 907-890-3441 Fax: 907-890-3811; Email: cityofelim@yahoo.com;
Tribal: Native Village of Elim; P.O. Box 39070, Elim, AK 99739; Phone: 907-890-3737; Fax: 907-890-3738; Email: eli.tc@kawerak.org;

Demographics

	2000	2010		2000	2010
Total Population	313	330	Median Household Income		$36,250
Median Age of Total Population	24	26	Rate of Unemployment		24.4%
Average Household Size	4	4	Total Number of Housing Units	106	105

Infrastructure

	Description	Notes
Housing	105 Total, 89 Occupied, 16 Vacant	Bering Straits Regional Housing Authority
Water/Wastewater	Elim Water Supply Water System	4 honey bucket haul systems
Power Generation	AVEC	Diesel generator
Landfill	City owned	Permitted Class 3
Access	Elim Airport—gravel, good condition	General aviation airport
	Moses Airport—gravel	Private airport, Owner: Elim Native Corporation

Non-Residential Buildings and Facilities Energy Information

Name	Notes	Name	Notes
Elim Aniguiin School	AHFC	Native Store Warehouse	
City Office		Elim IRA Office	
Native Store		Johnny's Corner Store	
City Library		Elim Clinic	
Elim Native Corporation		Headstart	
Covenant Church		Teacher Housing 4-plex	
Water Plan		School Shop	
City Shop		Fire Hall/Code Red bldg..	
Mukluk Telephone Building		NSEDC Office	
Boys & Girls Club		DOT shop	
FAA Quarters		New Well House	
City Rental Units			

ENERGY PROFILE – ELIM			
Power Production			
Utility owner/operator	AVEC		
	Make/model	**Size**	**Year/Condition/Hours**
Generator	Detroit 60	200	2002
Generator	Detroit 60	350	2002
Generator	Detroit MTU SV2000	500	2002
Heat recovery	Y		
Alternative Energy integration ready			
Back Up system			
Peak Electrical Load (kWh)	1,105		
Annual Community Load (kWh)	1,145,419		
Minimum Electrical Load			
Electrical Rates			
Production cost (kwh)	.59		
Residential rate	.60		
Rate with PCE subsidy	.19		
Commercial rate			
Fuel per kwh	.32		
Retail Fuel Prices			
	Commercial	**Residential**	**Senior**
Diesel		4.47	
Gasoline		5.99	
Propane 100# tank			
Alternative Energy			
Source	**Potential**	**Projects**	
Wind diesel	High, Class	Wind study, completion anticipated in June 2014	
Solar	Medium		
Coal	Low		
Hydroelectric	Low		
Geothermal	Low		
Biomass	Medium	Biomass-burning boiler monitoring	
Emerging technologies	Unknown		
Bulk Fuel Tank Farm Inventory			
Tank owner	**Tank capacity/# tanks/type of fuel**		
AVEC	135,000		
School	57,410		
City of Elim	87,000		
Native Corp	12,000		
Water & Sewer Infrastructure			
Utility owner/operator			
System type	**Residential**	**Commercial**	
Small Treated, Piped	75		

Golovin

Community and Energy Profile

COMMUNITY PROFILE – Golovin

Location: Golovin is located on a point of land between Golovin Bay and Golovin Lagoon on the Seward Peninsula. It is 70 miles east of Nome.

Longitude/Latitude: -163.0292/64.5433

ANCSA Region: Bering Straits Native Corporation

AEA Region: Bering Strait

Economy: Golovin is an Inupiat Eskimo village with a fishing, herding, and subsistence lifestyle. 92 residents employed, 43 in private sector, 49 in local government, and 0 in state government.

Alaskan Native Name and Definition: Chinik

Incorporation: 2nd Class City, 1971

Elevation: 59'

Historical Setting: Golovin was named for Captain Vasili Golovin of the Russian Navy. In 1887, the Mission Covenant of Sweden established a church and school south of the current site. Around 1890, John Dexter established a trading post that became the center for prospecting information for the entire Seward Peninsula. When gold was discovered in 1898 at Council, Golovin became a supply point for the gold fields. Supplies were shipped from Golovin across Golovin Lagoon and up the Fish and Niukluk Rivers to Council. A post office was opened in 1899.

Cultural Resources: The Eskimo village of "Chinik," located at the present site of Golovin, was originally settled by the Kauweramiut Eskimos who later mixed with the Unaligmiut Eskimos. Reindeer herding was an integral part of the missions in the area in the 1900s.

Community Plans: Golovin Local Economic Development Plan 2009-2013; Multi-Hazard Mitigation Plan 2008

Local Contacts

Native Corp: Golovin Native Corporation; PO Box 62099, Golovin, AK 99762; Phone: 907-779-3251 Fax: 907-779-3261

City of: City of Golovin, P.O. Box 62059, Golovin, AK 99762; Phone: 907-779-3681 Fax: 907-779-2239; Email: golovin_ak@hotmail.com

Tribal: Chinik Eskimo Community; P.O. Box 62020, Golovin, AK 99762; Phone: 907-779-2214 Fax: 907-779-2829; Email: dbrown@kawerak.org

Demographics

	2000	2010		2000	2010
Total Population	144	171	Median Household Income		$32,188
Median Age of Total Population	26	30	Rate of Unemployment		22.5%
Average Household Size	4	4	Total Number of Housing Units	45	49

Infrastructure

	Description	Notes
Housing	49 total, 49 occupied, none vacant	Bering Straits Regional Housing Authority
Water/Wastewater	Golovin Community Water System, small treated	
Power Generation	Golovin Power Utilities	Diesel generator
Landfill	Golovin 1.7 Mile North Landfill, Class 3, permitted	City of Golovin Owned
Access	Golovin Airport—gravel, good condition	General Aviation Airport

Non-Residential Buildings and Facilities Energy Information

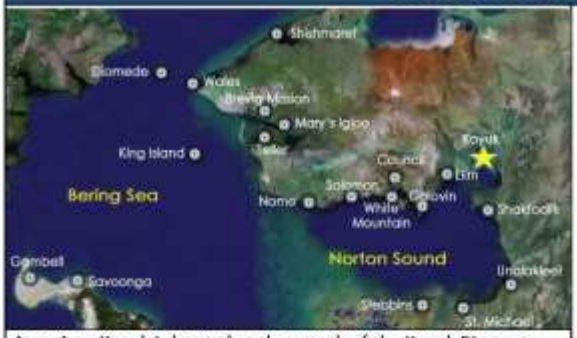
Name	Notes	Name	Notes
Chinik Tribal Building		School Shop (old)	
City Office		School Shop (new)	
High School		Old church (storage)	
City Shop		NSEDC building	
Elementary School		Covenant Church	
Fire Hall		Washeteria	
Code Red building		Post Office	
Clinic		DOT shop	
ANICA Chinik Store		VPSO building	
Old Clinic		Power Plant	
Water Treatment Plant		GCI building	

ENERGY PROFILE – GOLOVIN			
Power Production			
Utility owner/operator	Golovin Power Utilities		
	Make/model	**Size**	**Year**
Generator	Deere/ 6068TF250	115	
Generator	Deere/ 6068TF250	115	
Generator	Deere/ 6081AFM75	150	
Generator	Deere/6081T	200	
Heat recovery	Y		
Alternative energy integration ready			
Back Up system			
Peak electrical load	141		
Annual community load (kwh)	678,300		
Electrical rates			
Production cost (kwh)	.53		
Residential rate	.60		
Rate with PCE subsidy	.33		
Commercial rate	.27		
Fuel per kwh	.33		
Retail fuel prices			
	Commercial	**Residential**	**Senior**
Diesel		5.00	
Gasoline		5.00	
Propane 100# tank			
Coleman 16.4 oz. Disposable bottle			
Alternative Energy			
Source	**Potential**	**Projects**	
Wind diesel	Medium to High	Met Tower Pending	
Solar	Medium		
Coal	Low		
Hydroelectric	Low		
Geothermal	Low		
Biomass	Medium		
Emerging technologies	Unknown		
Bulk Fuel Tank Farm Inventory			
Tank owner	**Tank capacity**		
City of Golovin	12,000		
City of Golovin	123,500		
City of Golovin	28,700		
Martin L. Olson School	51,400		
Water & Sewer Infrastructure			
SYSTEM TYPE	**Residential**	**Commercial**	
Small Treated	150	200	
Truck Water	25		
Honey Buckets	25		
Pit Privies	21		

Koyuk

Community and Energy Profile

COMMUNITY PROFILE – Koyuk



Location: Koyuk is located at the mouth of the Koyuk River, at the northeastern end of Norton Bay on the Seward Peninsula, 90 air miles northeast of Nome.

Longitude/Latitude: -161.1569/64.9319

ANCSA Region: Bering Straits Native Corporation

AEA Region: Bering Strait

Economy: Residents maintain a subsistence lifestyle. 157 residents employed: 58 in private sector, 99 in local government, and 0 in state government.

Alaskan Native Name and Definition: Kuuyuk, meaning "where the river meets the sea".

Incorporation: 2nd Class City, 1970

Elevation: 161.5'

Historical Setting: The site of "Iyatayet", 40 miles SW, on Cape Denbigh to the south has traces of human habitation that are 6,000 to 8,000 years old. Villagers were historically nomadic. Lt. Zagoskin of the Russian Navy noted the village of "Kuynkhak-miut" here in 1842-44. A Western Union Telegraph expedition in 1865 found the village of "Konyukmute." Around 1900, the present townsite, where supplies could easily be lightered to shore, began to be populated. Two boomtowns grew up in the Koyuk region around 1914: Dime Landing and Haycock. The "Norton Bay Station," 40 miles upriver, was established to supply miners and residents in 1915. In addition to gold, coal was mined a mile upriver to supply steam ships and for export to Nome. The first school began in the church in 1915; the U.S. Government built a school in Koyuk in 1928.

Cultural Resources: Koyuk is a traditional Unalit and Malemiut Eskimo village who people speak a dialect of Inupiat Eskimo. Subsistence hunting includes: fishing, seals, walrus, beluga, fowl, caribou, moose, reindeer and musk ox.

Community Plans: Local Economic Development Plan 2012-2017

Local Contacts

Borough: Koyuk Native Corporation; PO Box 53050; Koyuk, AK 99753; Phone: 907-963-2424 Fax: 907-963-3352

City of: City of Koyuk; PO Box 53029, Koyuk, AK 99753; Phone: 907-963-3441 Fax: 907-963-3442; Email: cityofkoyuk@hughes.net

Tribal: Native Village of Koyuk; P.O. Box 53030, Koyuk, AK 99753; President; Phone: 907-963-3651 Fax: 907-963-2353; Email: tc.kka@kawerak.org

Demographics

	2000	2010		2000	2010
Total Population	297	332	Median Household Income		$24,250
Median Age of Total Population	25	24	Rate of Unemployment		24.4%
Average Household Size	4	4	Total Number of Housing Units	95	99

Infrastructure

	Description	Notes
Housing	99 Total, 89 Occupied, 10 Vacant	Bering Straits Regional Housing Authority
Water/Wastewater	Koyuk Public Water System, small treated	Population served: 277
Power Generation	AVEC	Diesel generator
Landfill	Koyuk Landfill, Class 3, not permitted	
Access	Koyuk Alfred Adams Airport, gravel, fair condition	General Aviation Airport

Non-Residential Buildings and Facilities Energy Information

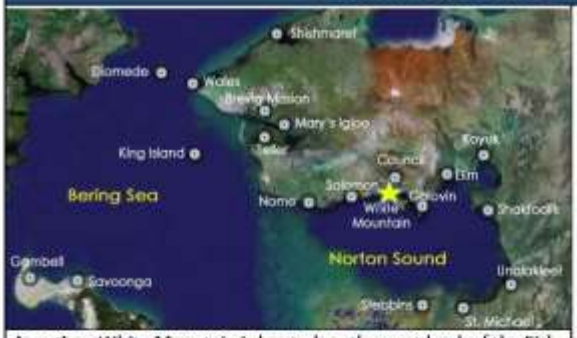
Name	Notes	Name	Notes
City Office	EECBG	Health Clinic	
Koyuk-Malemut School	AHFC	Headstart	
City Library		City Rec Center	
Public Safety Building		Tel Alaska building	
VPSO Housing		GCI	
BSSD Housing unit		Native Corp. building	
IRA building		Native Store (ANICA)	
Code Red building		Native Store Storage	
DOT shop		Water Treatment Plant	
City shop		Power Plant	
FAA Weather Station building			

ENERGY PROFILE – KOYUK			
Power Production			
Utility owner/operator	AVEC		
	Make/model	**Size**	**Year**
Generator	Detroit/60	325	
Generator	Detroit/60	325	
Generator	Cummins/ QSX15-09	500	
Heat Recovery	Y		
Alternative Energy Integration ready			
Back Up System			
Peak Electrical Load	147		
Annual community load (kwh)	1,324,557		
Electrical rates			
Production Cost (kwh)	.57		
Residential Rate	.60		
Rate with PCE subsidy	.19		
Commercial Rate			
Fuel per kWh	.30		
Retail fuel prices			
	Commercial	**Residential**	**Senior**
Diesel		6.31	
Gasoline		5.93	
Propane 100# tank			
Coleman 16.4 oz. Disposable Bottle			
Alternative Energy			
Source	**Potential**	**Projects**	
Wind diesel	Medium to High	Feasibility study on hold	
Solar	Medium		
Coal	Low		
Hydroelectric	Low		
Geothermal	Low		
Biomass	Medium		
Emerging Technologies	Unknown		
Bulk Fuel Tank Farm Inventory			
Tank owner	**Tank capacity**		
City and Tribe co-owners	135,000		
City and Tribe co-owners	93,000		
City and Tribe co-owners	120,000		
Water & Sewer Infrastructure			
System type	**Residential**	**Commercial**	
Circ	70	150	
Gravity	70	150	
Piped Water and Sewer (5% honey buckets)	51		

White Mountain

Community and Energy Profile

COMMUNITY PROFILE – WHITE MOUNTAIN



Location: White Mountain is located on the west bank of the Fish River, near the head of Golovin Lagoon, on the Seward Peninsula. It is 63 miles east of Nome.

Longitude/Latitude: -163.4056/64.6814

ANCSA Region: Bering Straits Native Corporation

AEA Region: Bering Strait

Alaskan Native Name: Nutchirviq, meaning "to look around the point".

Incorporation: 2nd Class City, 1969

Elevation: 267'

Historical Setting: The Inupiat fish camp of "Nutchirviq" was located here. The bountiful resources of both the Fish and Niukluk Rivers supported the area's Native populations. White Mountain grew after the influx of prospectors during the gold rush of 1900. The first structure was a warehouse built by miner Charles Lane to store supplies for his claim in the Council District. It was the site of a government-subsidized orphanage, which became an industrial school in 1926. A post office was opened in 1932.

Cultural Resources: White Mountain is a Kawerak Eskimo village, with historical influences from the gold rush.

Community Plans: White Mountain Local Economic Development Plan 2013-2018, Solid Waste Management Plan, 2015.

Economy: Subsistence activities are prevalent and include: fishing, seal, walrus, beluga, fowl, caribou, moose, reindeer, musk ox and berry picking. 25% are privately employed and 65% are local government employed.

Local Contacts

Borough: White Mountain Native Corporation; P.O. Box 81, White Mountain, AK 99784; Phone: 907-622-5003 Fax: 907-622-5004

City of: City of White Mountain; P.O. Box 130, White Mountain, AK 99784; Daniel Harrelson, Mayor;

Tribal: Native Village of White Mountain; P.O. Box 84090, White Mountain, AK 99784; Phone: 907-638-3651 Fax: 907-638-3652; Email: dbarr@kawerak.org Website: http://www.kawerak.org

Demographics

	2000	2010		2000	2010
Total Population	203	176	Median Household Income		$35,000
Median Age of Total Population	30	29	Rate of Unemployment		15.1%
Average Household Size	3	3	Total Number of Housing Units	75	79

Infrastructure

	Description	Notes
Housing	80 Total, 72 Occupied, 8 Vacant (2 not livable)	Bering Straits Regional Housing Authority
Water/Wastewater	White Mountain Water Treatment System, Small Treated	Population served: 210 – 70 served both residential and commercial
Power Generation	City of White Mountain	Diesel generator
Landfill	White Mountain Landfill, Class 3, permitted	
Access	White Mountain Airport, gravel, good condition	General aviation airport

Non-Residential Buildings and Facilities Energy Information

Name	Notes	Name	Notes
Water Treatment Plant	EECBG	Covenant Church	
BSSD school		Environmental Building	
ITC/IRA Office	RBEG	DOT Shop	
Health Clinic			
Native Store (ANICA)			
Public Safety Building			
City Office			
Power House			
School Shop			

ENERGY PROFILE – WHITE MOUNTAIN			
Power Production			
Utility owner/operator	White Mountain Utilities		
	Make/model	**Size**	**Condition/Hours**
Generator	Cat/C6.6	157	9600 hours/okay
Generator	Deere/4.5	125	160 hours/good
Generator	Deere/ 6101AF010 9L	225	4240 hours/good
Heat Recovery	Y, Public Safety building, Waterline		
Alternative Energy integration ready			
Back Up System			
Peak Electrical Load	175		
Annual community load (kwh)	758,500		
Electrical rates			
Production Cost (kwh)	.51		
Residential Rate	.62		
Rate with PCE subsidy	.3389		
Commercial Rate			
Fuel per kWh	.33		
Retail fuel prices			
	Commercial	**Residential**	**Senior**
Diesel		4.85	
Gasoline		5.25	
Propane 100# tank		374.99	
Coleman 16.4 oz. Disposable Bottle			
Alternative Energy			
Source	**Potential**	**Projects**	
Wind diesel	Medium	MET Tower Pending	
Solar	Medium		
Coal	Low		
Hydroelectric	Low		
Geothermal	Low		
Biomass	Medium		
Emerging Technologies	Unknown		
Bulk Fuel Tank Farm Inventory			
Tank owner	**Tank capacity**	**Condition**	
White Mountain Utilities	138,000		
White Mountain School, Bering Strait School District	46,000		
White Mountain Native Village	46,000		
White Mountain Native Village	46,000		
Storage	34,000		
Water & Sewer Infrastructure			
System type	**Residential**	**Commercial**	
Circulating	210		
Gravity			
Piped Water and Sewer (5% honey buckets)	59		

4.2.1 Energy Issues

Interties are made more difficult because there are four villages in this Sub-Region and three different electricity providers; which makes coordination between the entities more challenging. At the SAG meetings, participants cited a need for improved communication.

The community of Elim has identified the need to renovate the electrical system and to upgrade electrical systems in older houses to assist residents with energy needs. Along with the new wood-fired boiler for the clinic funded by ANTHC, a hydroelectric dam has been analyzed as a way to provide alternative energy for the community. The community has also been applying to AEA for funds to complete a feasibility study to examine nearby geothermal potential. The known geothermal springs near Elim, called Elim Hot Springs or Kwiniuk Hot Springs, is located approximately 8 miles inland from the community, and Clear Creek Hot Springs located approximately 15 miles northwest from the community. AEA has indicated they would consider a request to study the Elim area hot springs as a pilot project to determine the feasibility of a small scale geothermal project working in a remote Alaskan community. NSEDC has indicated they would consider installing a fish hatchery in Elim if energy was cheap enough.

AT the SAG meetings, the Golovin energy champion identified that they need to relocate the generator building to higher ground, investigate alternative energy sources such as wind and renovate older homes for energy efficiency.

Residents of Koyuk would like to upgrade existing housing for energy efficiency and ensure new construction meets 5 star energy efficiency standards.

White Mountain recently upgraded their power plant and the energy champion indicated they would like to capture waste heat and explore alternative energy. Existing lines and poles need maintenance.

4.3 Southeast Sub-Region

The Southeast Sub-Region includes the communities of Shaktoolik, Stebbins, Saint Michael and Unalakleet. These coastal communities are located along Norton Sound and range from 120 to 148 miles from Nome. Figure 4-4 shows the communities in the Southeast sub-region.

Figure 4-4: Southeast Sub-Region Communities

St. Michael

Community and Energy Profile

COMMUNITY PROFILE – ST. MICHAEL

Location: St. Michael is located on the east coast of St. Michael Island in Norton Sound. It lies 125 miles southeast of Nome and 48 miles southwest of Unalakleet.

Longitude/Latitude: -162.0392/63.4781

ANCSA Region: Bering Straits Native Corporation

AEA Region: Bering Strait

Economy: 188 residents employed: 68 in private sector, 118 in local government, and 2 in state government.

Alaskan Native Name: Tachik

Incorporation: 2nd Class City, 1969

Elevation: 98'

Historical Setting: A fortified trading post called "Redoubt St. Michael" was built by the Russian-American Company at this location in 1833; it was the northernmost Russian settlement in Alaska. The Native village of "Tachik" stood to the northeast. When the Russians left Alaska in 1867, several of the post's traders remained. "Fort St. Michael," a U.S. military post, was established in 1897. During the gold rush of 1897, it was a major gateway to the interior via the Yukon River. As many as 10,000 persons were said to live in St. Michael during the gold rush. St. Michael was also a popular trading post for Eskimos to trade their goods for Western supplies. Centralization of many Yup'iks from the surrounding villages intensified after the measles epidemic of 1900 and the influenza epidemic of 1918. The village remained an important trans-shipment point until the Alaska Railroad was built.

Cultural Resources: St. Michael's population is largely Yup'ik Eskimo today, and many residents are descendants of Russian traders. Seal, beluga whale, moose, caribou, fish, and berries are important staples. The sale and importation of alcohol is banned in the village.

Community Plans: Local Economic Development Plan 2005-2010, Hazard Mitigation Plan 2013

Local Contacts

Native Corporation: St. Michael Native Corporation; P.O. Box 59049, St. Michael, AK 99659; Phone: 907-923-3143 Fax: 907-923-3142

City of: City of St. Michael; PO Box 59070, St. Michael, AK 99659; Phone: 907-923-3222 Fax: 907-923-2284; Email: relachik@yahoo.com

Tribal: Native Village of Saint Michael; P.O. Box 59050, St. Michael, AK 99659;; Phone: 907-923-2304 Fax: 907-923-2406; Email: piuswashington12@gmail.com Website: http://www.kawerak.org/tribalHomePages/stMichael/index.html

Demographics

	2000	2010		2000	2010
Total Population	368	401	Median Household Income		$32,188
Median Age of Total Population	22	16	Rate of Unemployment		26%
Average Household Size	5	5	Total Number of Housing Units	93	117

Infrastructure

	Description	Notes
Housing	117 Total, 96 Occupied, 21 Vacant	Bering Straits Regional Housing Authority
Water/Wastewater	Saint Michael Water System, small treated	Population served: 495
Power Generation	AVEC	Diesel generator, PCE subsidized
Landfill	Saint Michael Landfill, Class 3, permitted	
Access	St Michael Airport, gravel, good condition	General Aviation Airport

Non-Residential Buildings and Facilities Energy Information

Name	Notes	Name	Notes
City Office	EECBG	Catholic Church	
Gym Complex		Assembly of God Church	
School		Water Treatment Plant	
Clinic		Pump House	
AC Store		Crater Shopping Center	
IRA Office		Native Corp Office	
Jerry's General Store		Fuel Store	
Public Safety Office		Post Office	

ENERGY PROFILE – St. Michael			
Power Production			
Utility owner/operator	AVEC		
	Make/model	**Size**	**Year/Hours/Condition**
Generator – Newage HC1544F	Cummins QSX15	499	Good
Generator – Newage HC1504C1	Detroit Series 60	363	Fair
Generator – Kato 6P4-1363	Detroit Series 60	229	Poor
Heat Recovery	Yes (AVEC)		
Alternative Energy Integration ready	Yes – intertie and wind with Stebbins (AEA, AVEC)		
Back Up System	Yes		
Peak Electrical Load	414		
Annual community load (kwh)	1,783,493		
Minimum Load	210 Average Load		
Electrical Rates			
Production Cost (kwh)	.59		
Residential Rate	.59		
Rate with PCE subsidy	.19		
Commercial Rate			
Fuel per kWh	.31		
Retail Fuel Prices			
	Commercial	**Residential**	**Senior**
Diesel		$7.96	
Gasoline		$7.85	
Propane 100# tank			
Coleman 16.4 oz. Disposable Bottle			
Alternative Energy			
Source	**Potential**	**Projects**	
Wind diesel	Medium to High	Wind resource conceptual design currently underway for site 1.5 miles NE of Stebbins on road to St. Michael. (AVEC/AEA)	
Solar	Medium		
Coal	Low		
Hydroelectric	Low		
Geothermal	Low		
Biomass	Medium		
Emerging Technologies	Unknown		
Bulk Fuel Tank Farm Inventory			
Tank owner	**Tank capacity/# of tanks/type of fuel/condition**		
AVEC	76,000/Diesel/Old		
Anthony A. Andrews School, Bering Strait School District	90,000/Diesel/New		
Crowley	32,000/Gasoline/Old		
Military & VA	10,000/Diesel/Old		
DOT	3,000/Diesel/Old		
Water & Sewer Infrastructure			
System type	**Residential**	**Commercial**	
Circulation/Vacuum sewer	81		
Honey-Bucket	Approx. 15		

Shaktoolik

Community and Energy Profile

COMMUNITY PROFILE – SHAKTOOLIK

Location: Shaktoolik is located on the east shore of Norton Sound. It lies 125 miles east of Nome and 33 miles north of Unalakleet.

Longitude/Latitude: -161.1539/64.3339

ANCSA Region: Bering Straits Native Corporation

AEA Region: Bering Strait

Economy: 122 residents employed: 44 in private sector, 78 in local government, and 0 in state government. The sale and importation of alcohol is banned.

Alaskan Native Name: Iyatayet, old village site Yupik name

Incorporation: 2nd Class City, 1969

Elevation: 24'

Historical Setting: Shaktoolik was the first and southernmost Malemiut settlement on Norton Sound, occupied as early as 1839. Twelve miles northeast, on Cape Denbigh, is "Iyatayet," a site that is 6,000 to 8,000 years old. Reindeer herds were managed in the Shaktoolik area around 1905. The village was originally located six miles up the Shaktoolik River and moved to the mouth of the river in 1933. This site was prone to severe storms and winds, however, and the village relocated to its present, more sheltered location in 1967.

Cultural Resources: Shaktoolik is a Malemiut Eskimo village with a fishing and subsistence lifestyle.

Community Plans: Local Economic Development Plan 2005-2010, Hazard Mitigation Plan 2013, Response Plan 2015, Hazard Mitigation Plan 2015

Local Contacts

Village Corporation: Shaktoolik Native Corporation; P.O. Box 46, Shaktoolik, AK 99771; Phone: 907-955-3241 Fax: 907-955-3243

City: City of Shaktoolik; PO Box 10, Shaktoolik, AK 99771;; Phone: 907-955-3441 Fax: 907-955-3221; Email: skkcity@arctic.net

Tribal: Native Village of Shaktoolik; P.O. Box 100, Shaktoolik, AK 997710100; Phone: 907-955-3701 Fax: 907-955-2352; Email: ksagoonick@kawerak.org Website: http://www.kawerak.org/tribalHomePages/shaktoolik/index.html

Demographics

	2000	2010		2000	2010
Total Population	230	282	Median Household Income		$29,219
Median Age of Total Population	25	27	Rate of Unemployment		28.3%
Average Household Size	4	4	Total Number of Housing Units	66	70

Infrastructure

	Description	Notes
Housing	70 Total, 64 Occupied, 0 Vacant	Bering Straits Regional Housing Authority
Water/Wastewater	Water pumped from 3 miles, treated, Piped system	Population served: 240
Power Generation	AVEC	Diesel generator
Landfill	Shaktoolik Landfill, Class 3, permitted	
Access	Shaktoolik Airport, gravel, fair condition	General Aviation Airport

Non-Residential Buildings and Facilities Energy Information

Name	Notes	Name	Notes
City Office		Covenant Church	
Health Clinic		Church rental unit	
Shaktoolik School	EECBG	Native Corp. Store	
Teen Center		Native Store (ANICA)	
Tribal Office Building		Morgue	
Water Treatment Plant	EECBG	School shop	
Washeteria		Code Red building	
Armory		DOT shop	
NSEDC fish plant			

ENERGY PROFILE – SHAKTOOLIK

Power Production

Utility owner/operator	AVEC		
	Make/model	**Size**	**Hours/Condition**
Generator – Kato, 6P4-1450	Detroit/60	207	Good
Generator – Kato, 4P2-1688	Detroit/60	363	Fair
Generator – Kato 4P3-1475	Cummins LTA-10	250	Poor
Heat Recovery	Planned heat recovery from wind		
Alternative Energy integration ready			
Back Up System	Yes		
Peak Electrical Load	307		
Average Electrical Load			
Annual community load (kwh)	836,251		

Electrical rates

Production Cost (kwh)	.61
Residential Rate	.57
Rate with PCE subsidy	.19
Commercial Rate	
Fuel per kWh	.33

Retail fuel prices

	Commercial	**Residential**	**Senior**
Diesel		5.82	
Gasoline		6.35	
Propane		$17.41/gallon	
Coleman 16.4 oz. Disposable Bottle			

Alternative Energy

Source	**Potential**	**Projects**
Wind diesel	High	AEA and AVEC constructed 2-turbine 200KW system in 2012. Native Store has 3 Skystreams.
Solar	Medium	
Coal	Low	
Hydroelectric	Low	
Geothermal	Low	
Biomass	Medium	80% use driftwood for heat
Emerging Technologies	Unknown	

Bulk Fuel Tank Farm Inventory

Tank owner	**Tank capacity**	**Condition**
AVEC	79,270/Diesel/Old	
Shaktoolik School	64,200/Diesel/Old	
Shaktoolik Native Corporation	196,200/Diesel/Old	

Water & Sewer Infrastructure

System type	**Residential**	**Commercial**
Shaktoolik Water System	240	

Stebbins

Community and Energy Profile

COMMUNITY PROFILE – STEBBINS

Location: Stebbins is located on the northwest coast of St. Michael Island, on Norton Sound. It lies 8 miles north of St. Michael and 120 miles southeast of Nome.

Longitude/Latitude: -162.2881/63.5222

ANCSA Region: Bering Straits Native Corporation

AEA Region: Bering Strait

Economy: 238 residents employed: 68 in private sector and 170 in local government.

Alaskan Native Name: Tapraq – first name recorded in 1900

Incorporation: 2nd Class City, 1969

Elevation: 19'

Historical Setting: Redoubt St. Michael was built at nearby St. Michael by the Russian-American Company in 1833. The Eskimo village of "Atroik" or "Atoka" was recorded north of here in 1898 by the U.S. Coast and Geodetic Survey. The Yup'ik name for the village is "Tapraq," and the name Stebbins was first recorded in 1900. The first U.S. Census occurred in 1950, indicating 80 Yup'ik Eskimos.

Cultural Resources: This Yup'ik Eskimo village has commercial fishing and subsistence lifestyle. The sale and importation of alcohol is banned.

Community Plans: Stebbins Comprehensive Plan 2012

Local Contacts

Native Corporation: Stebbins Native Corporation; P.O. Box 71110, Stebbins, AK 99671; Phone: 907-934-3074 Fax: 907-934-2399

City of: City of Stebbins; PO Box 22, Stebbins, AK 99671;; Phone: 907-934-3451 Fax: 907-934-3452; Email: stebbinscity@yahoo.com

Tribal: Stebbins Community Association; P.O. Box 71002, Stebbins, AK 99671; Phone: 907-934-3653 Fax: 907-934-3560; Email: tc.wbb@kawerak.org Website: http://www.kawerak.org/tribalHomePages/stebbins/index.html

Demographics

	2000	2010		2000	2010
Total Population	547	556	Median Household Income		$37,031
Median Age of Total Population	20	20	Rate of Unemployment		23%
Average Household Size	5	5	Total Number of Housing Units	134	153

Infrastructure

	Description	Notes
Housing	153 Total, 134 Occupied, 19 Vacant	Bering Straits Regional Housing Authority
Water/Wastewater	Stebbins Water Treatment System, surface water	Population served: 590
Power Generation	AVEC	Diesel Generator, PCE subsidized
Landfill	Stebbins Landfill, Class 3, permitted	
Access	Stebbins Airport, gravel, good condition	General Aviation Airport

Non-Residential Buildings and Facilities Energy Information

Name	Notes	Name	Notes
Stebbins K-12 School (Tukurngailnguq School)	AHFC	Water Treatment Plant	
IRA Office		Native Store	
City Office			
Post Office			
Power Plant			

ENERGY PROFILE – STEBBINS			
Power Production			
Utility owner/operator	AVEC		
	Make/model	**Size**	**Condition/Hours**
Generator	Cummins/ QSX15	500	
Generator	Cummins/ KTA19	350	
Generator	Cummins/ LTA10	250	
Heat Recovery	Y		
Alternative Energy integration ready			
Back Up System			
Peak Electrical Load	299		
Average Electrical Load			
Annual community load (kwh)			
Electrical rates			
Production Cost (kwh)	.56		
Residential Rate	.59		
Rate with PCE subsidy	.19		
Commercial Rate			
Fuel per kWh	.29		
Retail fuel prices			
	Commercial	**Residential**	**Senior**
Diesel		7.22	
Gasoline		7.47	
Propane 100# tank			
Coleman 16.4 oz. Disposable Bottle			
Alternative Energy			
Source	**Potential**	**Projects**	
Wind diesel	High	Ongoing wind study, approximate completion June 30, 2014. Wind resource conceptual design currently underway for site 1.5 miles NE of Stebbins on Rd to St. Michael (2013)	
Solar	Medium		
Coal	Low		
Hydroelectric	Low		
Geothermal	Low		
Biomass	Low		
Emerging Technologies	Unknown		
Bulk Fuel Tank Farm Inventory			
Tank owner	**Tank capacity**	**Condition**	
AVEC	320,500		
Tukurngailnguq School, Bering Strait School District	200,000		
Stebbins Native Corporation	109,600		
City of Stebbins	41,900		
Water & Sewer Infrastructure			
System type	**Residential**	**Commercial**	
Self-Haul	590		
Honey-Bucket	590		
Stebbins Water Treatment System	590		

Unalakleet

Community and Energy Profile

COMMUNITY PROFILE – UNALAKLEET

Location: Unalakleet is located on Norton Sound at the mouth of the Unalakleet River, 148 miles southeast of Nome and 395 miles northwest of Anchorage.

Longitude/Latitude: -160.7881/63.8731

ANCSA Region: Bering Straits Native Corporation

AEA Region: Bering Strait

Economy: The local economy is the most active in Norton Sound, along with a traditional Unaligmiut Eskimo subsistence lifestyle. Fish, seal, caribou, moose, and bear are utilized. The sale and importation of alcohol is banned. 382 residents employed: 186 in private sector, 188 local government, and 8 in state government.

Alaskan Native Name and Definition: Unalakleet, "from the southern side"

Incorporation: 2nd Class City, 1974

Elevation: 27'

Historical Setting: Archaeologists have dated house remnants along the beach ridge from 200 B.C. to 300 A.D. Unalakleet has long been a major trade center as the terminus for the Kaltag Portage, an important winter travel route connecting to the Yukon River. Indians on the upper river were considered "professional" traders with a monopoly on the Indian-Eskimo trade across the Kaltag Portage. The Russian-American Company built a post here in the 1830s. In 1898, reindeer herders from Lapland were brought to Unalakleet to establish sound herding practices. In 1901, the Army Signal Corps built over 605 miles of telegraph line from St. Michael to Unalakleet, over the portage to Kaltag and Fort Gibbon.

Cultural Resources: Unalakleet has a history of diverse cultures and trade activity.

Community Plans: Unalakleet Local Economic Development Plan 2014-2019

Local Contacts

Native Corporation: Unalakleet Native Corporation; P.O. Box 100, Unalakleet, AK 99684; Phone: 907-624-3411 Fax: 907-624-3833

City of: City of Unalakleet; PO Box 28, Unalakleet, AK 99684; Phone: 907-624-3531 Fax: 907-624-3130; Email: counk@alaska.com

Tribal: Native Village of Unalakleet; P.O. Box 270, Unalakleet, AK 99684; Phone: 907-624-3622 Fax: 907-624-3621; Email: tc.unk@kawerak.org Website: http://www.unalakleet.net

Demographics

	2000	2010		2000	2010
Total Population	747	688	Median Household Income		$50,625
Median Age of Total Population	31	31	Rate of Unemployment		14.9%
Average Household Size	4	4	Total Number of Housing Units	242	268

Infrastructure

	Description	Notes
Housing	268 Total, 225 Occupied, 43 Vacant	Bering Straits Regional Housing Authority
Water/Wastewater	Unalakleet Water Treatment System, Groundwater under direct influence of surface water	Population served: 757
Power Generation	Unalakleet Valley Electric Cooperative	Diesel generator, wind turbine
Landfill	Unalakleet Landfill, Class 3, permitted	
Access	Unalakleet Airport, 2 runways, asphalt, excellent condition	Commercial Service

Non-Residential Buildings and Facilities Energy Information

Name	Notes	Name	Notes
Unalakleet Elementary	AHFC		

ENERGY PROFILE – UNALAKLEET			
Power Production			
Utility owner/operator	Unalakleet Valley Electrical Cooperative		
	Make/model	**Size**	**Condition/Hours**
Generator	Cat/ 3456	455	Excellent/8400 hours
Generator	Cat/ 3456	455	Excellent/8366 hours
Generator	Cat/ 3456	455	Excellent/14176 hours
Generator	Cat/ 3456	455	Excellent10096 hours
Heat Recovery	Yes, BSSD, City Shop, Water Plant, Trash Bailer		
Alternative Energy integration ready	Yes, 6 wind turbines integrated into current power generation		
Back Up System	Yes		
Peak Electrical Load	Unknown		
Annual community load (kwh)	4,269,013		
Electrical rates			
Production Cost (kwh)	.50		
Residential Rate	.42		
Rate with PCE subsidy	.21		
Commercial Rate			
Fuel per kWh	.20		
Retail fuel prices			
	Commercial	**Residential**	**Senior**
Diesel		$6.62	
Gasoline		$6.62	
Propane 100# tank			
Alternative Energy			
Source	**Potential**	**Projects**	
Wind diesel	High	AEA and Unalakleet Valley Electric Cooperative constructed a 6-turbine system, with boiler and heat recovery loop. (2009)	
Solar	Medium		
Coal	Low		
Hydroelectric	Low		
Geothermal	Low		
Biomass	Low		
Emerging Technologies	Unknown		
Bulk Fuel Tank Farm Inventory			
Tank owner	**Tank capacity**	**Condition**	
Unknown. Co-op	787,300 DIESEL	Unknown	
Unknown. Co-op	508,400 AVGAS Jet A	Unknown	
Unknown. Co-op	141,300 GASOLINE	Unknown	
Water & Sewer Infrastructure			
System type	**Residential**	**Commercial**	
Unalakleet Water Distribution System, Class 2	203		
Unalakleet Water Treatment System, Groundwater, Class 2	757		
Unalakleet Wastewater Collection System	203		
Unalakleet Wastewater Treatment System	203		

4.3.1 Energy Issues

All the communities in the Southeast sub-region would benefit from and have identified a need for energy efficient homes, either new or upgraded.

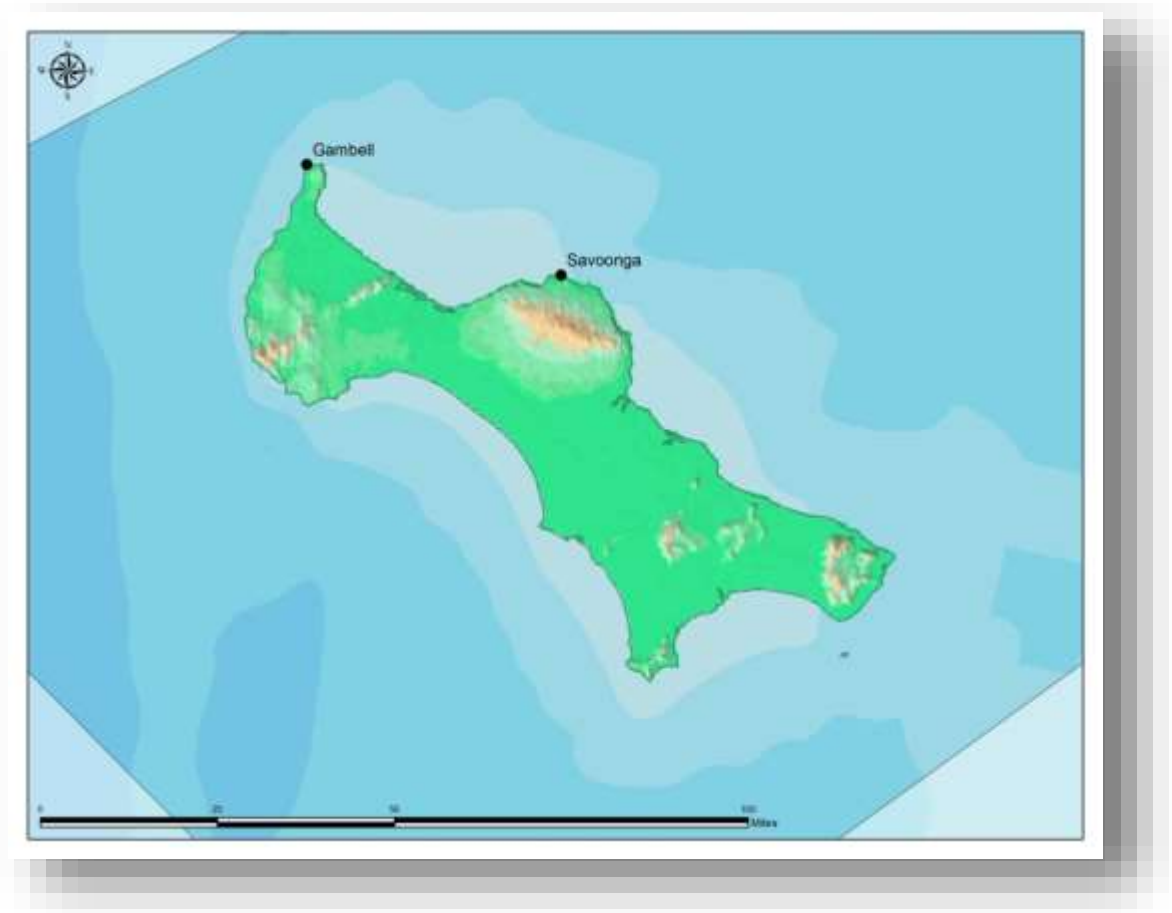
Three of the four community schools in this sub-region have had energy audits by AHFC which should be used in upgrading the schools appropriately. Additional energy audits were completed for three buildings in Shaktoolik: water treatment plant, health clinic and tribal office. A comprehensive list of audits and action items identified in these audits could help shape future auditing and capital investment planning. This analysis should also include waste heat recovery systems and capital improvements.

AVEC erected a met tower in a location later identified as a suitable site for gravel extraction. An alternate met tower site is needed.

4.4 Saint Lawrence Island Sub-Region

The Saint Lawrence Island Sub-Region contains two communities - Gambell and Savoonga. Gambell is located on the northwest cape of Saint Lawrence Island, 200 miles southwest of Nome, in the Bering Sea and 36 miles from the Chukotka Peninsula, Siberia. Savoonga is located on the northern coast of Saint Lawrence Island in the Bering Sea, 164 miles west of Nome and 39 miles southeast of Gambell. Figure 4-5 shows the two communities on Saint Lawerence Island.

Figure 4-5: Saint Lawrence Island Sub-Region



Gambell

Community and Energy Profile

COMMUNITY PROFILE – Gambell

Location: Gambell is located on the northwest cape of St. Lawrence Island, 200 miles southwest of Nome, in the Bering Sea. The city is 36 miles from the Chukotka Peninsula, Siberia.

Longitude/Latitude: 63.7797/-171.7411

ANCSA Region: Bering Straits Native Corporation

AEA Region: Bering Strait

Economy: Subsistence based upon harvests from sea: seal, walrus, fish, and bowhead and gray whales. Ivory carving is popular source of income. Bird-watching provides an opportunity for limited tourism. 254 residents employed, 66 in private sector, 185 in local government, and 3 state government.

Alaskan Native Name and Definition:

Incorporation: 2nd Class City

Elevation: 0.0

Historical Setting: St. Lawrence Island has been inhabited intermittently for the past 2,000 years by Yup'ik Eskimos. In the 18th and 19th centuries, over 4,000 people inhabited the island in 35 villages. Sivuqaq is the Yup'ik name for the village and for the island. The city was renamed for Mr. and Mrs. Vene C. Gambell, missionaries to the town. A tragic famine between 1878 and 1880 decimated the population. In 1900, reindeer were introduced to the island for local use, and in 1903 President Roosevelt established a reindeer reservation. During the 1930s, some residents moved to Savoonga to establish a permanent settlement there. The city was incorporated in 1963.

Cultural Resources: The isolation of Gambell has helped to maintain their traditional St. Lawrence Yup'ik culture, their language, and their subsistence lifestyle, which is based on marine mammals. Residents are almost completely bilingual. Walrus-hide boats are still used to hunt.

Community Plans: Gambell Local Economic Development Plan 2012-2017

Local Contacts

Village Corporation: Sivuqaq, Inc. Box 101, Gambell, Alaska 99742 Phone: 907-985-5826 Fax: 907-985-5426

City: City of Gambell, Box 189, Gambell, Alaska 99742 Phone: 907-985-5112 Fax: 907-985-5927 Email: cityofgambell@yahoo.com

Tribal: Native Village of Gambell, Box 90, Gambell, Alaska 99742 Phone: 907-985-5346 Fax: 907-985-514 Email: nvg90@yahoo.com

Demographics

	2000	2010		2000	2010
Total Population	649	681	Median Household Income		$30,833
Median Age of Total Population	26	26	Rate of Unemployment		31%
Average Household Size	5	5	Total Number of Housing Units	187	200

Infrastructure

	Description	Notes
Housing	200 housing units, 164 occupied, 36 vacant	Bering Strait Regional Housing Authority (BSRHA)
Water/Wastewater	Piped, 102 connections	City of Gambell owned
Power Generation	Diesel generators, AVEC owned, PCE subsidized	AEA and AVEC constructed 3-turbine 300kW system. (2010)
Landfill	Not permitted, Class III	City of Gambell owned
Access	Asphalt runway, 4,499'x96', condition fair	SOA DOT owned

Non-Residential Buildings and Facilities Energy Information

Name	Notes	Name	Notes
Gambell School	AHFC audit	Water Treatment Plant	EECBG
Tribal Office	EECBG		

ENERGY PROFILE – Gambell			
Power Production			
Utility owner/operator	AVEC		
	Make/model	**Size**	**Year/Condition/Hours**
Generator – Kato 6P4-1900	Cummins KTA 19G2	271	Unknown
Generator – Newage HC1540C	Cummins QSX 15	499	Unknown
Generator – Newage 750ROZD4	MTU 12V2000	710	Unknown
Heat recovery	No		
Alternative energy integration ready	Yes, AEA and AVEC constructed 3-turbine 300kW system. (2010)		
Back Up system	Yes		
Peak Electrical Load	499 (AVEC 2014)		
Annual Community Load (kwh)	1,883,105		
Minimum Load	228		
Electrical rates			
Production cost (kwh)	.50		
Residential rate	.54		
Rate with PCE subsidy	.19		
Commercial rate			
Fuel per kwh	.22		
Retail Fuel Prices			
	Commercial	**Residential**	**Senior**
Diesel		$7.22	
Gasoline		$7.81	
Propane 100# tank			
Coleman 16.4 oz. Disposable bottle			
Alternative Energy			
Source	**Potential**	**Projects**	
Wind diesel	High	AEA and AVEC constructed 3-turbine 300kW system. (2010)	
Solar	Medium		
Coal	Low		
Hydroelectric	Low		
Geothermal	Low		
Biomass	Low		
Emerging technologies	Unknown		
Bulk Fuel Tank Farm Inventory			
Tank owner	**Tank capacity/# of tanks/type of fuel/condition**		
Gambell School	44,600/Diesel/new 2006		
AVEC	240,900/Diesel/new 2006		
Gambell IRA Council	332,400/Diesel/1998 – certified 2006		
City of Gambell	55,300/Gasoline/1998 – certified 2006		
Water & Sewer Infrastructure			
System type	**Residential**	**Commercial**	
Circulating/Gravity	102		

Savoonga

Community and Energy Profile

COMMUNITY PROFILE – SAVOONGA

Location: Savoonga is located on the northern coast of St. Lawrence Island in the Bering Sea, 164 miles west of Nome. It lies 39 miles southeast of Gambell.

Longitude/Latitude: -170.4789/63.6942

ANCSA Region: Bering Straits Native Corporation

AEA Region: Bering Strait

Economy: It is a traditional St. Lawrence Yup'ik village with a subsistence lifestyle based on walrus and whale hunting. Savoonga is hailed as the "Walrus Capital of the World. The sale, importation, and possession of alcohol is banned in the village. 268 residents employed; 100 in private sector, 167 in local government, and 1 in state government.

Incorporation: 2nd Class City, 1969

Elevation: 59'

Historical Setting: St. Lawrence Island has been inhabited intermittently for the past 2,000 years by Yup'ik Eskimos. The island had numerous villages with a total population of around 4,000 by the 19th century. A tragic famine occurred on the island between 1878 and 1880, severely reducing the population. A reindeer camp was established in 1916 at the present village site. Good hunting and trapping in the area attracted more residents. A post office was established in 1934. When the Alaska Native Claims Settlement Act (ANCSA) was passed in 1971, Gambell and Savoonga decided not to participate and instead opted for title to the 1.136-million acres of land in the former St. Lawrence Island Reserve. The island is jointly owned by Savoonga and Gambell.

Cultural Resources: Whale, seal, walrus, and reindeer comprise 80% of islanders' diets. Due to the island's isolation, most residents are bilingual -- Siberian Yup'ik is still the first language. Islanders today have successfully mixed the past with the present.

Community Plans: Hazard Mitigation Plan 2012, Community Strategic Development Plan 2004-2009, Local Economic Development Plan 2009-2013.

Local Contacts

Village Corporation: Kukulget, Inc.; PO Box 160, Savoonga, AK, 99769; Phone: 907-984-6184 Fax: 907-984-6185; Email: tc.sva@kawerak.org

City: City of Savoonga; PO Box 40, Savoonga, AK 99769; Phone: 907-984-6614 Fax: 907-984-6301; Email: cityofsva@gmail.com

Tribal: Native Village of Savoonga; P.O. Box 120, Savoonga, AK 99769; Phone: 907-984-6414 Fax: 907-984-6027; Email: stoolie@kawerak.org Website: http://www.kawerak.org/tribalHomePages/savoonga/index.html

Demographics

	2000	2010		2000	2010
Total Population	643	671	Median Household Income		$30,313
Median Age of Total Population	26	23	Rate of Unemployment		17.6%
Average Household Size	5	5	Total Number of Housing Units	160	185

Infrastructure

	Description	Notes
Housing	185 Total, 166 Occupied, 19 Vacant	Bering Straits Regional Housing Authority
Water/Wastewater	Savoonga Water Treatment System, Groundwater	Population Served: 671
Power Generation	AVEC	Diesel generator, PCE subsidized
Landfill	Savoonga Landfill, Class 3, not permitted	
Access	Savoonga Airport, gravel, good condition	Commercial Service

Non-Residential Buildings and Facilities Energy Information

Name	Notes	Name	Notes
City Hall		Fish Processing Plant	NSEDC
Tribal Office			
Presbyterian Church			
School			
Old Clinic			
New Clinic			
New Store			
Water Treatment Plant			

ENERGY PROFILE – SAVOONGA			
Power Production			
Utility owner/operator	AVEC operated, City owned		
3 operators trained	**Make/model**	**Size**	**Condition/Year/Hours**
Generator	Detroit 60	363	Fair
Generator	Detroit QSX15-G9	500	Fair
Generator	Detroit QSX23-G1	600	Excellent
Heat Recovery	Yes – Living quarters and storage		
Alternative Energy integration ready	Yes - AEA and AVEC constructed 2-turbine 200KW system. (2010)		
Back Up System	Yes		
Peak Electrical Load	407		
Annual Load	2,184,840		
Minimum Load	248 Average load		
Electrical Rates			
Production Cost (kwh)	.55		
Residential Rate	.54		
Rate with PCE subsidy	.19		
Commercial Rate			
Fuel per kWh	.28		
Retail Fuel Prices			
	Commercial	**Residential**	**Senior**
Diesel		$6.77/gal	
Gasoline		$7.32/gal	
Propane 100# tank		$400.00	
Coleman 16.4 oz. Disposable Bottle			
Alternative Energy			
Source	**Potential**	**Projects**	
Wind diesel	High	AEA and AVEC constructed 2-turbine 200KW system. (2010)	
Solar	Medium		
Coal	Low		
Hydroelectric	Low		
Geothermal	Low		
Biomass	Low		
Emerging Technologies	Unknown		
Bulk Fuel Tank Farm Inventory			
Tank owner	**Tank capacity (# of tanks/type of fuel)**		
Hogarth Kingeekuk Sr. Memorial School	81,000/Diesel/new 2008		
AVEC	216,000/Diesel/new 2008		
Savoonga Native Store	306,000/Gasoline, 27000 Diesel tank		
City of Savoonga	148,501/Diesel/new 2008, 2-25000 Diesel tanks		
Water & Sewer Infrastructure			
System type	**Residential**	**Commercial**	
Circulating/Vacuum Utilidor system	162		
Haul Water/honey buckets	32		

4.4.1 Energy Issues

Like much of the Bering Strait region, this sub-region faces many energy challenges. The isolation of the island makes the cost of energy one of the highest in the region, the state and in the nation.

Other issues cited during the SAG meetings include the lack of energy efficient housing, home energy audits and energy efficiency education. They also have indicated they lack grant writers to assist in the submission and management of energy grants. AVEC has indicated a need for heat recovery systems, wind turbine improvements and the need for operator training to run the power plant more efficiently. While there was support for an additional wind turbine, the USWS and FAA do not support this.

4.5 Nome Sub-Region

The Nome Sub Region consists of Council, King Island Native Community, Nome Eskimo Community, and Solomon. The Native Village of Mary's Igloo is also located within this sub-region. Mary's Igloo members reside primarily in Teller and their lands are located near Pilgrim Hot Springs. King Island tribal members live in Nome. Solomon and Council are primarily seasonal communities whose citizenry reside in Nome or elsewhere most of the year. Figure 4-6 shows the communities in the Nome sub-region.

Figure 4-6: Nome Sub-Region

Nome

Community and Energy Profile

COMMUNITY PROFILE – Nome

Location: Nome was built along the Bering Sea on the south coast of the Seward Peninsula, facing Norton Sound. Nome is a city in the Nome Census Area in the Unorganized Borough of the U.S. state of Alaska. The city is located on the southern Seward Peninsula coast on Norton Sound of the Bering Sea.

Longitude/Latitude: 64 degrees 30 minutes north, 165 degrees 25 minutes west

ANCSA Region: Bering Straits Native Corporation

AEA Energy Region: Bering Strait

Incorporation: 1st Class City, 1909

Elevation: 19'8", on Norton Sound

Historical Setting: Gold was found as far back as 1865 by Western Union surveyors.

Cultural Resources: Malemiut, Kauweramiut, and Unklikmiut Eskimos have occupied the Seward Peninsula historically.

Community Plans: Bering Strait Comprehensive Plan 2009-2013
Local Hazards Mitigation Plan 2008
Long Range Transportation Plan Update 2013
Nome Eskimo Community Strategic Plan 2009
Nome Native Community Strategic Development Plan 2004-2009
Northwest Area Transportation Plan 2003

Economy: Government services provide the majority of employment. Nome is the hub for supply, service and transportation for the 15 surroundings villages. Retail services, mining, medical and private business add to the year-round income. Several small gold mines also provide some employment. 1,717 residents employed: 1,246 in private sector, 262 in local government, and 209 in state government.

Local Contacts

City of Nome Box 281 Nome, AK 99762 Denise Michels, Mayor Phone: 907-443-6663 Fax: 907-443-5345
Email: tmoran@nomealaska.org Website: http://www.nomealaska.org/

Nome Eskimo Community Box 1090 Nome, AK 99762 Phone: 907-443-2246 Fax: 907-443-3539
Email: nomeeskimo@gci.net Website: http://www.necalaska.org/

Demographics

	2000	2010		2000	2010
Total Population	3505	3598	Median Income	$31,695	$71,516
Median Age of Total Population	33	36	Rate of Unemployment	6.1%	9.78%
Average Household Size	3	4	Total Number of Housing Units	1,356	1,503

Infrastructure

	Description	Notes
Housing	1,503 housing units	Bering Strait Housing Authority
Water/Wastewater	Ground water, moonlight springs, provided by 3 artesian wells Buried piped system	Located north of Nome, Anvil Mountain 6 water delivery customers
Power Generation	Nome Joint Utilities	
Landfill	Nome Municipal Landfill, Class 2, permitted	
Access	Nome Airport—Paved runway 2 miles west of Nome Nome City Field - gravel good condition	Scheduled jet service Small aircraft

Non-Residential Buildings and Facilities Energy Information

Name	Notes	Name	Notes
Icy View Fire Station	AHFC		
Nome City Hall and Senior Center	AHFC		
Nome Community Recreation Center	AHFC		
Nome Public Works Building	AHFC		
Nome Volunteer Fire Station	AHFC		
Our Savior's Lutheran Church	ACEA		
Ublugiaq Building	ACEA		

ENERGY PROFILE – Nome

Power Production

Utility owner/Operator	Nome Joint Utilities Services (NJUS)		
	Make/Model	**Size**	**Condition/Year/Hours**
Generator	Wärtsilä 12V32 (2)	5211 kW	2005
Generator	CAT 3616	3660 kW	1991
Generator	CAT 3516B	1875 kW	1999
Generator	CAT 3456	400 kW	2005
Heat Recovery	Y		
Alternative Energy integration ready	Y		
Backup up system			
Peak Electrical Load	5787		
Annual Community Load (kwh)	22,850,508		

Electrical Rates

Production Cost	.4105
Residential Rate	.4066
Rate with PCE Subsidy	(.4066-.1775) = .2291
Commercial Rate	.4066
Fuel per kWh	.2123

Fuel Prices (10/01/14)

	CROWLEY	**BONANZA**	**SENIOR**
Diesel	$5.99/gal	$5.93/gal	N/A
Gasoline	$6.04/gal	$5.56/gal	N/A
Propane 100# tank	$179.00	$185.00	N/A

Alternative Energy

Source	**Potential**	**Projects**
Wind Diesel	High	Banner Wind Farm 900kW-1.8 mW-NJUS
Solar	High	BSNC 16.8kW installed capacity
Coal	Low	
Hydroelectric	Low/Medium	
Geothermal	Medium/High	Pilgrim Hot Springs
Biomass	Low/Medium Potential	Bulk purchase of pellets
Emerging Technologies	Unknown	

Bulk Fuel Tank Farm Inventory

Tank Owner	**Tank capacity (# of tanks/type of fuel)**
Nome Joint Utility System	2,520,000 capacity – DIESEL #2
Bonanza Fuel	
Crowley	

Water & Sewer Infrastructure

Utility owner/operator	NJUS	
System Type	**Residential**	**Commercial**
Underground Piped Water & Sewer	Approximately 1,980 customers	
Trucked Water	6 (estimated)	

4.5.1 Energy Issues

Fuel costs are high in part because of the limited window when fuel is available. In the fall of 2011, a fuel barge with more than 1 million gallons did not arrive as expected. Without the fall shipment, Nome would have run out of fuel in the spring. A 370-foot tanker brought fuel and averted the crisis. It began its journey from Russia in mid-December, picking up diesel fuel in South Korea before heading to Dutch Harbor, Alaska, where it took on unleaded gasoline. It arrived in January. Hauling equipment and supplies available to transport fuel are also limited.

The Alaska Center for Energy and Power (ACEP), in collaboration with the Geophysical Institute, is conducting tests at Pilgrim Hot Springs, located about 60 road miles north of Nome, which they hope will be able to assess the feasibility of developing this site to benefit the region and its residents. The project includes a comprehensive economic analysis of a variety of potential options for developing the springs. Options include a large scale power generation project to support the region as well as direct use, such as a greenhouse to supply fresh produce to the region. Partners in the project include owners of adjacent land: Unaatuq LLC, the property owner, Mary's Igloo Native Corporation (MINC) and the Bering Straits Native Corporation (BSNC).

The new hospital in Nome is reported to be consuming 3,500 gallons of heating fuel per week in the winter.

5 Implementation Plan

5.1 Prioritized Project Action list

In addition to energy actions identified in the sub-regional energy action tables, regional priority energy actions were identified from the AEA Community Deployment scenarios, stakeholder interviews and input from the public meetings. The priorities were categorized into immediate (0-1 year), short term (1-5 years), medium term (5-10 years), and long term (10-20 years). As the list was developed from information supplied by stakeholders, it is important to note that, as part of Phase III, projects will be reviewed by technical experts as well as the SAG, and revised according to input.

The regional and community energy projects are shown in Table 5-1. The table categorizes the project by the type of action shown as:

- Data Collection
- Program Development
- Training and Education
- Coordination
- Energy Efficiency
- Wind
- Solar
- Biomass
- Hydrokinetic
- Fuel Storage

Table 5-1 also shows estimated costs and potential partners, defined as those that have an interest in collaborating on the project. Also shown is the level of support which indicates who currently has stepped forward to support the project. The next steps shown indicate what needs to be done to keep the project moving.

Larger, longer-term projects could significantly reduce energy costs in the region. These projects include a spur line from the North Slope to the region, a deep water port in Nome or Kotzebue and a road to Nome from the Dalton Highway. It is important that the SAG stay engaged in on-going discussions of these projects with longer lead times. Opportunities to participate in public meetings, teleconferences and provide comments on planning documents are important to ensure that the region has input into the project development phases.

Potential sources, opportunities, and constraints for energy project funding are presented in Appendix D.

5.2 Assumptions

The following assumptions were developed to assist in evaluating project feasibility and costs. .

Fuel and Electricity

- Diesel will remain major source of energy.
- Fuel and Electricity cost will continue to rise.

- Costs continue to be impacted by the varying time intervals between the placement of orders, timing of departures of fuel deliveries from refineries, fuel storage inventories in communities, distances between refineries, fuel distributors and community storage facilities.
- No new major source of oil is discovered that could offset costs.
- Assume ISER fuel projection and methodology for calculating the B/C ratios.
- Small cordwood systems: $500 per year for maintenance plus labor costs for 1 hour per day to stock the boiler (usually added to an existing job).
- Large systems: Annual maintenance costs of 2% of capital costs.
- PCE will continue, but other subsides will be reduced.
- Costs for communities with more fuel storage will see a savings.
- State and federal dollars for energy projects will decline.
- Larger portion of diesel fuel costs will be replaced by alternative energy.

Cost and performance of proven and emerging tech

- Costs decrease as more system become operational and the "bugs" are worked out.
- More technologies are tested and are scaled to work in rural Alaska.
- Alternative energy systems become more efficient and affordable.

Transportation and Construction

- The more remote communities will see bigger impacts due to fuel cost increases (Diomede and St. Lawrence Island).
- Bypass Mail will increase transportation costs.
- No road to Nome within planning horizon.

Construction and replacement cost of existing energy generation and storage

- Cost will continue to rise for parts and complete replacements.
- Fuel tank replacement costs will rise and available funding for bulk fuel tanks will be harder to come by.

Maintenance and Operations

- Assume that more people will get trained and gain experience in maintaining and operating the systems, but turnover and system sophistication will continue to hamper reliable maintenance and operation.

Building and Energy Use Efficiency

- Assume building and end-use efficiency and weatherization continue to improve.
- Assume average potential annual savings of 30% for economic energy efficiency measures. On average, achieving this level of savings requires an investment of $6 - $7 per square foot or $17k per unit.

Table 5-1: Regional Priority Energy Actions

Action Type	Project	Estimated Costs	Potential Partners	Next Steps	Schedule	Project Status
Data collection	Collect community wide energy end use data for electricity and space heating	$10k per Community	AEA, NSEDC, Utilities	Identify project champion	Short	Identified
	Identify water and sewer infrastructure improvements to reduce energy use	$18k per Community	ANTHC/ARUC, VSW	Coordinate with ANTHC/ARUC	Short	On-Going
	Complete Energy Audits – home, public and commercial buildings	Unknown	AEA	Inventory missing audits	Short	On-Going
Training and Education	Implement K-12 Alaska Smart Energy curriculum.	Unknown	BSSD, NSD, UAF, Kawerak, AEA, DOE	Lobby School Districts to include energy education in schools	Short, Medium, Long	Identified
	Provide training to prepare workforce for near term jobs in the energy sector and to improve operator knowledge to operate energy systems more efficiently	Approx. $2,500-$10,000/ class	SAG., ACEP, UAF, AEA, DOE	Identify interested students, seek funding	Short	Identified
	Seek funding from a variety of sources	N/A	SAG, Kawerak	Provide energy specific information to grant writers	Short	Identified
	Conduct Village Energy Planning workshops	$5k per Community	Kawerak	Identify project champion, develop schedule, agenda, participants, etc.	Short	On-Going
Collaboration	*Region-Wide* - Collaborate with regulatory agencies to overcome energy project development hurdles	N/A	Steering C.,	Identify Project Champion, contact agencies	Short, Medium, Long	On-Going
	Region-Wide - Participate in discussions regarding long term projects that could benefit energy users such as regional deep water port, a natural gas fired power plant in Prudhoe Bay with statewide transmission, etc.	N/A	SAG, City, Tribes, State, BSNC	Identify Project Champion, prepare list of projects and contacts	Short, Medium, Long	On-Going
	Region-Wide - Maintain an on-going dialogue with higher education institutions regarding potential pilot energy projects	N/A	UAF	Identify Project Champion, prepare list of contacts, set up meetings	Short, Medium, Long	Identified

Action Type	Project	Estimated Costs	Potential Partners	Next Steps	Schedule	Project Status
Energy Efficiency	*Region-Wide* - Replace street lights with LED street lights	$5k per Community for inventory	Utilities, Tribes	Identify project champion, meet with utility, conduct inventory	Short-Medium	Identified
	Region-Wide - Develop appliance replacement program	Approx. $5k per house	AEA, DOE, Kawerak, NSEDC	Identify Project Champion, research funding	Short, Medium	Identified
	Region-Wide - Design and construct energy efficient prototype home	$250-$300k per house	HUD, CCHRC, NIHA, UAF	Identify Project Champion, contact CCHRC, identify funding source	Short, Medium	Identified
	Region-Wide - Encourage use of 'green', climate appropriate, building technology in all new construction including schools and housing.	N/A	SAG, ACEP, UAF, NIHA, BSSD, NSD	Identify project champion, meet with NIHA, School Districts	Short, Medium, Long	Identified
	Region-Wide - Promote the full utilization of the heating assistance program	N/A	DHOUSEHOLDSS	Identify project champion	Short	On-Going
	Region-Wide - Implement home and commercial energy audit recommendations	Unknown	AEA	Identify project champion	Short, Medium	On-Going
	Region-Wide - Reduce energy consumption in sewer and water systems	Varies	ANTHC	Seek funding to conduct analysis of W/S energy use in all communities	Short	On-Going
	Brevig Mission and Teller –Repair Intertie	$1.25 M	AVEC, Local support	Coordinate with funding agencies	Short	On-Going
	Elim Diomede, Golovin, Koyuk, Shaktoolik, Shishmaref, *Stebbins, Wale, White Mountain, Unalakleet*- Heat Recovery System Upgrade	$355 -Elim $155k -Diomede, $327 -Shishmaref $435,000 -Koyuk $250,000 –Shaktoolik Stebbins - $1.3m $182k –Wales $120,000 -White. $1.28 M - Unalakleet	ANTHC	Complete project	Short	On-Going
	Wales – Upgrade the Power Plant	$1.2m	ANTHC	Apply for funding	Short, Medium	On-Going
	Teller – Install back up power plant	Unknown	AVEC	Apply for funding	Short, Medium	On-Going
	Golovin – Complete wind feasibility study	Unknown		Apply for funding	Short, Medium	On-Going

Action Type	Project	Estimated Costs	Potential Partners	Next Steps	Schedule	Project Status
Energy Efficiency	*Region-wide* - Weatherize residential units	$30,000 per house	E. Steering Committee, Local Support	Identify Project Champion, research funding	Short, Medium, Long	On-Going
	Region wide – Solar PV at Water Treatment Plant	$75,000 each	ANTHC	Identify Project Champion, research funding	Short	Identified
	Region-wide – Support continuation of VEEP	N/A	Energy Steering C	SAG to write letter of support, identify supporters	Short	Identified
	Stebbins – Construct new power plant	$3.5m	AVEC	Complete project	Short, Medium	On-Going
	St Michael – install waste burner at IRA building	$50,000	Tribe	Apply for funding	short	Identified
	Region-wide - Analyze sewer and water deficiencies	$15,000 per community	ANTHC	Identify Project Champion, seek funding	Short, Medium	Identified
	Region-wide - Develop building energy standards for the region	Unknown	E. Steering Committee, AEA, Housing Authority	Identify Project Champion, research funding	Short, Medium, Long	Identified
	Region-wide – Analyze and improve energy efficiency in non-residential buildings	Unknown	E. Steering Committee, Local Support	Identify Project Champion, research funding	Short, Medium, Long	Identified
Wind	*Brevig Mission* –Conduct Wind Feasibility Study	$150,000	AEA, AVEC	Identify Project Champion, research funding	Short, Medium	Identified
	Diomede, Gambell – Install wind turbine if allowed by USFWS and FAA.	N/A	USFWS, FAA, Gambell, Diomede Govt.	Identify project champions, Set up meeting with USWS and FAA on wind turbine siting	Short	Identified
	Diomede – Complete Wind Study	$150,000	AEA, Diomede Electric	Identify Project Champion, research funding	Short	On-Going
	Elim - Install wind turbine			Identify Project Champion, research funding	Medium, Long	Identified
	Gambell - Convert *excess w*ind energy for residential heat	$420,000	AVEC	Complete study	Short	On-Going
	Nome - Capture Excess Wind Energy to heat project	Unknown	NJUS	Apply for funding	Short	Identified

Action Type	Project	Estimated Costs	Potential Partners	Next Steps	Schedule	Project Status
Wind	*St Michael, Stebbins* - Complete wind turbine final design/construction					
	St Michael and Stebbins - Install additional wind turbines in with heat recovery				Short-Medium	
	Shaktoolik – Complete surplus wind energy recovery study for Water system heat	$250,000	AEA, AVEC		Short, Medium	On-Going
	Shishmaref, Wales - Wind Feasibility Study and Conceptual Design	$142,500 ea.	AEA, AVEC	Identify Project Champion, research funding	Short, Medium	On-Going
	Unalakleet – Complete repairs to 2ndary load system and low voltage on transmission line	$200,000	Utility	Conduct turbine efficiency study to determine needed improvements	Short	On-Going
	Unalakleet – install additional wind turbines	Unknown	Utility	Conduct Feasibility study	Medium	Identified
	Wales – Replace wind turbines	Unknown	KEA (current turbines), AVEC (new ones)		Medium	On-Going
Solar	*Region-wide* - Install Solar PV at Power Plants	$75,000 each	Utilities, ANTHC, DOE,AEA,	Identify Project Champion	Short	Identified
Biomass	*Elim, Koyuk, Shaktoolik, Unalakleet, White Mtn.,* - Develop Biomass Projects	$50,000 each for study	AEA, DNR	Identify Project Champion, contact DNR, Conduct Biomass Study	Short, Medium, Long	Identified
	Elim - install woody biomass boilers					Identified
	Koyuk – Install biomass for public buildings					Identified
Hydrokinetic	*Brevig Mission , Diomede*, *Golovin, St. Michael, Teller* – Study potential for hydrokinetic projects	$150,000 each	AEA, Utilities	Apply for funding for feasibility studies	Short, Medium	Identified
Geothermal	*Elim* - Geothermal development	Unknown	AEA, ACEP , local govt.	Collect Water temp data and samples and deliver to UAF, make request to AEA for pilot study	Short, Medium, Long	Identified
	Pilgrim Hot Sprints – Geothermal development	$60 m	SAG, ACEP, UAF, NIHA, BSSD, NSD, Mary's Igloo	Complete PHS geothermal study and seek funding for conceptual design phase	Short, Medium, Long	Identified

Action Type	Project	Estimated Costs	Potential Partners	Next Steps	Schedule	Project Status
Fuel Storage	*Teller – Community* Bulk fuel storage	Unknown	AVEC	Apply for AEA or DCEED revolving loan funding	Short	Identified
Transportation	*Region-wide* - Feasibility Study for Port at Cape Darby	$250,000	DOT&PF, BSNC	Identify Project Champion, apply for feasibility study funds	Medium, Long	Identified
	Nome Access Road – Continue participation in on-going discussions	N/A	DOT&PF, Kawerak, BSNC, local governments	Continue attending meetings and teleconference to learn of project updates	Short, Medium, Long	On-0going

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Appendix B. Energy Funding Opportunities

The majority of energy funding resources accessed for Alaska projects come from either the State of Alaska or from U.S. Department of Energy. AHFC funds energy efficiency projects for residences, businesses, and buildings owned by municipalities and educational entities, such as the University of Alaska Anchorage. AEA provides energy audit services to commercial and governmental agencies, renewable energy funds, rural power systems upgrades, bulk fuel construction funds and alternative energy and energy efficiency development programs. AEA also provides economic assistance to rural customers where kilowatt hour charges for electricity are three to five times higher than more urban areas of the state.

Private foundations and corporations also provide funds for smaller projects, some of which can be energy improvements, but most of which are capital funds for construction or reconstruction projects.

In the table that follows, funding sources are listed by type of project and then funding agency. The description of the type of project eligible is included as well as if the funding eligibility is dependent on economic status of the applicant.

Energy Performance Contracting

An option for paying for energy improvements is a method called Energy Performance Contracting. This financing technique allows building owners to achieve energy savings without upfront capital expenses. With Energy Performance Contracting, the building owner enters into an agreement with a private energy service company (ESCO). The ESCO will identify and evaluate energy-saving opportunities and then recommend a package of improvements to be paid for through savings. The costs of the energy improvements are borne by the performance contractor and paid back out of the energy savings. Other advantages include the ability to use a single contractor to do necessary energy audits and retrofits, and to guarantee the energy savings from a selected series of conservation measures. The ESCO will guarantee that savings meet or exceed annual payments to cover all project costs—usually over a contract term of seven to 10 years. If savings don't materialize, the ESCO pays the difference, not the building owner. To ensure savings, the ESCO offers staff training and long-term maintenance service. This type of ESCO has not been proven in rural Alaska, but is a very viable option.

Program	Funding Agency	Description of Funding Opportunity	Restrictions for Eligibility	Comments
Direct Aid				
Power Cost Equalization	Alaska Energy Authority http://www.akenergyauthority.org/	To provide economic assistance to customers in rural areas of Alaska where the kilowatt-hour charge for electricity can be three to five times higher than the charge in more urban areas of the state. PCE only pays a portion of approximately 30% of all kWh's sold by the participating utilities.		AEA determines eligibility of community facilities and residential customers and authorizes payment to the electric utility. Commercial customers are not eligible to receive PCE credit. Participating utilities are required to reduce each eligible customer's bill by the amount that the State pays for PCE.
Low Income Home Energy Assistance Program -- LIHEAP	Department of Health and Social Services http://liheap.org/?page_id=361	Fuel assistance for low-income families.	Income-based	
Energy Efficiency Improvements				
Alaska Energy Efficiency Revolving Loan Fund Program	Alaska Housing Finance Corporation http://www.ahfc.us	Provides financing for permanent energy-efficient improvements to buildings owned by regional educational attendance areas, the University of Alaska, the State or municipalities in the state. Borrowers obtain an investment grade audit as the basis for making cost-effective energy improvements, selecting from the list of energy efficiency measures identified. All of the improvements must be completed within 365 days of loan closing.	Public facilities	

Program	Funding Agency	Description of Funding Opportunity	Restrictions for Eligibility	Comments
Commercial Energy Audit Program	Alaska Energy Authority http://www.akenergyauthority.org/	Funding for energy efficiency audits for privately owned commercial buildings across Alaska. The program provides reimbursements of qualified commercial energy audits for privately owned commercial buildings up to 160,000 square feet. The maximum reimbursement is set by the building size and complexity and ranges from $1,800 for buildings under 2,500 square feet up to $7,000 for buildings from 60,000 and above.	Owners of commercial buildings	This funding was available in 2013/2014. Check website for notice of future funding availability. Application period is typically November to December.
Energy Efficiency Interest Rate Reduction Program	Alaska Housing Finance Corporation http://www.ahfc.us	AHFC offers interest rate reductions when financing new or existing energy-efficient homes or when borrowers purchase and make energy improvements to an existing home. Any property that can be energy rated and is otherwise eligible for AHFC financing may qualify for this program. Interest rate reductions apply to the first $200,000 of the loan amount. A loan amount exceeding $200,000 receives a blended interest rate rounded up to the next 0.125 percent. The percentage rate reduction depends on whether or not the property has access to natural gas.	Energy Rating Required	
Alaska Home Energy Rebate Program	Alaska Housing Finance Corporation http://www.ahfc.us	Homeowners may receive up to $10,000 for making energy-efficient improvements. Based on before and after energy audits. Rebate is based on final energy rating audit outcome.		Upfront cost for energy audit.
Second Mortgage Program for Energy Conservation	Alaska Housing Finance Corporation http://www.ahfc.us	Borrowers may obtain a second mortgage to finance home improvements or purchase a home in conjunction with an assumption of an existing AHFC loan and make repairs if need be.		The maximum loan amount is $30,000. The maximum loan term is 15 years. The interest rate is the Taxable Program or Rural Owner-Occupied, 15-year interest rate plus 0.375.

Program	Funding Agency	Description of Funding Opportunity	Restrictions for Eligibility	Comments
Village Energy Efficiency Program	Alaska Energy Authority http://www.akenergyauthority.org/	Upgrades are performed in rural Alaskan community buildings. There are currently three phases of funding with Phase II communities recently completed. Community selection was based on the status of the respective village's Rural Power System Upgrade (RPSU). The community either recently received or is slated to receive a new power system.		
Weatherization Program	Alaska Housing Finance Corporation http://www.ahfc.us	Weatherization programs have been created to award grants to nonprofit organizations for the purpose of improving the energy efficiency of low-income homes statewide. These programs also provide for training and technical assistance in the area of housing energy efficiency. Funds for these programs come from the US Dept. of Energy and AHFC.		
RurAL CAP Weatherization	RurAL CAP http://www.ruralcap.com	Rural Alaska Community Action Program, Inc. (RurAL CAP) manages a state program administered by Alaska Housing Finance Corporation that offers free weatherization services for low and middle-income residents in western and northern Alaska, the Municipality of Anchorage, and the City and Borough of Juneau. An Anchorage family of four with income up to $87,800 qualifies.	An income-based program	

Program	Funding Agency	Description of Funding Opportunity	Restrictions for Eligibility	Comments
RurAL CAP Energy Wise	RurAL CAP http://www.ruralcap.com	The Energy Wise Program engages rural Alaskan communities in behavior change practices resulting in energy efficiency and energy conservation. This tested model uses community-based social marketing to save energy – a multi-step educational approach involving residents in changing home energy consumption behaviors. Locally hired crews are trained to educate community residents and conduct basic energy efficiency upgrades during full-day home visits. Through Energy Wise, rural Alaskans reduce their energy consumption, lower their home heating and electric bills, and save money.	No income restrictions	Communities receive the following: ten locally hired and trained crew members; on site "launch week" by a RurAL CAP staff for hiring and training of local crews; one community energy fair to engage community residents and organizations. Households receive: Full day home visit from a trained, locally hired crew; household energy consumption and cost assessment conducted with the resident; education on energy cost-saving strategies; an estimated $300 worth of basic, home energy efficiency supplies installed.
Infrastructure Development				
Alternative Energy & Energy Efficiency Development Program	Alaska Energy Authority http://www.akenergyauthority.org/	AEA's Alternative Energy and Energy Efficiency programs promote: 1.) Use of renewable energy resources and local sources of coal and natural gas alternatives to diesel-based power, heat, and fuel production; 2.) Measures to improve efficiency of energy production and end use.		
Bulk Fuel Construction Program	Alaska Energy Authority/Denali Commission http://www.akenergyauthority.org/	With substantial contributions from the Denali Commission, the bulk fuel upgrades program provides funding for the design/engineering, business planning and construction management services to build code-compliant bulk fuel tank farms in rural communities. The bulk fuel upgrade retrofit and revision program, with financial support		

Program	Funding Agency	Description of Funding Opportunity	Restrictions for Eligibility	Comments
		from the Denali Commission, provides funding for repairs to enable affected communities to continue to receive fuel.		
Emerging Energy Technology Fund	Alaska Energy Authority http://www.akenergyauthority.org/	The Authority may make grants to eligible applicants for demonstration projects of technologies that have a reasonable expectation to be commercially viable within five years and that are designed to: test emerging energy technologies or methods of conserving energy; improve an existing energy technology; or deploy an existing technology that has not previously been demonstrated in Alaska.		Eligible applicants: An electric utility holding a certificate of public convenience and necessity under AS 42.05; an independent power producer; a local government, quasi-governmental entity, or other governmental entity, including tribal council or housing authority; a business holding an Alaska business license; or a nonprofit organization.
Renewable Energy Fund	Alaska Energy Authority http://www.akenergyauthority.org/	Solar water heat, photovoltaics, landfill gas, wind, biomass, hydroelectric, geothermal electric, fuel cells, geothermal heat pumps, CHP/cogeneration, hydrothermal, waste heat, transmission or distribution infrastructure, anaerobic digestion, tidal energy, wave energy, fuel cells using renewable fuels, geothermal direct-use		
Rural Power Systems Upgrades	Alaska Energy Authority/Denali Commission http://www.akenergyauthority.org/	Upgrades may include efficiency improvements, powerhouse upgrades or replacements, line assessments, lines to new customers, demand-side improvements and repairs to generation and distribution systems.		

Program	Funding Agency	Description of Funding Opportunity	Restrictions for Eligibility	Comments
Tier 1 Grant Program	Rasmuson Foundation http://www.rasmuson.org	Grants for 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.		