Barriers to and Opportunities for Private Investment in Rural Alaska Energy Projects

ALASKA ENERGY AUTHORITY

ACEP
Alaska Center for Energy and Power

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Barriers to and Opportunities for Private Investment in Rural Alaska Energy Projects

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This report has been developed in support of the Alaska Energy Authority's Alaska Affordable Energy Strategy. The objective of the Alaska Affordable Energy Strategy is to provide the legislature with recommendations for delivering affordable energy to areas in the state without direct access to a potential future North Slope natural gas pipeline.

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Photos on the front cover:
Left: Blades being lifted into place at the Delta Wind Farm. Photo courtesy of Mike Craft. Right top: The community of Eagle sits on the upper Yukon River. Photo by Todd Paris/UAF. Right bottom: ACEP research professor Daisy Huang discusses co-firing biomass with coal at the Aurora Power Plant in Fairbanks. Photo this page: The community of Elim on the Bering Sea coast. Photo by Gwen Holdmann/ACEP.

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Terminal dust heralds the approach of winter at Pilgrim Hot Springs in the Kigluaik Mountains north of Nome. Photo by Chris Pike/ACEP

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The City of Tanana's washeteria uses solar PV, biomass, and diesel to heat the domestic hot water. Photo by Amanda Byrd/ACEP

Acronyms

ACEP	Alaska Center for Energy & Power
AEA	Alaska Energy Authority
AEL&P	Alaska Electric Light & Power
AHFC	Alaska Housing Finance Corporation
AIDEA	Alaska Industrial Development and Export Authority
APU	Alaska Pacific University
BSNC	Bering Straits Native Corporation
CEM	Contract Energy Management
C-PACE	Commercial Property Assessed Clean Energy
DOTPF	Department of Transportation and Public Facilities
ESCO	Energy Service Company
ESMAP	Energy Sector Management Assistance Program
ESPC	Energy Savings Performance Contract
EU	European Union
FERC	Federal Energy Regulatory Commission
FiT	Feed-in Tariff
IPP	Independent Power Producer
IRB	Interest Rate Buy-down
ISER	Institute for Social and Economic Research, University of Alaska Anchorage
KEEP	Kansas Energy Efficiency Program
kWh	kilowatt hour
LLC	Limited Liability Corporation
LLR	Loan Loss Reserve
LPSD	Lake and Peninsula School District
MMBTU	Million British Thermal Units
MW	Megawatt
NEA	Naknek Electric Association
NEPCO	National Electric Power Company
NJUS	Nome Joint Utilities Systems
PCE	Power Cost Equalization
PPA	Power Purchase Agreement
PPLF	Power Project Loan Fund
PPP	Public Private Partnership
PTC	Production Tax Credit
PURPA	Public Utilities Regulatory Policy Act
PV	Photovoltaic
QF	Qualifying Facilities
RCA	Regulatory Commission of Alaska
REAP	Renewable Energy for America Program
REF	Renewable Energy Fund
REP	Regional Energy Provider
RFP	Request for Proposals
RPSU	Rural Power System Upgrade Program
RUS	Rural Utility Service
SETS	Sustainable Energy Transmission and Supply Development Fund
SNC	Sitnasuak Native Corporation
USDA	United States Department of Agriculture
VEDA	Vermont Economic Development Agency
WHEEL	Warehouse for Energy Efficiency Loans

Executive Summary

Overview

Historically, rural energy projects in Alaska have relied–either wholly or in part–on public funding. For example, both the state and federal governments helped fund the initial electrification of many rural communities via loans and grants, and continue to play a large role in financing rural energy projects today. Because state revenue is projected to decline, less capital will be available to allocate to rural energy projects. Private sector financing could potentially be used to replace state funding, but the private sector requires a reasonable risk-adjusted return on investments. For many rural energy projects, the risks are too high and the return too low to secure private funding. As a result, there are relatively few privately developed and funded energy projects in rural Alaska.

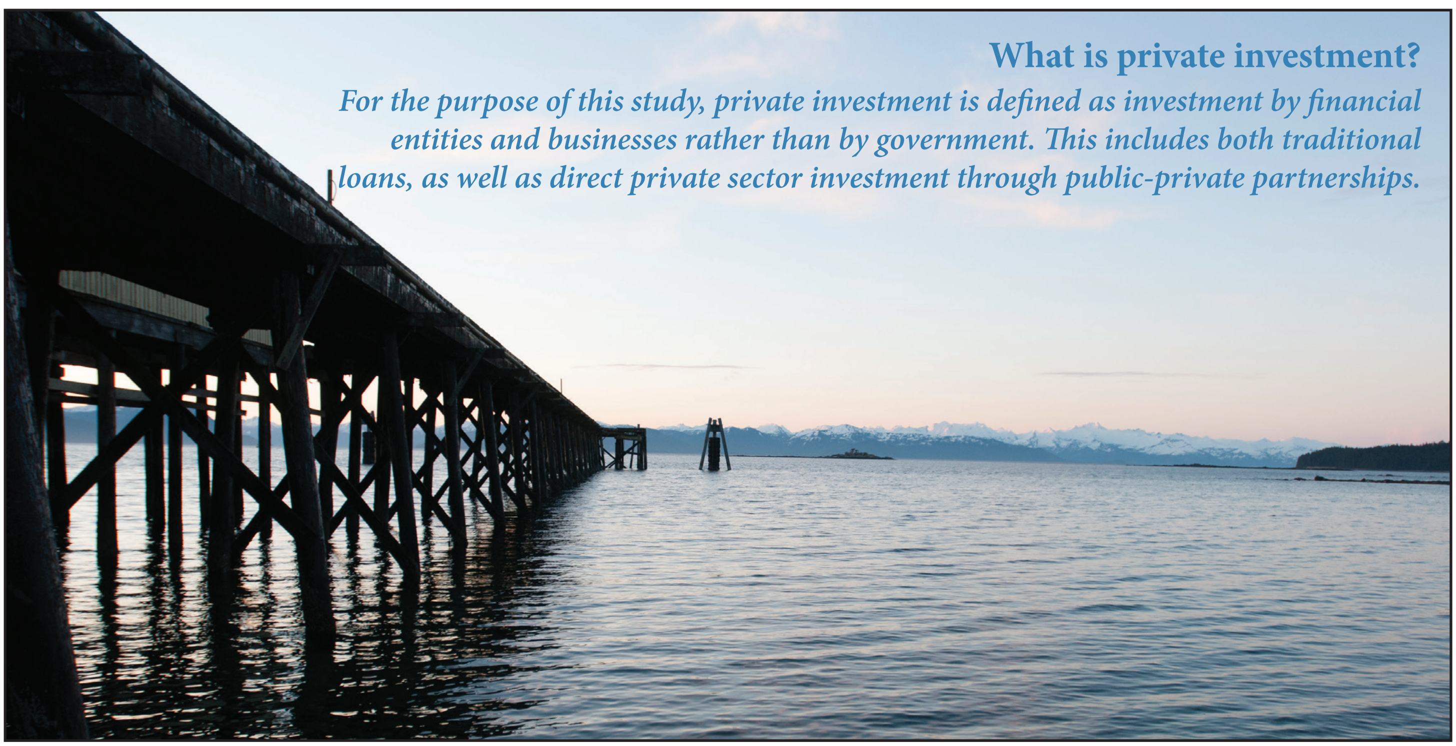
The purpose of this report is to identify common barriers to private investment in rural Alaska energy infrastructure, and recommend strategies to overcome these barriers. Information and data were collected through an initial literature review, followed by a series of interviews and roundtable discussions focused on energy infrastructure development in communities located outside the Railbelt region. The interviews were conducted by telephone and in person between September 2015 and July 2016 and included individuals who represent the financial sector, private industry, project developers, federal agencies, state agencies, and Alaska Native corporations. The goal of these conversations was to gain insight on rural energy infrastructure development from diverse perspectives. The questions asked were tailored to the specific area of each interviewee's involvement in Alaska energy projects, ranging from finance to development to power purchase and sales. Those interviewed were asked to identify barriers they have experienced while developing projects in Alaska, as well as potential strategies to overcome these barriers. Existing state- and federal-backed loan and grant programs were discussed and examined to determine their impact on project development as well as their role in attracting private developers to invest in rural energy infrastructure.

The findings detailed in this report include a discussion of specific barriers to private investment in small energy markets such as Alaska and identification of specific project characteristics and strategies of interest to lenders and/or private financiers (Part 1); a description of existing programs and mechanisms for financing and investing in energy projects (Part 2); and a description of specific strategies used to reduce barriers to private investment that have been successful in other, similar markets and how the strategies might apply to the Alaska market (Part 3). In the final section of the report, we recommend several targeted actions that could increase opportunities for private investment in rural Alaska. These recommendations are summarized in the following pages. Throughout the report, we make ample use of specific case studies from projects that have been developed or have been considered for development in Alaska.

Study Area

The focus of this report is on rural Alaska communities, but many of the challenges addressed here are common to more urban parts of Alaska, as well as small energy markets in other places in the world. We have chosen to define our study area using the International Energy Agency definition of a remote community. According to this definition, a rural community (sometimes referred to as a remote community) is a community not connected to central energy infrastructure (e.g. natural gas pipeline or regional electricity grid) and relying on diesel generators to meet most of its energy needs, (IEA-RETD, 2012). This definition overlaps well with the intended focus of the Alaska Affordable Energy Strategy Program, to create a "plan and recommendations to the Legislature on infrastructure needed to deliver affordable energy to areas of the state that will not have direct access to a North Slope natural gas pipeline."

Because of their remoteness and smaller populations, rural communities typically suffer from higher energy costs compared with the grid-connected areas of Alaska. Typically, rural communities are too far apart and sparsely populated to justify the cost of building roads or interties between them. Over 80% of rural utilities have generating capacities of less than 2.5 megawatts (MW) and are unable to achieve economies of scale, as their fixed costs are spread over relatively few kilowatt hours (kWh) (Fay & Schwörer, 2010). Unsubsidized electricity rates in these rural communities are two to ten times more expensive per kWh than in urban areas of the state, (AEA, 2016).



What is private investment?

For the purpose of this study, private investment is defined as investment by financial entities and businesses rather than by government. This includes both traditional loans, as well as direct private sector investment through public-private partnerships.

Pier in Sitka reaches out into Sitka Sound. Photo by ACEP

Barriers to Private Investment

The following barriers to private investment were identified by participating stakeholders.

Scale and Population Density

Alaska is a large state that is sparsely populated. A number of communities serve as "hub" communities, that is, they serve as economic and transportation centers for several surrounding communities. Generally speaking, the population density of communities decreases as distance from the hub communities increases. Likewise, the cost of delivering fuel and other services increases the farther one travels from a hub community. Therefore, economies of scale for infrastructure projects are substantially harder to realize because there is a smaller population across which to spread project costs, including transaction costs (legal fees, permits, loan-closing fees, etc.) as well as capital and operating costs.

Oil and Transportation Markets

The cost of diesel for Alaska communities is dictated by global markets over which the state has no influence, and by the complex logistics associated with delivery to remote areas with small markets. These factors result in significant variability in the delivered cost of fuel that can be much greater than simple market fluctuations in the price of bulk fuel, and can be difficult to predict. These variations occur not only from year to year, but even within a single year depending on the lift date for the fuel delivered to the community. Larger utilities or communities participating in a consolidated bulk fuel purchase program[1] are often able to negotiate lower fuel prices, but are still hampered by market variability, a limited shipping season, and the vagaries of environmental conditions that complicate delivery.

Historic Availability of Subsidies and Grants

For many decades, public funds-often in the form of grants-have been invested in rural Alaskan communities to fund basic infrastructure. It is well documented that funding projects through grants can distort market economics over the long term and conceal the true costs of a particular source of energy. Because subsidies are typically designed to support status quo energy systems, they can inadvertently create barriers to transitioning to different energy sources, or new business models (Beck and Martinot, 2000).

Utility Structure

Because of its lack of a statewide grid system, Alaska has many more independent utilities scattered throughout the state compared with jurisdictions of similar size (geographically or population-based). Diverse ownership and lack of a central grid complicates efforts to develop economies of scale on the level that might attract private capital. In addition, multi-decadal certification of utilities in rural Alaska could inhibit private investment in future energy infrastructure projects. Utilities that enjoy a local monopoly sometimes have little incentive to accommodate generation from independent power producers (IPPs). Furthermore, some utilities are fully vertically integrated, or maintain an interest in the supply chain of diesel importation and distribution (although a reasonable argument can be made that such integration allows for economic efficiency and competition in an otherwise underserved logistics market).

[1] An example of a consolidated bulk fuel purchase program is managed by Norton Sound Economic Development Corporation (NSEDC). Through this program, NSEDC acts as a fuel purchasing agent on behalf of the participating communities to coordinate the order, issue a Request for Proposals to fuel suppliers, evaluate the proposals and award a contract, and acts as a single point of contact for the fuel supplier and program participants.

Terrain and Climate

Alaska's terrain poses a significant challenge with respect to building a transmission grid network across the state, or even from hub communities to nearby villages. Lack of a grid system requires communities to build and support energy infrastructure that meets local needs, including providing for redundant systems in the event of an outage. This significantly reduces opportunities to build larger projects that can achieve better economies of scale, because serving multiple population centers within a geographic region through a single, centralized project is generally not an option. Harsh and variable climatic conditions common in many parts of the state can significantly increase project costs compared with equipment installations in more temperate regions, because arctic packaging, specialized foundations for permafrost areas, and heated enclosures are needed. As a result, projects in Alaska are typically far more expensive per kilowatt than similarly sized projects in warmer and more accessible locations.

Diversity of Stakeholders

Compared to the size of both communities and associated energy projects, there are a large number of stakeholders that may not always agree on a particular project. Stakeholders may include any or all of the following: the municipal government, the borough government, the tribe, the Alaska Native Regional and Village Corporations, the school district, the electric utility, housing authorities, the fuel distributor, and the regional native non-profit. This can complicate agreements related to energy projects, particularly for investors that are not familiar with the diversity of stakeholders associated with even very small communities. As a result, many of the financiers or investors who have taken the time to familiarize themselves with the Alaska market have found that the transaction costs very high relative to projects outside the state.

Institutional Knowledge

Alaska is a transient state, with an average residency of seven years and a 40% turnover in the state's population every five years (Alaska Department of Labor and Workforce Development, 2012). Maintaining institutional knowledge related to operating community micro-grids in rural communities, each with its unique challenges, is difficult. Seldom is there an existing pool of experienced individuals living in rural communities to take the place of vacating and retiring powerhouse employees. It may take years to find and train a suitable replacement employee upon whom the community can rely. Additionally, many jobs in small communities are part-time. When residents are able to acquire specialized skills, they can often obtain full-time employment based on those skills outside the community.

Heterogeneous Nature of Projects

The renewable energy resources potentially available to each community in Alaska vary, and uniformity in existing energy infrastructure is generally lacking. For these reasons, a homogeneous approach to project development is challenging, and one-off solutions are frequently required when designing new systems. This leads to increased costs associated with project development and higher transaction costs for potential investors, since a single design cannot generally be applied to multiple projects.

A freight barge makes it way up the Yukon River past Tanana. Photo by Daisy Huang, ACEP

Findings and Recommendations

The goal of this study was to seek strategies to address specific barriers to private investment in rural Alaska energy projects by leveraging the state's resources to attract private investment.

Our findings indicate that there is no need for creating new financing programs if existing state programs can be modified through legislation and adequately funded. For renewable energy projects, the Renewable Energy Fund (REF) can be used for funding the high-risk early stages of project development, and construction can be funded through loans or private financing supplemented through grant funding, in some cases. For conventional technologies such as diesel powerhouses, grant programs like the Rural Power Systems Upgrade (RPSU) program can be transitioned to a loan program. For both conventional technologies and renewable technologies, the Power Project Loan Fund (PPLF) is an ideal funding source, since the program is tailored to the needs of rural borrowers and offers low interest rates, long payback periods, and minimal collateral requirements. These state programs compliment existing and proposed loan and grant programs at the federal level that are designed to finance rural energy projects throughout the U.S.

Facilitating public-private partnerships (PPP) in ways that protect community interests can also provide an important avenue for funding future projects. Establishing a Rural Energy Project Development portal would allow potential borrowers to understand available financing options and could help relieve some of the budgetary pressure on the state if qualified borrowers pursue federal and private financing. While some barriers to private investment such as scale are nearly insurmountable, other barriers such as poor bookkeeping and low financial literacy are resolvable through capacity building. Strong training, education, and mentorship programs could help communities and utilities that are nearly bankable, become bankable. These communities could then qualify for traditional means of financing, which would also help reduce the financial burden on the state. Attracting private investment for rural energy infrastructure presents challenges, but tools to overcome these challenges are available and should be pursued. Reducing the need for purely grant-funded programs by leveraging public money to attract private investment is the financially prudent path to take to ensure the long-term viability of Alaska's rural communities.

Specific recommendations developed through this study are detailed on the following pages. These strategies are discussed in detail in Part 4 of this report.

Summary of Recommendations

Recommendation #1	**Rebrand and Expand the Power Project Loan Fund (PPLF)** The PPLF is a loan fund administered by Alaska Energy Authority (AEA) that provides low-interest loans to develop or upgrade small-scale electric power facilities. We recommend that the PPLF be expanded and rebranded as the Alaska Energy Infrastructure Bank to increase awareness of the program and its benefits, and to take steps to ensure that the program is attractive to the spectrum of prospective customers in rural Alaska. In addition, the program will need to be recapitalized but is expected to be an important financing tool for future Alaska energy infrastructure development.
Recommendation #2	**Develop a Project Specification Process that Facilitates Public-Private Partnerships for Energy Projects** Where there is an opportunity for private sector investment to meet a specific infrastructure need, existing state technical resources could assist communities and utilities in developing the Request for Proposal (RFPs) to clearly define technology or project-specific specifications. This process would decrease transaction costs and make it easier for private developers to respond to opportunities that have the support of local stakeholders, including the local electric utility.
Recommendation #3	**Develop and Maintain a Rural Energy Project Development Portal** A single source of information on rural Alaska project financing options does not currently exist. We recommend that the AEA and/or other Alaska-based institutions partner with interested federal agencies to create and maintain a development portal. The portal can be used to provide technical assistance to potential borrowers, as well as information to lenders and private investors about the rural Alaska energy market. This Portal could be managed in conjunction with the existing Alaska Energy Data Gateway.
Recommendation #4	**Assess how RCA Statutes and Regulations Align with the State's Renewable Energy Target, and Federal Statutes that Promote Renewable Energy Development.** Balancing the desire to invite investments with the protection of the public is an important role of the State of Alaska. Recent decisions by the RCA to grant independent power producers exemptions from regulation, as well as questions of how federal statutes such as the Public Utility Regulatory Policy Act (PURPA) interact with the state's regulatory regime have raised concerns from both developers and communities/utilities. We recommend the Legislature seek a legal opinion from the Attorney General's office about how the objectives of state utility regulation, the state's renewable energy target and federal law align, or are in possible conflict. The goal of this review should be to define a clear and predictable legal and market framework, or signal the need for possible statute changes.

Recommendation #5	**Build Capacity and Create Opportunities for Mentorship to Improve "Bankability" of Alaska Communities** Lack of financial literacy and inconsistent bookkeeping are a challenge for some rural utilities. Continued support for programs that build capacity and help promote good bookkeeping practices, such as training resources provided by the National Rural Electric Cooperative Administration, the Alaska Rural Manager Initiative, and the Rural Utility Business Advisor Program is important in order to help utilities access more financing options in the future. Additional programs, such as managed service internships for University of Alaska students, could provide additional technical support. Finally, "Regional Energy Provider" (REP) networks that pool utility resources within as region could help increase capacity and economies of scale in rural Alaska that could lead to improved opportunities for private sector investment.
Recommendation #6	**Use the Renewable Energy Fund (REF) to Finance the High Risk, Early Stages of Project Development** We recommend that, instead of funding all stages of projects with the highest benefit-cost ratio, which are also the most likely projects to be attractive to private investors, the REF should be restructured to: (1) provide grants for reconnaissance and feasibility studies, since these are the highest risk stages of a potential energy project, and (2) provide partial construction funding for projects with lower benefit-cost ratios that need a portion of the construction costs covered in order to attract lenders or private partners. We also recommend continuing to fund this program, even if only at a reduced level, to continue the progress made on renewable energy infrastructure development across the state.
Recommendation #7	**Continue to Administer the Power Cost Equalization (PCE) Program** The PCE Program provides a subsidy to help rural residents pay for the high cost of electricity, and helps partially mitigate the credit risk of rural energy projects by assuring a source of community revenue. Lenders consider the stream of payments from the PCE Program a credit positive, and view the PCE Endowment, which funds the annual PCE payments, as an important reserve.
Recommendation #8	**Continue to Fund the Rural Power System Upgrade (RPSU) Program and Transition the Program from a Purely Grant-Funded Program to a Flexible Loan-Based Program** We recommend that the state continue to fund the RPSU Program to update and replace outdated and failing powerhouse infrastructure in rural communities, but transition of this program from a purely grant-funded program to a flexible loan-based program. In cases where direct public infrastructure subsidies are needed because a utility is unable to take on additional debt, it may be prudent to consider requiring that the local utility merge or affiliate with a larger cooperative or regional utility.

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Part 1. Background and Introduction

Rural communities vary in their ability to access private financing. Some communities have more financial acumen and more robust local economies than others. In general, larger communities will have more diverse economies. As economies diversify, community members have more opportunities to develop job skills because there are more employment opportunities. Thus, larger communities will have bigger, more diverse labor pools. The utilities serving these communities also generally have more assets to serve as collateral to secure loans, and more equity to contribute to projects. These communities can support bigger energy projects that can absorb the transaction costs associated with loans. Bigger energy projects are able to generate more revenue and repay debt in a timeframe that is more attractive to private lenders.

Because of the relationship between population and attributes that are attractive to lenders, Alaska communities were categorized into groups based on their populations.[2] Throughout this report, the applicability of a particular program or strategy is frequently assessed based on these groupings:

> **Group One** – Group One consists of larger hub communities with populations greater than 2,000 residents. These communities typically qualify for conventional financing such as bank loans. Currently, 7 rural communities in Alaska fall into Group One.
>
> **Group Two** – Group Two consists of midsized communities with populations between 500 and 2,000 residents. The ability of these communities to qualify for conventional financing depends on local capacity to comply with the terms and conditions of the loan. Currently, 44 rural communities in Alaska fall into Group Two.
>
> **Group Three** – Group Three consists of smaller communities with populations of fewer than 500 residents. These communities typically do not qualify for conventional lending because they do not meet traditional lending criteria. Currently, 126 rural communities fall into Group Three.

It is important to note these groupings are over simplified in many ways, and exceptions are numerous. For example, communities that are served by utilities such as AVEC or AP&T often fall under Group Three, but benefit from being part of a larger utility network that has assets, resources, and access to financing than most other Group Three communities.

Grant versus Loan Programs

Most energy projects in rural Alaska have been funded by governments through grants given for a specific purpose, such as the construction of an energy project, without the expectation of being repaid. Note that while grants are frequently made by government organizations, they can also be made by privately funded organizations, such as

[2] These are the populations of communities are reported in the 2015 *Power Cost Equalization Program report* (AEA, 2016a).

philanthropic foundations. One concern generally associated with grant funding is that easy availability can cause an overreliance on public funding sources for a revenue generating project, thereby impeding (or "crowding out") private sector financing.

It is the consensus of the lenders interviewed for this report that rural communities have become accustomed to pursuing state funding and receiving grants for projects rather than seeking private investors, and that unrealized opportunities are available to allocate public funding with the aim of incentivizing private sector investment for an energy project rather than displacing it. However, these lenders agree that grants and subsidies probably have not "crowded out" private investment in the rural Alaska energy market. The lenders interviewed assume that most rural energy projects would not qualify for commercial loans anyway because the projects are too small scale and high risk, and would require payback periods longer than what is acceptable to most private lenders.

In a market such as rural Alaska, which has significant challenges in terms of scale and remoteness, public funding is often necessary. If designed correctly, publicly funded programs can play a positive and essential role in attracting private sector investment. The challenge is to move away from a direct support grant-based model to one in which public finance can be used innovatively to more successfully leverage private sector investment.

Grant programs make economic sense when they are directed toward developing technologies that would not be funded otherwise. This is the case for many emerging technologies unable to secure private financing. Grant programs also make economic sense when they are used to leverage public dollars to help attract private financing to projects. For example, funding the high-risk predevelopment stages of a renewable energy project to prove the project's economic viability can help attract private funding and private partners during the construction and operating phases of the project. In some cases, it can even be helpful to provide partial construction funding for a project if that funding can help make a project whole.

With continued pressure on the state budget, communities in Alaska may be forced to move toward more self-sustaining funding mechanisms for energy projects, especially projects in rural Alaska. Financial institutions loan money with the expectation of repayment, plus interest, over a specified period. Group One communities should be well positioned to access loans from private financiers because of the scale of their projects and larger population bases that allow for revenue streams large enough to be attractive to a financier. State agencies should encourage communities and utilities that meet the lending criteria of private lenders to pursue those avenues of financing rather than rely solely on public funding.[3]

Out of necessity, most Group Two and Group Three communities rely on grants for funding energy infrastructure projects. However, transitioning from grants to loans through state-funded loan programs such as the Alaska Power Project Loan Fund makes sense for borrowers that would have a hard time repaying loans if not for the low interest rates and flexible terms that the state can offer. These types of loan programs may also improve the sustainability of state-funded energy programs because as loans are repaid, those funds can be lent again for other projects. The state has the ability to be more flexible with interest rates and terms than private lenders, and this flexibility allows the state to meet the needs of many rural borrowers.

What Constitutes "Private Funding" in Energy Projects?

For the purpose of this study, private investment is defined as investment by financial entities and businesses rather than by government. This includes both traditional loans, as well as direct private sector investment through

[3] It is possible that some low-risk loans will be needed to reduce the portfolio risk of state-managed revolving loan funds.

public-private partnerships (PPPs). From the perspective of a community or a utility, these two categories—loans and PPPs—are different, most notably in who bears the majority of the risk and who benefits from the development of the project.

Project Loans (Finance)

Project loans in Alaska typically involve an agreement between a financial institution and an energy service provider, such as an electric utility, with the obligation to develop, manage, and maintain the project and pay back the debt resting with the utility. If there is a problem with the project or there are cost overruns, the risk and responsibility lie with the utility.

Note that there is a difference between project finance and traditional corporate finance. In corporate finance, money is lent based on the financial health of the corporate entity. In project finance, a single-purpose project company, usually called the "project sponsor," is typically formed for each project. This project company will not have a credit history, so money is lent based on the project's risk and projected cash flows (Comer, 1996). Lenders have limited recourse to the project sponsor because they are repaid only from the cash flows generated by the project. Project finance is often used for infrastructure projects that are too large for a single corporation's balance sheet, but this financing mechanism can be and has been used for relatively small-scale projects in Alaska. For example, project financing was used for the Fire Island Wind farm, jointly developed by Cook Inlet Region Inc.

Construction of the Fire Island Wind Farm, developed by Fire Island Wind LLC, which is a wholly owned subsidiary of CIRI Native Corporation. The 17.6 MW project provides power to the Railbelt grid under a long-term power purchase agreement with Chugach Electric Association.

(CIRI) and Summit Power (Ardani, Hillman, and Busche, 2013). A wholly owned subsidiary of CIRI, Fire Island Wind LLC was formed to own and operate the 17.6 MW project. A 25-year power purchase agreement for a flat price of $97 per MWh was negotiated with Chugach Electric Association. The project was financed through a combination of debt, equity, and a government-sourced 1603 Treasury Department Grant.

Public-Private Partnerships (PPPs)

Public-private partnerships (PPPs) are contractual arrangements between public sector and private sector entities. They provide for a public good, in the case of rural energy projects, infrastructure development. The terms of the PPP delineate how the investment, risk, responsibility, and financial returns are shared between the two entities. The PPP model is a common approach for development of infrastructure and other types of projects in many countries.

Public-private partnerships in the power sector are mainly used for generation and transmission projects. Each partnership is a unique arrangement designed to suit particular circumstances and varies with location, scale, technical, and political factors. Public-private partnerships are generally used to enhance public sector budgets by attracting private sector investment. With this model, it is possible to use public funding sources to finance larger-scale projects than would otherwise have been possible.

Project Characteristics Attractive to Lenders

According to the lenders interviewed,[4] a borrower must demonstrate that a project is "bankable" (see additional detail on following page) by having sufficient collateral and a high probability of future cash flow and repayment of the loan to be acceptable to institutional lenders for potential financing. Attributes of communities and their utilities that make them attractive to lenders include:

> ***The ability to repay debt.*** Repayment ability can be based on prior history, as well as current factors. For example, if a substantial amount of revenue is expected to come from a single anchor customer such as a fish processing facility, the long-term viability of that business will be scrutinized.
>
> ***The ability to repay loans in a time acceptable to lenders.*** In some cases and for some lenders, the payback period for the project may be longer than what is customary.
>
> ***Sufficient collateral to secure loans.*** For project financing, collateral is frequently the project infrastructure itself; however, in remote locations this equipment may have minimal value since resale in the case of non-payment is unlikely to be a viable option.
>
> ***Sufficient administrative capacity.*** A lack of administrative consistency and/or capacity, along with general financial literacy and inconsistent bookkeeping, was repeatedly identified as a challenge, particularly for smaller communities.
>
> ***Sufficient equity to contribute toward projects.*** In cases where the community or utility is unable to contribute equity for a project, the project is considered much higher risk.

[4] Interviews were conducted with lending representatives from CoBank, the National Cooperative Bank, Wells Fargo, Northrim Bank, the USDA, AEA, and AIDEA as well as utilities that have used these loan programs. (Loan program details on page 22).

The Bankability of Organizations Seeking to Develop Energy Projects

What makes a project bankable? A bankable project is one that has sufficient collateral and a high probability of future cash flow and success to be acceptable to institutional lenders for financing. Rural utilities, city or tribal governments, or private developers, including Alaska Native Corporations, are examples of organizations that could be interested in developing energy projects in a particular community. Some of these entities are more bankable than others. Lending institutions have guidelines regarding the bankability of a potential borrower; these guidelines are commonly referred to as the Five C's of Credit: Character, Capacity, Capital, Collateral, and Conditions. Project developers with strong ratings on the Five C's of Credit are considered bankable and are more likely to secure loans from lenders.

Character - The lender will be interested in the character of the borrower. The borrower must be able to demonstrate a history of repaying debts in a timely manner. Additionally, the lender will be interested in whether the borrower has a good business reputation with vendors and contractors.

Capacity - A lender will be interested in the borrower's debt history. The lender will want to be assured that the borrower is in a position to repay current debt and actually has the capacity to take on more debt. The lender will be interested in the borrower's history of repaying loans.

Capital - A borrower with substantial capital has greater capacity to repay a loan. A lender will want assurance that the borrower has a vested interest in the project. This is demonstrated by the amount of capital the borrower has invested in the project. The more capital the borrower has invested in the project, the less likely the borrower is to default on the loan.

Collateral - Lenders want a borrower to secure a loan with collateral. Should the borrower default on the loan, the collateral provides recourse to the lender. An entity with assets such as real estate or equipment to use as collateral is more bankable than an entity with few assets.

Conditions - A lender will be interested in the economic conditions of the location where the project will be built. Any condition that could affect a borrower's cash flow is of interest to the lender. For example, a lender may be interested in the stability of the ratepayer base and the percentage of utility customers in arears

Pilgrim Hot Springs geothermal site in the Bering Straits Region. The property is privately owned by Unaatuq, LLC and has been considered for potential development of a geothermal power plant to benefit the community of Nome. Photo by Chris Pike, ACEP.

Projects large enough to justify the high transaction costs associated with the loans. A common challenge for rural Alaska is that individual projects are often too small to generate reasonable economies of scale.

The case study for Cordova Electric Cooperative's Humpback Creek project, presented on the following page, is a good example of a Group One community able to benefit from project financing through CoBank (detail on their programs is included in Part 2 of this report), while also leveraging grants from both state and federal sources.

During interviews, lenders expressed concerns about the risks associated with investing in rural power projects. Rural energy projects are often not a good match for mainstream bank financing for reasons related to their small scale; however, several opportunities for improving the attractiveness of rural energy projects were suggested. In particular, the following five areas of potential focus were identified:

1. Cataloging of projects

Currently, no avenue is available for rural communities to advertise their infrastructure needs to the investment community in terms that financiers can understand. Contact between loan officers and a potential borrower is often based on individual relationships, and information about programs is often spread by word of mouth. Similarly, no avenue is available for investors to learn about opportunities to invest in rural Alaska. Therefore, it has been suggested that a catalog of rural projects in need of investors be developed and, to attract the interest of investors, initial feasibility studies be prepared for each project using standardized investment criteria, updated regularly.

2. Project / opportunity aggregation

Related to project cataloging, for investors it may not be worth the time investment of appraisal and the associated transaction costs for one or a small number of projects. However, aggregating or bundling projects may provide the scale required for investors to commit. This approach may also allow for sharing contracts and power purchase agreements and other complex project elements. Costs for specialist consultant support could be pooled between projects, thereby reducing costs. From an investor's perspective, bundling projects may allow for sharing and reduction of due diligence costs.

3. Strengthening project proposals

One of the main complaints of investors and financiers worldwide is that they are often presented with propositions that are of insufficient quality; that is, they are not "investment ready." Measures can be taken to improve the quality of proposals that reach potential investors. These measures could include technical assistance, business-planning support, proofing and strengthening of project financials, and strengthening of underlying resource assessments.

4. Project standardization

Standardization and scale are important factors when dealing with distributed smaller-scale energy projects. Employing common standardized technology across a number of projects can reap technical and cost benefits that improve project attractiveness for potential investors.

5. Improving financial literacy

In the past, programs for on-the-job training and mentorship have improved bookkeeping practices and general financial literacy that can make prospective lenders more comfortable with the ability of lendees to meet their obligations under the terms of a prospective loan. While some of these efforts continue on a one-on-one basis, a more organized effort building on existing programs could be a significant asset for communities with limited local human resources.

Loan/Grant Case Study: Humpback Creek Hydroelectric Project

The Humpback Creek Hydroelectric Project is a 1.25 MW run-of-the-river plant that serves the community of Cordova. This project complements a second hydroelectric project, the 6 MW Power Creek Hydroelectric Plant. Cordova has about 2,200 residents and significant industrial loads from fish processors, which operate during the summer months. The Humpback Creek Project was developed in 1909 and refurbished in 1991. It was severely damaged in a flood in October 2006. After this event, it was decided to rebuild the project from the ground up, both to capture additional energy from the creek and to update infrastructure, ensuring that it would last for many decades. To fund the project, Cordova Electric Cooperative (CEC) negotiated funding from a number of sources, including both grants and loans. Because of the damage to the original infrastructure, CEC qualified for disaster funding from FEMA and the State of Alaska, which is typically not otherwise available for project development. In addition, CEC received grant funding through a number of sources that have been widely tapped for project development in Alaska. These sources included the state's Renewable Energy Fund and federal grants, including a direct allocation from the Denali Commission and a grant from the USDA Rural Utility Service. Finally, CEC financed 38% of the project, $9.3 million, through Co-Bank.

Lessons Learned

CEC was able to leverage a number of funding sources due to:

In-house knowledge of grant and finance options. CEC planned to use a combination of grants and loans from the beginning. It is likely the project would not have been economical without access to subsidies, though the break-even point has not been calculated. CEC wisely maximized grant funding in the early project stages, well before applying to several lending institutions. CEC was approved for loans from several institutions, but chose to finance through Co-Bank.

Humpback Creek during construction. Photo courtesy of Clay Koplin, CEC.

Ability to negotiate with agencies. The Humpback Creek Project did not initially qualify for FEMA funds because these funds are only available for projects that rebuild an original design. Because CEC was proposing to substantially deviate from the 110-year-old design, FEMA was not willing to approve the project, thus requiring CEC to negotiate a resolution. Ultimately, FEMA agreed to provide funding equivalent to the estimate for rebuilding the dam if it were built to its original design.

Humpback Creek Funding Sources	Amount
Federal Emergency Management Agency (grant)	$3,911,204
State of AK Dept. Homeland Security and Emergency Management (grant)	$1,303,735
AEA Renewable Energy Fund (Round 1 and 3) (grant)	$8,000,000
Denali Commission (grant)	$607,300
USDA Rural Utility Service (grant)	$1,037,500
Financing through Co-Bank (loan)	$9,300,000
TOTAL	$24,159,739

Project Characteristics Attractive to Private Investors

In general, the investment strategy of a private investor is to maximize risk-adjusted returns. In other words, the goal is not to invest in projects with the highest rate of return, but rather to invest in projects that have well understood and compensated financial risk. As such, to merit allocation of the investor's resources, a project must be deemed to offer an acceptable rate of return and be within the acceptable risk threshold of the investor. Standardized financial analysis allows for objective ranking of investment opportunities and is the key to the investment decision for most private investors.

Several small or micro-scale independent power producers (IPPs) are currently active in the Alaska market[5] or have expressed interest in developing projects in the state. These IPPs have historically focused on a niche market, centered on either a particular resource or community. Based on interviews with these project developers and investors (both active and prospective), it is possible to make some general observations regarding the sort of project that is attractive to private investors or developers in rural Alaska:

Investor familiarity with technology or project type. Investors may invest in a project because it reinforces a competence in a technology area by demonstrating a new application, thus expanding business into a new technical area.

Investor familiarity with the community. In some cases, a potential investor may have a special interest in a particular community or region. For example, this may be the case with Alaska Native Corporations that have a unique interest in investing in financially viable projects in the community or region they serve.

Project scale. There is a range of size or scale of projects that most appeals to an individual investor. For example, projects of less than a certain value may not be big enough to merit evaluation, whereas projects of too large a size may be beyond the financial reach of some investors. Anecdotally, the range between $1 million and $10 million appears to be the most appealing to potential investors consulted for this report. Additional prospective private investors should be canvassed to determine their preferences, as they may materially differ from the anecdotal evidence presented herein.

Projects that can enhance image or reputation. Certain projects may offer intangible benefits for investors, which may cause the project to become a more appealing prospect. Association with a "first-of-a-kind/high-impact" project that offers the potential for brand enhancement is an example of an intangible value.

The first phase of the Nome Banner Peak Wind Farm (case study provided on following page) is an example of a successful public-private partnership in rural Alaska between local and regional Alaska Native Corporations that jointly served as project developer and IPP, and Nome Joint Utilities Service.

During interviews, potential private investors expressed frustration about the complex nature of project development in rural Alaska and the large number of stakeholders related to any single project. While most investors still believe opportunities exist to develop projects—particularly related to renewable energy systems that could offset diesel fuel and benefit from federal tax credits—many are discouraged over the long time horizons, perceived unfriendly regulatory environment, and high transaction costs associated with contract and project development.

[5] Many of these projects have been developed along the Railbelt, although a few examples in rural Alaska exist, including a solar project in Naknek and the Banner Peak Wind Farm in Nome (case study on following page).

As an outcome of these meetings, four areas of potential focus for streamlining projects were identified:

1. Project definition

The high transaction costs and long development timelines associated with project development in rural Alaska is a common concern. Prospective developers are of the opinion that opportunity exists to reduce these costs by using public funds to more clearly delineate specific project opportunities and allow potential developers or IPPs to bid on the project.

2. Uncertain regulatory climate

There is real or perceived discrepancy in federal and state law as to whether small, independent IPPs are exempt from economic regulation as "Qualifying Facilities" under federal law[6] or meet the definition of a for-profit utility under Alaska statutes[7] and thus are economically regulated under the Regulatory Commission of Alaska (RCA) unless a specific exemption is obtained. While IPPs have been successful on several occasions in seeking an exemption, this process is expensive, both in the length of time the process takes and the costs involved.

3. Importance of the PCE Program as de facto project equity

Both traditional lenders and developers stressed the importance of the Power Cost Equalization (PCE) Program, and more importantly its endowment, as an important long-term revenue guarantee for rural utilities, and thus a significant positive factor in assessing the long-term financial viability of these utilities.

4. Project insurance or loan guarantee

Some prospective developers have explored options for insuring projects in rural Alaska against future losses, whether they are unforeseen climactic or weather-related production losses or financial losses.

Fish wheels sit along the frozen Yukon River in the community of Tanana. Photo by Amanda Byrd/ACEP

[6] Federal Energy Regulatory Commission (FERC) rule 18 C.F.R. § 292.602(c)(2) provides for the exemption from certain State laws and regulations, including rates and the financial and organizational regulation of electric utilities for "Qualifying Facilities", which includes most IPPs.

[7] Under AS 42.05.990(4)(A), a public utility includes every "company ... that owns, operates, manages, or controls any plant, pipeline, or system for furnishing, by generation, transmission, or distribution, electrical services for compensation."

Public-Private Partnership Case Study: Nome Banner Peak Wind Farm:

Project Status: Complete

Community: Nome, Alaska

Population: 3,800 (2013)

Private Investor: Banner Wind LLC – Partnership between Bering Straits Native Corporation and Sitnasuak Native Corporation

Utility: Nome Joint Utilities Systems – mean load 4 MW, baseload 2.5 MW

Investment: 900kW Wind Farm

Cost: $4.7 million

Project Performance: Unavailable

Barriers: Time constraints

Success: First wind farm owned and maintained by private industry in Alaska

The Nome Banner Peak Wind Farm was the first wind farm to be installed by a private company in Alaska. Jointly owned by Sitnasuak Native Corporation (SNC) and Bering Straits Native Corporation (BSNC), Banner Wind LLC began construction in late 2008 with the installation of eighteen (18) 50 kW Entegrity wind turbines (of which 15 are still in operation). This initial 900 kW project was the first phase of a larger project, with a final installed capacity of 3 MW. A power purchase agreement (PPA) was not finalized until 2010, when Banner Wind LLC successfully negotiated a 20-year PPA with the municipally owned Nome Joint Utilities Systems (NJUS). Under this PPA, Banner Wind LLC agreed to sell the wind power to NJUS at a price below the fuel surcharge. This agreement allowed the utility to purchase power for less than NJUS could produce it, thus providing savings to its operations. Revenue from the wind farm power sales was split equally between BSNC and SNC.

Project issues and successes

The Banner wind farm has been operating successfully since it was commissioned, despite some early setbacks. The Banner Wind LLC partners had been interested in investing in regional energy projects for some time, and BSNC had already completed a 16.8 kW photovoltaic (PV) array on its office building in March 2008—one of the largest in the state at that time. In late 2008, concerns developed over the scheduled expiration of federal tax credits for some renewable energy technologies, which would negatively impact the economics of the wind project if it were not constructed before the credits expired.[8]

Serving as an additional incentive, the newly minted Alaska Renewable Energy Fund (REF) released its first round

[8] The PTC credited 2.2₵ per kWh for electricity produced by wind, and was later extended by the American Reinvestment and Recovery Act of 2009. The project also qualified for an Investment Tax Credit (ITC), reducing federal income taxes for qualified tax-paying owners based on capital investment in renewable energy projects (measured in dollars) put in service between December 31, 2005, and December 31, 2012. The ITC generally allows taxpayers to take a single tax credit against the project's tax basis equal to 30% in its first year and allows a taxpayer to elect certain qualified facilities to be characterized as energy property eligible for a 10% or 30% ITC, depending on the technology.

of solicitation in September 2008. Nome Joint Utilities Systems applied for and was awarded an $800,000 grant to pay for the extension of a transmission line between the wind farm and the NJUS grid, a major cost component of the project. The Banner Wind Project began construction in fall 2008 with a deadline of December 31, 2008. The wind farm had to be in operation before the deadline in order to take advantage of federal production tax credits (PTC). The wind farm was commissioned in December 2008, meeting the deadline for the tax credits.

Given the short timeline for project development, the choice of wind turbine manufacturer was made without adequate research, resulting in installation of turbines that were not optimal for Nome's harsh winters. The situation worsened when the manufacturer, Entegrity Wind Systems, filed for bankruptcy shortly after the project was completed, resulting in subsequent difficulties procuring parts for maintenance and repair. Nonetheless, most of the turbines have functioned adequately with regular maintenance. There have been two catastrophic failures. First, a full stop during a high wind speed event[9] resulted in failure of one of the braking mechanisms and over-spinning and self-destruction of a turbine. Second, a turbine and tower collapsed due to structural failure. In general, the wind farm has achieved high-capacity factors for this turbine type.

After the full value of all federal tax credits were realized by Banner Wind LLC, the company sold the Banner Wind Project, including a long-term lease agreement for the land, to NJUS effective January 2015. Since then, NJUS has proceeded with the original plan for a larger wind farm, and today a total capacity of 2.7 MW has been installed. The expansion was funded by a grant awarded through the REF, and NJUS purchased two 900 kW EWT turbines, which are better suited for operating in an arctic environment.

Lessons Learned

This project was an early example of how Alaska Native Corporations can invest in energy projects in their regions, in ways that allow them to take advantage of federal tax credits not available to publicly owned projects. Unfortunately, the accelerated timeline for project development, forced by expiring federal tax credits, caused several issues. Lessons learned for future projects include:

- **Lack of a PPA put in place before construction began.** This project developed dependent on the goodwill of all parties involved. While a PPA was ultimately negotiated, favorable terms for the private owner can be more difficult to obtain if a PPA is not negotiated in advance of project development.[10]
- **Poor equipment selection.** A number of factors, including both the appropriateness of the equipment for operating in an arctic environment and the long-term viability of the company manufacturing the equipment, are important for minimizing operation and management costs, maintaining high capacity, and ensuring that the equipment lasts for the designed lifetime.
- **Would they build the project again?** The Bering Straits Native Corporation reports that it would consider future projects similar to Banner Peak Wind Farm, however, while BSNC has an appetite for tax incentives it would require more stringent evaluation for projects as risky as Banner Peak Wind Farm. If BSNC were to consider the project again it would conduct a more comprehensive site evaluation and select turbines better suited for arctic conditions. While the BSNC is pleased with its management performance, it would not use the same team as future project consultants.
- **Successful installation and joint stakeholder project.** This project is a great example of a collaborative effort to fast track a high-profile project in Alaska with an IPP making the actual construction of the project happen as successfully as possible.

[9] The Wartzilla engines, which are prime movers for the NJUS diesel powerhouse require 50% loading to stay in compliance with EPA emissions limitations, and during this wind event high wind penetration and low loads threatened to drop output below this set point. This caused NJUS to force an emergency shutdown of the wind farm as a curtailment mechanism.

[10] This error was not repeated when NJUS was approached about development of a second privately funded project, a 2 MW geothermal project proposed at Pilgrim Hot Springs. In that case, a long-term PPA was negotiated well in advance of project development (this development has not occurred to date).

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Part 2. The Status Quo: Existing Programs and Mechanisms

There is a wide range of existing programs available for financing rural energy infrastructure in Alaska. This chapter provides an overview of these programs, organized in two sections. The first section details programs that support development of basic energy infrastructure, and the second section provides information on existing programs specifically targeted at renewable energy development.

We have also included a summary table of programs categorized by source on pages 23-24. The summary table includes an initial assessment about the community "groups" (defined on page 9) that might be a good fit for each funding or financing option.

In general, if a program has rigid requirements for collateral, equity, match funds, and/or a short payback period, then the program is assumed to be appropriate for Group One communities with sufficient financial resources to qualify for the program. Programs with less stringent requirements for collateral, equity, match funds, and/or a relatively long pay-back period are assumed to be appropriate for both Group One and Group Two communities because these communities are more likely to meet the terms and conditions for these programs.

Grant programs with no match requirements and unusually flexible loan programs are generally appropriate for all groups. Whether or not an eligible borrower decides to apply for a program is strictly the determination of the borrower, and this categorization is not meant to discourage any party from exploring whether a program is a good fit for them; on the contrary, if nothing else, it is hoped that more parties might become aware of available programs and choose to look into those programs that are of interest to them.

Boats sit on the banks of Lake Iliamna near the city of Kokhanok.
Wind farm with two Vestas V-17 90 kW turbines is visible in the background. Photo by ACEP.

Program Summaries: Programs Supporting Development of Basic Energy Infrastructure

Cooperative Banks and Traditional Banking Institutions

There are a wide range of banking institutions that are active in the State of Alaska, though a much smaller subset have engaged in loans related to public energy infrastructure projects. Two examples that have a lengthy history in Alaska are CoBank, and the National Cooperative Bank.

> ***CoBank:*** CoBank is a national cooperative bank serving vital industries across rural America. The bank provides loans, leases, export financing and other financial services to agribusinesses and rural power, water and communications providers across the country, including Alaska. CoBank offers infrastructure loans to rural electric cooperatives utilities up to 100% of infrastructure costs. Utilities that perform similar to cooperatives are eligible to receive loans up to 49% of hard infrastructure costs. Loan duration varies from 5 to 30 years.
>
> ***National Cooperative Bank:*** National Cooperative Bank (NCB) was established to provide comprehensive banking services to cooperatives and other member-owned organizations throughout the country. These can include grocery wholesaler co-ops, housing co-ops, and electric utility co-ops. NCB loans are offered for energy projects that benefit Alaska Native or low/middle income individuals. Loans are available to project developers and amounts range from $2 million to $20 million. Loan durations are up to 15 years and a PPA of 15 years or more is desirable.

Both CoBank and the National Cooperative Bank only fund cooperatives or, in the case of NCB, organizations that function like cooperatives. CoBank has a higher risk tolerance than traditional banks and will loan up to 100% of infrastructure costs for rural electric cooperative project. These banks are both suited to the needs of borrowers in Group One communities because these communities are likely to have the financial resources to meet the lending requirements. Because NCB offers loans in smaller amounts with longer payback periods, it is also suited to the needs of Group Two communities.

USDA Rural Utility Service (RUS) Electric Programs

The United States Rural Utilities Service (RUS) administers programs that provide infrastructure or infrastructure improvements to rural communities, including water and waste treatment, electric power, and telecommunications services. The RUS was formed under the Rural Electrification Administration (REA), one of the agencies created under in 1935 to promote rural electrification, and is now an operating unit of the USDA Rural Development agency of the United States Department of Agriculture (USDA). The RUS has a number of grant and loan programs applicable to Alaska as follows.

> ***RUS High Energy Cost Grant:*** The USDA RUS High Energy Cost Grant is a grant to assist utilities in reducing energy cost in areas where household energy costs are 275% or higher than the national average (USDA, 2016a). Thus an area with an average total household energy expenditure of $5,566 qualifies for this grant. The maximum amount of the grant is $3 million and the minimum is $50,000. This grant does not require cost sharing. The grant can be used to finance the acquisition, construction or improvement of electric generation, transmission, and distribution facilities. Backup power facilities, natural gas storage and distribution facilities, petroleum product storage and handling facilities, renewable energy facilities, and energy efficiency initiatives also qualify for grant funding. State and local government entities, federally

Table 1. Summary of available funding options

Nationwide Funding and Financing Programs

Lenders	Financial Instrument	Eligible Borrowers	Terms	Groups
CoBank	15 year infrastructure loan (with PPA over 15 years)	Cooperatives and regulated utilities	Up to 100% of project cost on restricted loans Up to 49% of project cost on unrestricted loans	Group One
National Cooperative Bank	5 – 25 year development loans	Rural utilities, developers	Smaller loans, \$100,000 up to \$1 M, and larger loans \$2M to \$20M	Group One Group Two
Wells Fargo / other banks	Mezzanine financing, project development financing, subordinate loans	Project developers, small businesses	Varies	Group One
USDA Rural Business Cooperative Service	REAP energy audit & renewable energy development assistance grants	Small businesses, agricultural producers	75% energy audit costs, up to \$100,000 per fiscal year	Businesses
USDA Rural Business Cooperative Service	REAP Renewable Energy Systems & Energy Efficiency Improvement Loans & Grants	Small businesses in rural areas (50,000 people or less), and agricultural producers	Loans of 75% of total eligible project costs, grants of 25% of total eligible project costs, Combined loan/grant of 75% of total eligible project costs Loan guarantees \$5,000 - \$25 M	Businesses
USDA Rural Utility Service	High Energy Cost Grant	State and local entities, federally recognized tribes and tribal entities, for-profit and non-profits businesses	For areas with household energy costs 275% or higher than the national average Grants between \$50,000 and \$3M	Group One Group Two Group Three
USDA Rural Utility Service	Denali Commission High Energy Cost Grant	Both for-profits and non-profits, sole proprietorships, state and local government entities, federally recognized tribes, and individuals	For areas served by the Denali Commission with energy costs 275% or higher than the national average	Group One Group Two Group Three
USDA Rural Utility Service	Electric Infrastructure Loan and Loan Guarantee Program	Non-profit, cooperatives, public bodies, utilities	Up to 100% of loans	Group One Group Two
USDA Rural Utility Service	Distributed Generation Energy Project Financing Program	Project developers, IPP	Up to 75% project costs with 25% cash equity	Group One
U.S. Department of Energy	ATVM Direct Loan or Title XVII Loan Guarantee	With the exception of federal entities, all parties are eligible to apply for funds under the Title XVII and ATVM programs. These entities include, but are not limited to, for-profits, non-profits,sole proprietorships, and state and local government entities, among others.	Direct loans and loan guarantees up to 80% of total eligible project costs	Group One Group Two Group Three

State Funding and Financing Programs

Lenders	Financial Instrument	Eligible Borrowers	Terms	Groups
AIDEA	SETS Loan participation	Co-op, for-profit businesses	Up to $25 M, up to 75% of collateral	Group One
AIDEA	SETS Direct energy development loan	Coop, for-profit businesses	33.3% of total project costs up to $20 M	Group One
AIDEA	SETS Loan or bond guarantees	Co-op, for-profit businesses	33.3% of total project costs, up to $20 M	Group One
Alaska Energy Authority	Power Project Fund Loan Program	Local utilities, local government, and IPPs	Maximum term of loan is useful life of project up to 50 years. No set minimum or maximum amount	Group One Group Two Group Three
Alaska Energy Authority	Alaska Renewable Energy Grant Fund	Investor-owned, municipal, and cooperative utilities, local and state government, schools, and retail suppliers	Maximum grant is $2M for "low energy cost areas" and $4M for "high energy cost areas" for final design and permitting, construction and commissioning. For reconnaissance, and feasibility and design studies the maximum grant is 20% of anticipated construction cost up to $2M	Group One Group Two Group Three
Alaska Energy Authority	Rural Power System Upgrade Program	Non-Railbelt utilities, municipalities, school districts, unincorporated villages, community associations, Native corporations, eligible councils, and any provider of power or fuel to the public	Need-based assistance to upgrade community power systems funded by Alaska legislative appropriations, the Denali Commission, and other matching funds.	Group Two Group Three

Solar panels provide power to the water treatment plant in the North West Arctic Borough community of Deering. Photo by Rob Bensin.

Summary of Community Categorization

Group One: Larger, hub communities of >2,000 residents

Group Two: Mid-sized communities of 500 - 2,000 residents

Group Three: Smaller communities of <500 residents recognized tribes and tribal entities, for-profit businesses, and non-profits including cooperatives and limited dividend and mutual associations are all eligible to apply.

This program is well utilized in rural Alaska. During the last round of awards announced in September 2015, a total of nine grants were awarded, three of which were awarded for projects in Alaska (USDA, 2015). The Alaska Native Health Consortium was awarded $426,916 to retrofit systems and train sanitation workers in 9 rural communities. Puvurnaq Power Company was awarded $857,920 to integrate battery storage into a wind-diesel power system in Konignak. Ipnatchiaq Electric Utility was awarded $175,071 for system repairs and operations and maintenance training in Deering. Because this is a program with no cost share system repairs and operations and maintenance training in Deering. Because this is a grant program with no cost share requirement, it is well suited to the needs of Group One, Group Two, and Group Three communities.

***RUS Electric Infrastructure Loan and Loan Guarantee Program*:** The Electric Infrastructure Loan and Loan Guarantee Program awards insured loans and loan guarantees to non-profit and cooperative associations, public bodies, corporations, limited liability companies, and utilities. Insured loans are used for financing construction of electric distribution facilities in rural areas (USDA, 2016c). The expanded loan guarantee program is available for financing generation, transmission, and distribution facilities. System improvements, demand side management programs, conservation programs, and renewable energy systems are also eligible for funding. All financed facilities must be used for public purposes. The project area must be designated as rural in order to qualify for funding. Loan guarantees are available up to 100% of the loan allowing the Federal Financing Bank to extend credit to qualified borrowers. Interest rates for loans are fixed at the time of loan closing, and are determined by the daily U.S. Treasury rate plus 1/8th of 1%. Up to 100% of the construction work plan can be financed through the Federal Financing Bank. The maximum term of a loan is 35 years or up to the useful life of the financed facility. Hardship loans are available in areas that are economically distressed or recovering from and unavoidable event such as a natural disaster. Hardship loans have a fixed 5% rate of interest for up to 35 years. State and local entities, federally recognized tribes, non-profits including cooperatives and limited dividend mutual associations, and for-profit businesses such as corporations or LLCs (limited liability corporations) are eligible to apply.

According to those interviewed, this program has been underutilized in rural Alaska. Two reasons were given to explain why it has not been used more: 1) rural borrowers prefer to use State's Power Project Loan Fund because of the programs more flexible terms and conditions, and 2) grant funding has typically been available to fund rural energy projects. This program is well suited the needs of Group One communities and Group Two communities that are able to repay loans made under these terms and conditions.

RUS Distributed Generation Energy Project Financing: The Distributed Generation Energy Project Financing Program provides loans and loan guarantees to energy project developers for distributed energy projects, including renewables, in rural communities served by other utilities or by current USDA RUS Electric Program borrowers (USDA, 2016d). Distributed energy project developers, USDA RUS Electric Program borrowers, and other electric utilities that serve rural areas are eligible to apply. If the project developer is an existing RUS borrower, then the loan is treated as an Electric Infrastructure Loan described in the previous section.

In a second scenario, a project developer/owner is the RUS borrower. The developer builds and operates the project and has a PPA to serve rural customers. In this scenario, a minimum of 25% cash equity is required at the project start and the maximum loan is 75% of the cost of the project. Only commercial technology is eligible for financing and the project timeline must include the National Environmental Policy Act (NEPA) process. Risk mitigation measures are also required. Financed projects are required to have a minimum Times Interest Earned Ratio (TIER) of 1.05 and a Debt Service Coverage (DSC) ratio of 1.0 in each of the 10 years in the long range financial forecast of the project. Typical loan terms are 20 years for a solar project with an interest rate of Treasury plus 0.125%.

In a third scenario, a wholly-owned subsidiary of an existing RUS borrower owns and operates the project, and the subsidiary has a PPA with the RUS borrower to take the entire output of the project. The same loan requirements hold for this scenario as described in the project developer scenario above except, in this case, the project developer is not required to have any equity in the project and the cooperative must guarantee the loan.

The Distributed Generation Energy Project Financing Program is suited to the needs of a well-capitalized IPP that can afford to place 25% cash equity into a project, or a utility that is able to guarantee loans for a wholly-owned subsidiary. Most rural utilities would not be able to do so. This program is suited to borrower needs in Group One communities.

Denali Commission High Energy Cost Grants

The Denali Commission is a federal agency established in 1998 with the mission of '*providing job training and other economic development services in rural communities ... with a specific focus on promoting rural development, and providing power generation, transition facilities, modern communication systems, water and sewer systems and other infrastructure needs in rural Alaska*'[11].

Although the Denali Commission is an independent agency, the Denali Commission High Energy Cost Grant receives funding from the USDA Rural Utility Service. The grant is designed to help reduce energy costs in areas of Alaska served by the Denali Commission with energy cost 275% or higher than the national average (USDA, 2016b). Funds may be used to finance energy generation, transmission, and distribution initiatives as long as the facilities are used for a public purpose. The Denali Commission often works with AEA and the Alaska Village Electric Cooperative on projects awarded funding through the grant. Both for-profit and non-profits are eligible to apply. Sole proprietorships, state or local government entities, federally recognized tribes, individuals, or groups of individuals are also eligible to apply. This grant program is only available to rural Alaskan communities. The program is well utilized and, like the general USDA High Energy Cost Grant, is suited to the needs of Group One, Group Two, and Group Three communities.

Department of Energy Loan Programs Office (LPO)

The mission of LPO is to accelerate the domestic commercial deployment of innovative and advanced clean energy technologies at a scale sufficient to contribute meaningfully to the achievement of national clean energy objectives – including job creation, reducing dependence on foreign oil, improving the nation's environmental legacy, and enhancing American competitiveness in the global economy (DOE-LPO, 2015). LPO guarantees loans to eligible

[11] Based on Denali Commission Act of 1998, PL 105-277 42 USC 3121.

clean energy projects and provides direct loans to eligible manufacturers of advanced technology vehicles and components.

LPO has supported more than 30 projects across the United States by providing more than $30 billion in loans, loan guarantees, and commitments. These projects have generated more than $50 billion in total project investment. LPO has more than $25.5 billion in remaining loan guarantee authority to finance innovative clean energy projects through the Title XVII Innovative Clean Energy Loan Guarantee Program (Title XVII).
The Title XVII program provides loan guarantees to accelerate the deployment of innovative clean energy technology. The program applies to advanced fossil energy, advanced nuclear energy, and renewable energy and efficient energy. Eligible projects must utilize a new or significantly improved technology, avoid, reduce, or sequester greenhouse gases, be located in the United States, and have a reasonable prospect of repayment.

AIDEA Sustainable Energy Transmission and Supply Development Fund (SETS)

The Sustainable Energy Transmission and Supply Development Fund (SETS) fund was created in 2012 through the passage of SB 25, the Alaska's Sustainable Strategy for Energy Transmission and Supply (ASSETS) Act. The SETS fund is housed within the Alaska Industrial Development and Export Authority's (AIDEA) Infrastructure Development Division but is managed separately from AIDEA's revolving fund. SB 25 expanded AIDEA's authority to finance, or facilitate the financing of energy infrastructure projects. The SETS fund was specifically designed to help leverage public dollars to foster energy development across the state.

Energy development projects that qualify for SETS funding include any project that consists of the transmission, generation, conservation, storage, or distribution of heat or electricity (AIDEA, 2016). Projects that develop the distribution or storage of refined petroleum products qualify, as do natural gas projects, excluding a gas pipeline for transferring North Slope or Cook Inlet gas. Energy efficiency measures are also eligible for SETS funding.

Financing tools made available through passage of SB 25 include loan participation, direct lending, and a loan and bond guarantee program (AIDEA, 2016) as described below.

> ***SETS Loan Participation:*** For AIDEA's SETS loan participation program, a loan must originate in a financial institution. Then the financial institution submits a loan participation application to AIDEA on behalf of the borrower (AIDEA, 2016). AIDEA can purchase up to 90% of a participating loan, up to the maximum loan amount of $25 million. The maximum term for a loan is 25 years. The interest rate depends on market rates at the time the loan is made. The maximum loan value is 75% of the collateral. The remaining 10% of the loan remains with the originating financial institution.

> ***Direct Energy Development Loans:*** In the Direct Energy Development Loans program, the borrower may borrow directly from AIDEA as opposed to through a financial institution (AIDEA, 2016). Under the terms of this loan program, AIDEA can provide up to 33.3%, but not to exceed $20 million, of a qualifying project's total cost. Any proposed investment that is greater than one third of a project's total cost, or exceeds the $20 million limit, requires legislative approval. The remaining two thirds of project funding must come from private equity, debt, grant funds, or other sources. The maximum term of a loan is 30 years unless the loan is for a hydroelectric project, in which case, the term can be 50 years. AIDEA is able to provide direct financing from its SETS fund.

Loan or Bond Guarantee: AIDEA is authorized to utilize the SETS fund to issue a guarantee on either a loan or bond for a qualified energy development project up to 33.3%, but not to exceed $20 million, of a project's total cost (AIDEA, 2016). The maximum term of a guarantee is 30 years unless the guarantee is for a hydroelectric project, in which case, the term is 50 years. A guarantee can help the borrower secure a lower interest rate in the private market.

As of this writing, $10 million remains in the SETS fund, but it has not been used to fund any rural energy projects. It has only been used to fund projects on the Railbelt. This could be because the requirements for the SETS program exceed the resources available for most potential rural borrowers. For the Loan Participation Program, a borrower must qualify for a loan through a bank and the loan amount is restricted by the value of the borrower's collateral. For the Direct Energy Development Loan Program, the borrower must be able to obtain two-thirds of the funding for the project in order to qualify for the one-third that can be provided through AIDEA. For the Loan or Bond Guarantee Program, the borrower must be able to qualify for a loan or bond in order to qualify for the AIDEA guarantee of one-third of the project costs. The terms of the SETS program may be more suitable for borrowers that have access to traditional means of lending, such as those found in Group One communities.

Alaska Energy Authority Programs

The Alaska Energy Authority (AEA) is an independent corporation of the State of Alaska and the state's energy office. AEA manages two programs that are tailored to the unique needs of Alaska's rural communities - the Power Project Loan Fund, and the Rural Power System Upgrade Program.

AEA Power Project Loan Fund Program: The PPLF program is administered by the Alaska Energy Authority (AEA, 2016b). PPLF loans can be used to fund the development or upgrade of small-scale (less than 10 MW) conventional power facilities, and alternative energy generation facilities (no size limitation). Energy conservation, heat recovery, reconnaissance or feasibility studies, transmission and distribution, and bulk fuel storage are also eligible loan uses. The maximum term of the loan is the useful life of the project up to 50 years. Although there are no minimum or maximum amounts, loans exceeding $5 million require legislative authorization. Interest rates range between federal tax-exempt rates and zero. Local utilities, local governments, and IPPs are eligible to apply.

The PPLF is unusually accommodating regarding terms, interest rates, and collateral requirements. As intended, a wide range of projects have been funded in communities of all sizes, including diesel powerhouse construction and bulk fuel storage facilities, as well as various renewable energy projects. Borrowers that use the PPLF broadly fall into two distinct categories:

Category 1 Borrowers: For smaller utilities with fewer resources, the PPLF is often a lender of last resort because the project developer may not qualify for conventional financing. At least half of all PPLF-financed projects fall into this category, and borrowers in this category frequently benefit from reduced interest rates required to make the projects financially feasible.

Category 2 Borrowers: Larger rural utilities and IPPs in good financial health often shop around to seek the most attractive option for funding among a variety of lenders. The PPLF can be used to make these projects 'whole', by providing a portion of project financing in conjunction with other sources. However, it has also been used to entirely fund projects for category two borrowers. Category two borrowers utilizing PPLF have paid higher interest rates than some category one borrowers because the larger projects are economically feasible even with higher interest rates.

$9.5 million remains in the PPLF. Since the program's inception in 1980, over $100 million in commitments have been issued for 95 loans. Not all approved loans were dispersed. Seventeen of the 95 approved applications were withdrawn or expired after the commitment was issued. About $41 million has been disbursed through the program, although the actual disbursed amount is possibly higher since records from the earliest years of the program are no longer on file.

Due to the flexibility of this program, it is well suited to the needs of Group One, Group Two, and Group Three communities and utilities as well as IPPs. Of the 120 application submitted over the life of the program, nine were for projects in Group One communities, 25 were for projects in Group Two communities, 61 were for projects in Group Three communities, and sixteen were for projects in communities outside the study area[12].

AEA Rural Power System Upgrade Program: The Rural Power System Upgrade Program, established in 2000, is a grant program administered by the AEA that provides need-based assistance to upgrade community power systems. Upgrades can include efficiency improvements, powerhouse upgrades and replacements, demand-side management, heat recovery, and generation and distribution system repairs (AEA, 2016c). Fuel savings of 30% to 40% are not uncommon for powerhouse replacement projects (AEA, 2016c). Funding is provided by legislative appropriations, the Denali Commission, and matching funds.

Community power systems are evaluated and ranked based on deficiencies. The systems most in need of repair are prioritized. In order to be eligible to participate in the program, a community must have between 20 and 2,000 residents, not be predominantly military or industrial, have a centralized community power system, and not be connected to the Railbelt, Four Dam Pool, or Juneau power distribution systems. Eighty-one upgrade projects have been completed as of February 2016.

The Rural Power System Upgrade Program is a need-based grant and therefore is well suited to the needs of Group Two and Group Three communities. Group One communities are not qualified for the program based on the size of their populations. Of the 81 projects funded through the program, twenty were in Group Two communities, 60 were in Group Three communities, and one was outside of the study area.

The community of Tenakee Springs is home to around 100 residents and is located on Chichagof Island. Photo by Gwen Holdmann/ACEP

[12] The documentation provided from AEA did not link the loan amounts with individual communities.

Program Summaries: Programs Incentivizing Renewable Development

Alaska Energy Authority

Alaska Renewable Energy Grant Fund: The Alaska Renewable Energy Grant Fund (REF) was established in 2008 and is administered by the Alaska Energy Authority (AEA, 2016d). The REF provides grants to fund renewable energy project-related activities including feasibility studies, reconnaissance studies, energy resource monitoring, as well as efforts contributing to the design and construction of eligible facilities. The maximum grant amount for final design and permitting, construction and commissioning is $2 million for "low energy cost areas" and $4 million for "high energy cost areas." For reconnaissance, as well as feasibility and design studies, the maximum grant amount is 20% of anticipated construction cost up to $2 million (DSIRE, 2016). Even though no match is required, communities are encouraged to demonstrate match funds in their application.

Since its inception, the REF has disbursed over $188 million in funds for renewable energy projects across the state (AEA, 2016e). These funds were accompanied by over $118 million in match funds. This grant program is well suited to the needs of Group One, Group Two, and Group Three communities. Of the $188 million REF expenditures, $32 million went to Group One communities, $41 million went to Group Two communities, $51 million went to Group Three communities, and $64 million went to communities outside of the study area.

USDA Rural Business-Cooperative Service

Rural Energy for America Program (REAP) Energy Audit & Renewable Energy Development Assistance Grants: The REAP Audit & Renewable Energy Development Assistance grantees provide technical assistance to rural small businesses and agricultural producers in the form of energy audits, renewable energy technical assistance, and renewable energy site assessments. The grant covers 75% of the cost of conducting the assistance for each business, and the application must demonstrate that multiple businesses will be assisted (USDA, 2016e). The maximum amount of the grant in a fiscal year is $100,000. Federal and state governments, federally-recognized tribes, land-grant colleges or universities or other institutions of higher education, rural electric cooperatives, public power entities, and Resource Conservation and Development Councils are eligible to apply for funding.

Grantees funded through this program could assist rural small businesses across communities in all groups. For example, in May 2016, the Southeast Conference, the regional economic development organization for Southeast Alaska, was awarded $96,000 which it will use to conduct energy audits on 26 rural small businesses (USDA, 2016f).

Rural Energy for America Program Renewable Energy Systems & Energy Efficiency Improvement Loans & Grants: REAP Renewable Energy Systems & Energy Efficiency Improvement Loans & Grants provide guaranteed loan financing and grants. The guaranteed loans and grants are provided to purchase or install renewable energy systems, or for making energy efficiency improvements (USDA, 2016g). Small businesses in areas with fewer than 50,000 residents and agricultural producers may apply.

Loan guarantees are available on loans up to 75% of project costs, and grants are available for up to 25%

of project costs. Combined grant and loan guarantee funding is available for up to 75% of total project costs. For loan guarantees, the minimum is $5,000 and the maximum is $25 million. Interest rates for loan guarantees are negotiated with the lender and are subject to USDA approval. The maximum term for a loan guarantee is seven years for capital loans, 15 years for machinery and equipment, and 30 years for combined equipment and real estate loans.

Renewable energy system grants have a $2,500 minimum and a $500,000 maximum. Energy efficiency grants have a $1,500 minimum and a $250,000 maximum. All energy efficiency projects require an energy audit or assessment. All funded projects greater than $200,000 require a technical report.

This program is only available to businesses. A community must form a for-profit business in order to participate in this program. The loan guarantee portion of this program requires an entity to qualify for a loan with a bank, and grant funding is only available for up to 25% of eligible project costs. This program is suitable for any business meeting these requirements across all community groups.

The new health clinic in Hughes serves the community of 90 on the Koyukuk River. Photo by Amanda Byrd/ACEP

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Part 3. Strategies to Reduce Barriers to Private Investment

The challenges faced by Alaska in identifying opportunities to incentivize private investment in rural communities in ways that benefit the public good are not unique to Alaska. Many other energy markets - including some that are much more developed - face similar challenges. In order to identify potential strategies for reducing barriers to private investment in rural Alaska energy projects, it is important to understand what sorts of policies and programs have been effective elsewhere. In total, there are 9 strategies explored in this chapter that have either not been utilized, or only minimally utilized in Alaska. These include:

1. State Energy Infrastructure Banks
2. Tax-Equity Partnerships (includes a case study from the community of Naknek)
3. Use of performance or output based incentives such as a Feed-in Tariff (FiT)
4. Energy Service Companies (ESCO, includes a case study from Elmendorf Air Force Base)
5. Public loan guarantees through establishment of a Loan Loss Reserve (LLR)
6. Loan or project aggregation
7. Interest rate buy-down
8. Project revenue or minimum revenue guarantee
9. Resource assessment to encourage project development

When possible, we have focused on strategies that have been successful in energy markets that have some similarity to Alaska. For this reason, we have not limited ourselves to the U.S., but have selected examples from around the world that have elements that could be applied in Alaska. In each case, we have attempted to describe how the program works, provide an example of how it has been applied elsewhere, and describe how the program, or elements of the program, could be applied in Alaska.

1. State Energy Infrastructure Banks

In mature markets conventional private sector debt typically accounts for the majority of financing for small-scale energy projects. However, bank lending for energy projects has not occurred to any significant degree in rural Alaska. An energy infrastructure bank can play a role in creating favorable conditions for conventional debt financing by improving the attractiveness of projects for potential investors and bridging funding gaps to enable projects to move forward.

State Energy Infrastructure Bank Models

Investment funds and investment banks have been established in several states to promote the development of energy projects. Frequently, these programs place an emphasis on renewable energy and energy efficiency projects, and accordingly are frequently called 'Green' or 'Clean Energy' banks, but the model can be applied more broadly. These programs are designed to provide a cost-effective option for energy projects with the goal of transitioning public funds away from grants, rebates, and subsidies by shifting funds towards self-sustaining financing tools that generate returns (Berlin, Hund, Muro, & Saha, 2012). In addition, they seek to leverage public funds by partnering with private funding entities. There are three leading models for green banks:

- **The Connecticut Model** – In the Connecticut model a quasi-public clean energy bank is established in which several existing clean energy and energy efficiency funding sources are consolidated into the clean energy bank (Berlin, et al., 2012). The clean energy bank is authorized to issue bonds and bond anticipation notes, and is also authorized to raise or leverage funds from private sources.
- **The State Clean Energy Financing Bank** – Under this model, state resources for certain energy programs, including staff, funding, and presumably legislative authority, is transferred from some agencies to the clean energy bank (Kennan, 2014). The clean energy bank is a government owned non-profit entity authorized to raise private funds for the purpose of leveraging government funds under a formal partnership agreement.
- **The Infrastructure Bank** – This model is similar to the clean energy bank model except traditional infrastructure projects are financed along with clean energy projects by a combined state clean energy and infrastructure bank. In contrast to infrastructure projects which are public goods, the energy projects financed under this model would generate revenue. Thus, it is suggested that the energy bank is set up as a subsidiary of the infrastructure bank with separate management and balance sheets (Kennan, 2014).

Connecticut Green Energy Bank

The Connecticut Clean Energy Finance and Investment Authority was created by the state legislature in 2011 and renamed the Connecticut Green Bank in 2014. The green bank was initially capitalized with $48 million from a utility surcharge and from proceeds from Regional Greenhouse Gas Initiative. The goal of the bank is to transition the clean energy market from government-based incentives to private sector financing. Before the inception of the green bank 80% of the state's clean energy funding was directed towards grants, rebates, and subsidies (Belden, Clemmer, & Wright, 2015). Currently 80% of the state's clean energy funding is directed towards loans and credit enhancements (Belden, Clemmer, & Wright, 2015).

The bank houses both residential and commercial programs. The residential programs provide loans and leases for solar and solar thermal installations. The solar leases have a term up to 20 years. The solar loans have a 15 year term and a 6.49% interest rate. The bank also sponsors a residential energy efficiency loan called the Smart-E loan with 5 to 12 year terms and interest rates between 4.49% and 6.99%. The green bank provides a loan loss reserve fund for the Smart-E loan program which reduces risk on behalf of creditors. Through the Smart-E loan program $2.8 million in state funds has been leveraged into $30 million in private sector loans. The commercial division of the bank houses the commercial property assessed clean energy (C-PACE) financing program which provides loans for property for energy efficiency upgrades or renewable energy installations. The C-PACE loans are then repaid through a tax assessment tied to the property. The green bank administers the loans. The loans have terms from 10 to 20 years with interest rates between 5% and 6% with a closing fee. The green bank warehouses the C-PACE loans and sells them to a secondary debt market once enough loans are closed.

How the State Energy Infrastructure Bank Models could be applied in Alaska in the future

Expand the Power Project Loan Fund (PPLF) and rebrand it as an energy infrastructure bank. The PPLF already serves many of the same functions as an infrastructure bank, with the exception of funding end-use energy efficiency projects. The PPLF will require recapitalization if it is to become an important financing tool for future Alaska energy infrastructure projects. Effort should be made to increase awareness of the program and its benefits to attract the full spectrum of potential borrowers. See recommendation #1 (page 50) for more information.

2. Tax-Equity Partnerships

Tax incentives improve the economic feasibility of energy projects by reducing the taxes owed by the project developer. These partnerships are formed around federal tax credits for renewable energy systems, namely investment and production tax credits (PTC). Originally enacted in 1992, the PTC has been renewed and expanded numerous times. The most recent extension was approved in December 2015 through the Consolidated Appropriations Act, 2016. This legislation extends eligibility for specific renewable energy projects commencing construction before December 31, 2016, and remains in effect through the December 31, 2019.

An additional challenge for small rural project developers is that very few of them have the capacity to take full advantage of the tax incentives available. This is because many developers are small businesses that do not pay enough federal tax to allow them to fully use all of the tax benefit available from a project. Therefore, they seek a tax-equity partnership so that an entity with a large enough tax obligation can buy into the project and recoup the full benefit of the tax incentives offered.

There are three commonly used tax-equity partnership investment vehicles: partnership flip, sale leaseback, and lease pass-through (Ardani, Busche, & Hillman, 2013).

- **Partnership flip** – In a partnership flip, a company serving as the project developer covers costs of designing and developing the project, while a tax-equity investor incurs the construction cost. The tax-equity investor holds a majority of the project company's equity and receives the majority of the tax benefits and negotiated cash-flow up to the point their pre-determined rate of return is met. At this point, the allocation of equity is reversed and the project company receives the majority of the cash flows and any remaining tax benefits.
- **Sale-Leaseback** – In a sale-leaseback the developer pays for both the project development and construction. The developer then sells the project to a tax-equity investor but signs a long-term lease agreement. The developer is the project operator and negotiates a long-term PPA. The cash flow from the power purchase covers the developers operating costs and lease payments. A sale leaseback is used to pass the Investment Tax Credits from a project's equity owner to a lessee through lower negotiated lease payments.
- **Lease Pass-through** – In a lease pass-through the developer pays for the project development and

Tax-Equity Partnership Case Study: Naknek Solar Project

Project Status: Completed

Community: Naknek, Alaska

Population: 554 (2010)

Private investor: CapStone Solutions

Utility: NEA

Investment: 80 kW solar PV

Cost: est. $500k

Successes: Collaboration with local installers and installation of largest Solar PV system in Alaska

In October 2014, an 80 kW solar photovoltaic (PV) array, the largest in Alaska, was installed in the Bristol Bay School District at Naknek High School. The school purchases electricity from the local electric cooperative, Naknek Electric Association (NEA). The 310 panel PV system, designed and owned by CapStone Solutions, Inc., was installed by Lime Solar, an Alaska-based company. CapStone Solutions paid for the installation and worked with the school to determine the appropriate business structure. The school estimated savings of $20,000 annually by purchasing up to 73,000 kWh of electricity per year at a fixed rate which was set below NEA's retail price for power. The payback for the system was estimated to be less than five years. Because the school did not pay for the system, the savings to the district would be immediate.

The school expected to purchase this electricity under a power purchase agreement with CapStone Solutions, Inc. However, participation in an electric co-op frequently prohibits its members from purchasing power from a third party, and this was also true of the NEA co-op. Therefore, if the school district was to purchase power from Capstone, then the rules of the co-op would require the school to leave the co-op and become entirely self-generating. For this reason the 80 kW solar array has not provided any power to the school to date. NEA and Capstone have subsequently entered negotiations for NEA to purchase the Capstone assets. Under the circumstances, this arrangement seems preferable to NEA purchasing power from Capstone, in part due to the current RCA regulations pertaining to the sale of power by an IPP to a local utility. NEA operates as an exempt utility under RCA regulations; however, the RCA requires CapStone to be economically regulated before it can sell power from its solar installation to the utility. Economic regulation of an IPP is meant to offer protection to ratepayers in the event that an IPP should increase rates without warning to the utility and its customers.

CapStone petitioned the RCA for exempt status for future development projects citing a precedent set where IPPs were granted exemption because small energy projects are rarely feasible when the burden of regulation cost is put on the IPP. Without regulatory exemption, it becomes prohibitively expensive for small scale energy development to occur in rural communities. Their argument is that a utility would willingly enter into an agreement with an IPP if it could be demonstrated that doing so would lower the overall operating cost for the utility. Lower operating costs could include displacing high priced diesel fuel, establishing a stable energy price over a long period, and demonstrate to the market and potential investors that incorporating renewable energy, in conjunction with energy storage when appropriate, is an economic approach to solving the region's high cost of energy while providing a business opportunity.

The petition for CapStone Solutions, Inc. to be exempted from future RCA regulation was granted on December 16th, 2015. The exemption is subject to three conditions including: 1) "CapStone will only offer to sell power to utilities that are not regulated by the Regulatory Commission of Alaska, or to utilities that are exempt from economic regulation by the Regulatory Commission of Alaska,"[13] 2) they shall construct and maintain systems in accordance with the National Electric Safety Code, and 3) that they will not demand avoided cost payments for the energy they sells to the utility.

Lessons Learned

This project is an example of the importance of understanding the rules under which a utility operates as well as the regulatory environment before investing in energy projects as an IPP in Alaska. The Alaska market for IPP developers is relatively "uncharted territory," and furnishes unique challenges for early adopters of business arrangements which may be novel in the Alaska marketplace.

- **Engage with the utility during project planning:** There is a need for early engagement with the local utility anytime a facility is considering independent power generating options, and this is especially true in Alaska where many utilities operate as member owned co-ops. In this example, the parties appear to have overlooked that NEA may have rules of operation (for economic as well as technical reasons) that would impact the agreement between CapStone and the school district. This resulted with CapStone failing to realize a return on its investment until NEA's purchase of the CapStone PV facility is finalized, or until the regulatory issues regarding economic regulation of an IPP is sorted out.
- **Economic regulation can be prohibitively costly:** The CapStone entry into Alaska's rural markets illustrates the complication of the economic regulation of an IPP when trying to sell power to a local utility. An IPP incurs the cost of economic regulation which drives up its project costs. Often, these projects are very small to begin with, and there is not the volume of sales potential across which to spread the incremental costs, especially for a project that relies on intermittent generating sources such as wind and solar. The CapStone petition to the RCA notes that the utility has business reasons of its own to vet an IPP's offer and that the additional benefit from RCA regulation may not be worth the cost.

[13] http://rca.alaska.gov/RCAWeb/ViewFile.aspx?id=10108623-D29A-476E-AB49-BE1786B8F86E

construction of the project and then leases the assets to the tax-equity investor. The tax-equity investor sells the developer electricity through a PPA. The Investment Tax Credit can be passed through to the lessee.

Examples of how tax-equity partnership have been used

The Banner Wind project in Nome was the first wind farm to be installed by a private company in Alaska. It is a good illustration of how federal tax credits can be used to incentivize project development in rural Alaska through the partnership flip model. The project was developed by Banner Wind LLC beginning in late 2008. Banner Wind LLC was created explicitly to develop and operate the project, and was jointly owned by Sitnasuak Native Corporation (SNC) and Bering Straits Native Corporation (BSNC)[14]. The project was developed with an installed capacity of 900 kW, and a 20-year PPA was finalized with the Nome Joint Utilities Systems (NJUS) in 2010. Banner Wind LLC was responsible for operating and maintaining the system. BSNC and SNC monetized tax credits from the project and participated in revenues from power sales to NJUS. After the full value of all federal tax credits were realized in 2015, the Banner Wind project was sold to NJUS, including a long-term lease agreement for the land, which is owned by SNC and BSNC, and Banner Wind LLC was dissolved.

Examples of how tax-equity models could be applied in Alaska in the future

Tax equity partnerships appear to be an under-utilized tool in Alaska, particularly as a project development mechanism between regional and village Alaska Native corporations with communities in their area. Uncertainty related to the long-term availability of these tax credits has undoubtedly played a role, as has been the case in other markets. However, several Alaska-specific challenges exist such as resistance of many rural utilities to entering into PPAs due to real or perceived risk to their business model, and reluctance by many rural residents to accept for-profit models for power generation, in a state where the majority of providers are publicly owned. The perception that someone might be making money from residents that are experiencing high levels of poverty is often anathema to such business arrangements. However, the reality is often such that the strong incentive to perform in order to receive payment (PTCs are based on kWh generated and sold) results in better efficiency and higher availability of equipment installed under this model. Native corporations are in a position to maximize tax equity from a project and earn public trust due to their unique relationships with the communities in their region.

3. Use of Performance or Output Based Incentives such as a Feed-in Tariff

Performance or output-based incentives can provide powerful incentives for private sector development and long-term operation of energy systems. They are often used to increase the installed capacity of a certain generating technologies that feed the grid, and are frequently employed as a policy mechanism for meeting renewable energy development targets. A Feed-in Tariff (FiT) – also known as a "Standard Offer" rate or "Advanced Renewables Tariff" – is a common example of financial support paid per unit output (i.e. electricity generated).

How Feed-in Tariffs work

A FiT is a technology-specific price-based support whereby a generating asset benefits from either a guaranteed price per unit generated, or a fixed addition to the variable market price. Under a FiT scheme, the utility is obliged to pay a fixed long-term rate per unit output and is then usually reimbursed for this amount from a centralized fund. The FiT is usually guaranteed over a portion of, or all of, the life of a generating asset.

[14] SNC later sold their share in Banner Wind LLC to BSNC, making BSNC the sole parent company of Banner Wind LLC when it was later sold to NJUS.

FiTs are used commonly in the European Union (EU), particularly in Germany, Spain and the United Kingdom as well as in many developing countries to support policy objectives for the rollout of renewable energy technologies. They have often been used to incentivize projects in the small scale and residential sectors, and have been proven to be effective in encouraging solar and wind energy technology – particularly in the EU.

Some of the benefits include:

- A FiT system can be designed to support preferred generating technologies in targeted regions, or to support specific project ownership structures – i.e. FiT for Community Owned projects. By adopting a FiT, markets for a certain generating technologies, or types of projects, can be created 'overnight'.
- FiTs reward production - if projects do not perform, they do not receive payment.
- Appropriate limits can be placed on project scale or overall installed capacity.
- FiT can be reviewed and revised over time to best match changing policy objectives.
- The FiT structure is typically administered by the local utility. The administrative burden on the public sector is generally low.

4. Energy Service Companies

Energy Service Companies (ESCOs) are specialized businesses established with the aim of providing one or all of a broad range of energy solutions and services. ESCO activities are varied and can include implementation of energy efficiency programs, retrofitting or construction of new energy assets and power plant development, operation and power supply (UNECE, 2013). The ESCO concept can include additional activities such as Contract Energy Management (CEM) and other performance related areas. The presence of ESCOs is increasingly regarded as being a key ingredient of a well-functioning energy market with a healthy investment environment.

How ESCOs work

Under an ESCO model, the customer enters into an Energy Savings Performance Contract (ESPC) with an ESCO. The ESPC guarantees a minimum level of energy (or cost) savings over the duration of a contract. The ESCO incurs the upfront costs for the energy audit, system design and engineering, equipment, and installation. These costs are recouped with the cash flow resulting from the energy savings of the project with the ESCO responsible for paying any shortfalls. This is an attractive option for an entity interested in investing in energy efficiency, because there are no upfront capital costs and once the ESPC expires, the customer reaps the full savings from the efficiency upgrades.

Examples of how ESCOs have been used in Alaska

ESCOs already operate in the State of Alaska, but these ESCOs are nationally or internationally based. Some companies that provide these services have worked on projects in rural Alaska, but not under a traditional ESCO model due to the small scale of the projects. For example, Siemens, which frequently operates as an ESCO in larger markets, worked closely with the Lake and Peninsula School District (LPSD) in Southwest Alaska to identify and complete a number of energy efficiency improvements for each of their thirteen schools. Siemens was paid for this work through revenues generated from bonds sold through the Alaska Municipal Bond Bank Authority. In this case, Siemens was able to lend their expertise to each aspect of the project including the financing component, but was not able to employ an ESCO model due to low profit margins.

ESCO Case Study: Elmendorf Air Force Base Heat and Power

Project Status: Complete

Community: Elmendorf Air Force Base, Anchorage, Alaska
Population: 5,700 (2013)

Private investor: Ameresco, Inc.

Investment: 300+ natural gas boilers in 130 facilities

Cost: $49 million

Electric Utility: Integrated into Doyon Utilities

In 2004, Ameresco, Inc.[15] was awarded the largest energy savings performance contract (ESPC)[16] in the U.S. Air Force's history to replace a 50-year-old coal-fired combined heat and power plant at Elmendorf Air Force Base (Now Joint Base Elmendorf-Richardson)[17]. The project resulted in reducing energy consumption by over one-million MMBTU, equivalent to $123 million in energy savings over the 22 year contract.

Once completed, this project enabled the decommissioning and removal of the coal-fired plant that supplied power and district heat to the base. It was replaced with decentralized natural gas-fired boiler systems installed in each of the 130 buildings on base. Ameresco also negotiated with ENSTAR Natural Gas to construct eight miles of new pipe to supply the base; and with the local utility, Municipal Light & Power, to provide electric power service and manage the power distribution system on base.

Ameresco negotiated a 22-year ESPC with Elmendorf Air Force Base. The arrangement permitted Ameresco to leverage the cost savings from energy efficiency improvements to pay for the financing of the capital investments, and to provide for ongoing operations and maintenance. Under this agreement, Ameresco owns, operates, and maintains all boilers installed on the base during the 22 year performance period. Elmendorf Air Force Base continues to pay a negotiated energy service fee based on based on historic (pre-project) rates for the life of the contract. A negotiated Monitoring and Verification Plan defines the details for how cost savings are defined before any energy upgrades are executed.

As a result of this project, energy savings of over 1 million MMBTU annually has been achieved. These savings

[15] Ameresco, Inc., is an independent service provider of renewable energy and energy efficiency retrofits throughout North America.

[16] Energy savings performance contracts are an option for public, or private, industry to develop renewable energy projects or to undertake energy efficiency projects without also taking on the burden of the cost.

[17] This project required an exemption from Section 433 of the Energy Independence and Security Act of 2007, which mandates elimination of all fossil fuel-generated energy use in federal buildings by the year 2030. The mandate covers new buildings and major renovations of at least $2,500,000 (in 2007 dollars), and includes restrictions on the adoption of natural gas combined heat and power and waste heat recovery systems.

exceed the performance criteria and are frequently recognized as an example of progress the United States Air Force has made toward achieving its energy savings targets. At the end of the 22-year contract, Joint Base Elmendorf-Richardson will take over ownership, operations, and management of the equipment and ancillary systems.

Lessons Learned

This project is an example of how a facility owner can use an energy service company to procure energy savings and facility improvements without incurring up-front capital costs. Entering into an ESPC allows the cost of the project to be paid through the savings from energy and efficiency upgrades, with the savings going to the energy services contractor, in this case Ameresco, Inc.

- **ESPCs are more lucrative when there are economies of scale.** The Elmendorf Air Force project was a large-scale, multi-year retrofit to aging infrastructure that took advantage of a relatively low-cost local fuel source – Cook Inlet natural gas. It is unlikely that a similar type of project could be realized in rural Alaska in the near future – both in terms of scale and the opportunity to switch to an alternate fuel source. This latter factor may change if affordable fuel alternatives, LNG for example, becomes available to some of Alaska's coastal communities.
- **ESPC contracts eventually end and operations and maintenance is resumed by owners.** Reaching the end of an ESPC puts the ownership and burden of operations and maintenance of the upgraded systems in the facility owner's hands. Under a successful ESPC the equipment would be assumed to be in excellent working order, but this may not always be the case as a looming end of contract could offer the temptation of a reduction in maintenance by the contractor.

Ameresco manages the heat utility at Elmendorf Air Force base. Photo from of Militarybases.com

In 2004, Ameresco, Inc. was awarded the largest energy ESPC in the U.S. Air Force's history to replace a 50-year-old coal-fired combined heat and power plant at Elmendorf Air Force Base (now Joint Base Elmendorf-Richardson). To finance the project, Ameresco negotiated a 22-year ESPC with Elmendorf Air Force Base, which leveraged the cost savings from energy efficiency improvements to finance the capital costs of the project and provide ongoing operations and maintenance. The large scale of this project allowed for the traditional ESCO model to be successfully employed. Various ESCOs are also being used to retrofit public buildings in Alaska through contracts awarded through the Energy Office of the Department of Transportation and Public Facilities (DOTPF). Over 50 state-owned buildings have been retrofitted across the state with annual energy costs savings more than $2.4 million (DOTPF, 2015).

How ESCOs could be applied in Alaska in the future

Because the Alaska market is so small, margins on projects developed in most communities are too small to attract the interest of for-profit ESCOs. However, the possibility of a regionally-based, non-profit ESCO with specific goals of creating a market for energy efficiency or weatherization projects within a region could be worth exploring. In addition, Native Corporations that already operate building and facilities management services in the Alaska market could expand into energy services and form regional ESCOs across the state. Native Corporations already have an established business presence in many rural communities. Regional ESCOs could provide a new business opportunity while saving community members money on energy expenditures.

5. Public Loan Guarantees through Establishment of a Loan Loss Reserve (LLR)

A loan guarantee is designed to guarantee at least a portion of the losses incurred by a project developer in the event of a specified occurrence which has the potential to undermine project viability. Loan guarantees are typically offered by governments or other central agencies to address market-specific issues and challenges.

Public loan guarantee programs can mobilize commercial co-financing by distributing the investment risk between different investors, thereby lowering the risks faced by individual investors. Furthermore, whereas funds allocated as direct grants can only benefit a single project, funds applied via risk sharing mechanisms are capable of mobilizing investment in a number of projects simultaneously.

An LLR is a risk sharing measure typically put in place between a public sector state- or city-level agency and private sector financial institution implementation partner (Office of Energy Efficiency and Renewable Energy, 2016). The public sector partner provides partial risk coverage to the commercial lender partner by allocating a funding reserve to cover a pre-specified percentage of total loan losses – these are loans which have not been serviced by borrowers and are in danger of or have already gone into default.

How Loan Loss Reserves work

The LLR can be set up to cover first losses incurred by a program as well as a set percentage of overall losses incurred. Loan loss reserve programs put in place by US Department of Energy to date have tended to focus on energy efficiency and renewable energy lending, often targeted at the residential sector, although the model is applicable to other markets. LLRs have been set up to cover typically between 75% - 90% of overall losses (US

Department of Energy, 2010).

LLRs provide risk protection for the lender which results in less stringent underwriting requirements and higher rates of approval of loans thereby improving access to credit for eligible projects and borrowers. A portion but not all of the loss is covered by the loan loss reserve thereby maintaining an incentive for good loan origination and administration on the part of the implementing institution. Some additional benefits of LLRs are outlined below:

- LLRs are potentially a highly efficient use of public funds and allow for leveraging of public monies. LLR programs in the USA have typically ranged from 2% - 10% of overall portfolio value, and have allowed up to $10 of private sector finance to be leveraged for every $1 of public money (MacLean, 2010).
- Risk-sharing allows for projects and borrowers with high risk or lower credit scores to be considered for financing. Under the status quo these applicants would be likely to be refused credit.
- Greater overall security in the lending portfolio should allow the lender to offer longer term loans with lower interest rates, resulting in lower monthly repayments. Longer term loans have the added benefit of matching the expected life of a generating asset with the amortization period.
- Lowering the risk faced by the lending institution allows them to potentially broaden the range of financing options for borrowers. This is particularly valuable for encouraging investment in pre-commercial areas or innovative technologies which are perceived as being higher risk by lenders.

Example of LLRs being applied elsewhere

For the past three years, the Vermont Economic Development Agency (VEDA) has been using LLRs to encourage energy efficiency projects. Under the program, eligible lending banks may offer loans for energy efficiency projects which are 75% guaranteed by the LLR. The total portfolio size is approximately $10 million (Vermont Government, 2013).

VEDA's use of LLRs was expanded to include the Thermal Energy Finance Pilot Program, which was launched in February 2014 to help homeowners gain greater access to financing to improve thermal efficiency. The program was further expanded in April 2015 to include "Heat Saver Loans" for the installation of high efficiency oil and propane boilers and furnaces, cold-climate heat pumps, solar hot water systems, central wood pellet systems, as well as weatherization activities. The Heat Saver Loan offers interest rates that range from 0% to 4.99% based on an applicant's household income, and loan terms up to a maximum of $35,000 and 15 years (Vermont Department of Public Service, 2015). The state's investment for this program in the form of LLRs and interest rate buy-down is expected to leverage up to $7 million in total private financing (Vermont Government, 2015).

In April 2014, Vermont announced the formation of an additional LLR targeted at reducing the risk of lending to start-up technology companies in Vermont (Vermont Government, 2014). This announcement of three separate LLR programs in three years speaks to the perceived effectiveness of this instrument in promoting clean energy, energy efficiency, and technology development.

How LLRs could be applied in Alaska

The PCE Endowment Fund holds a balance of over $900 million. A portion of the endowment could be set aside as a LLR to support energy project financing in rural Alaska. The LLR could be invested conservatively in accordance with state guidelines. Using a portion of the endowment fund as a reserve fund for loan guarantees for rural energy projects could potentially help reduce power costs in rural Alaska which is the purpose of the PCE program. A loan guarantee program would allow the state to support more projects than a direct loan program because only a portion of every loan is guaranteed and typically only a small portion of loans go into default[18] resulting in payment from the LLR.

Under a loan guarantee program, loan terms are negotiated between the borrower and the lender and approved by a state agency before the guarantee is issued. A loan guarantee shifts part of the risk from the lender onto the guarantor, providing incentive for lenders to execute loans they may otherwise deem too risky. This type of program enables high risk rural energy projects that could not otherwise attract private financing.

6. Loan or Project Aggregation

Loan or project aggregation programs have similar goals of 1) addressing the inherent inefficiencies and fixed costs associated with small projects by 'packaging' a large number of them, and 2) spreading risk among a sufficient number of projects, such that if some of them turn out to be uneconomical, then the losses can be absorbed through the larger 'package' of projects.

Loan Aggregation Example: The Warehouse for Energy Efficiency Loans (WHEEL)

The Warehouse for Energy Efficiency Loans (WHEEL) is a PPP which allows energy efficiency programs to leverage public funds and access the bond market. WHEEL was developed by a coalition made up of the National Association of State Energy Officials, the Pennsylvania Treasury, Renewable Funding, and Citigroup Global Markets. WHEEL aims to access the bond market by standardizing and aggregating residential energy efficiency loans across states and programs. State energy efficiency programs can be designed or adapted to fit WHEEL's requirements.

WHEEL's current base interest rate is 9.99% which reflects the risk of unsecured lending (Kramer, Clemmer, & Wright, 2015). State energy efficiency program administrators can opt to use interest rate buy downs to reduce the interest rate, but interest rate buy downs may prove costly to programs. The maximum term of a loan under WHEEL is 10 years. In order to qualify for a loan through a WHEEL approved program, a customer must have a minimum FICO score of 640. With these standardized loan features, it is estimated that the average program contribution will be 20%, allowing participating program administrators to achieve a leverage ratio of 5:1 (Kramer, Clemmer, & Wright, 2015).

Program administrators must align their program to meet the WHEEL requirements and commit subordinated capital in order to join WHEEL. State program funds make up 20% of the WHEEL portfolio (Kramer, Clemmer, & Wright, 2015). The state funds act as a credit enhancement for the private, senior funds which make up the remainder of the portfolio. Loan losses are taken out of the subordinated capital first. Senior lenders would only be affected if loan losses greater than 20% of the portfolio occurred.

First loans are originated by WHEEL-approved lending partners. A lending partner funds the loan and then the loan is sold to WHEEL. WHEEL aggregates unsecured loans and warehouses them until there are enough to package and sell to bond investors. The loan payments are used to pay down the bonds. Once the bonds are paid

[18] For example, there are no PPLF loans currently in default.

down, program administrators receive payments on their investment.

Pennsylvania, Kentucky, Virginia, New York, Indiana, Florida and the Greater Cincinnati Energy Consortium have joined WHEEL. In June 2015, Citi and Renew Financial issued $12.6 million in securities backed by pooled residential energy efficiency loans (Citigroup Inc., 2015). This was the first issuance of energy efficiency loan-backed securities.

How this could apply in Alaska

Due to the relatively high interest rate of 9.99%, this program may not be tenable without an interest rate buy-down program. Additionally, the minimum FICO score of 640 may be prohibitively high, especially for communities with mixed cash-subsistence economies where residents may not have established credit histories. Lastly, the maximum 10-year loan term may result in monthly payments that are too high for low-income households to repay. This program may be better suited for the more urban areas of the state.

The Alaska Housing Finance Corporation (AHFC) offers the Home Energy Loan for residential energy efficiency improvements for owner-occupied properties. For this program, an energy audit is conducted on the property. Then the homeowner selects which upgrades to undertake from a list of pre-approved energy efficiency measures compiled by the energy auditor. The energy efficiency upgrades must be made within one year of the loan closing. The maximum loan amount is $30,000 with a maximum loan term of 15 years. The interest rate for the Home Energy Loan is currently 3.5% for homes in urban areas and 3.375% for homes in rural areas (AHFC, 2016a). Currently the AHFC offers lower interest rates and a longer payback period than The WHEEL program.

7. Interest Rate Buy-Down

An Interest Rate Buy-down (IRB) is typically an upfront payment made to a commercial lender by a state or local entity in order to lower or 'buy down' the interest rate charged to loan applicants. This enables financiers to provide low cost credit to applicants.

The upfront payment is typically calculated from the difference between the sum of all principal and interest payments that a lender would be projected to receive at the market interest rate, and the sum of all principal and interest payments that the lender would receive at their calculated target interest rate discounted to net present values (Office of Energy Efficiency and Renewable Energy, 2016). Some additional benefits of IRBs are outlined below:

- IRBs can be implemented relatively rapidly
- Reducing the risk faced by private lenders results in reduced interest rates for borrowers.
- An upfront payment to lenders can act as a strong incentive for involvement and swift program implementation
- IRBs can be effective in encouraging lenders to enter new markets – either in new geographic areas or in less mature perceived higher risk technological sectors
- IRBs can be effective in encouraging program participation en masse. Higher participation rates are

beneficial in terms of spreading fixed administration costs over a larger borrower base.

Example of IRBs applied elsewhere

Numerous examples exist of use of IRBs in improving access to finance for energy installations and financing energy efficiency measures in the United States. Most examples are targeted at the residential sector with relatively small individual loan amounts generally in the $10,000 - $25,000 range.

The State of Kansas has operated the Kansas Energy Efficiency Program (KEEP) since 2006. The program finances energy efficiency improvements such as heaters and insulation upgrades for residential buildings. The program operates by 'buying down' the interest rate charged by a single lending bank partner for eligible energy efficiency loans. The program buys down half of the loan at 0% interest and the lending partner retains the other half at the market interest rate with the end result of borrowers paying interest at half of the market rate. Loans are secured via a lien against the borrower's property. The lending bank is reimbursed by the state once the loan has been granted. The state's participation is capped at $10,000 per loan (Brown, N/A).

How IRBs could be applied in Alaska

The AHFC operates an IRB program through the Energy Efficiency Interest Rate Reduction Program for residential properties (AHFC, 2016b). The program is available for new construction, existing energy-efficient properties with 5+ star energy ratings, and existing properties with energy improvements. The rate reduction applies to the entire cost of the home, not just to the energy investment. The rate reductions vary from 0.125% to 0.75% and are dependent on the energy efficiency of the home and whether or not the home has access to natural gas. The interest rate reductions apply up to the first $200,000 of a loan with any remaining amount beyond $200,000 receiving a blended interest rate. An approved lender notifies AHFC that the borrower intends to participate in the program.

A project revenue or minimum revenue guarantee is a project-level guarantee are provided by governments, state agencies, or other sovereign backed lenders (e.g. World Bank) to address risks deterring private sector investment. These guarantees are typically used in less developed markets where sophisticated insurance products are not available.

8. Project Revenue or Minimum Revenue Guarantee

A minimum revenue guarantee assures a minimum of revenue over a specified period, thereby lowering risk and improving the attractiveness of the investment. The revenue guarantee pays the difference between realized revenue and the predetermined minimum revenue. This is a potential means for tackling the higher risk associated with many rural energy projects.

Example of Minimum Revenue Guarantees being applied elsewhere

Project or minimum revenue guarantees are relatively common in PPP projects such as construction of toll roads and toll bridges. Use of revenue guarantees for energy projects appears to be less common, or at least less publicized, than for large-scale infrastructure projects such as toll roads. In Brazil, revenue guarantees were used to encourage construction of 'merchant' natural gas plants to alleviate electricity shortages in the early 2000's. 'Merchant' plants sought to maximize profits by supplying electricity into the spot market. From the perspective of the network operator, the flexible standby capacity of these plants reduces the severity of spikes in the spot market electricity price.

To encourage buildout of flexible gas plants Petrobras, the state utility, offered a minimum revenue guarantee for the Termoceará plant. Termoceará is a 290 MW natural gas-fired power plant in northern Brazil developed by MDU Resources, a United States utility, and EPX Capital, a Brazilian industrial firm. The plant commenced operations in late 2002 and was sold to Petrobras in mid-2005 for $137 million; the original project cost was $100. In advance of this sale the revenue guarantees was paid by Petrobras to MDU for 3 years (Woodhouse, 2006).

How Minimum Revenue Guarantees could be applied in Alaska

During interviews conducted as part of the research for this report, financiers and energy project developers in Alaska stated that many remote or smaller scale communities in Alaska were heavily dependent on a single employer (e.g. fish processing plant or other remote light-industrial plant). This lack of employment diversity increases the risk profile of constructing an energy project in these communities and creates a barrier to investment. Closure or significant downscaling of this employer would reduce demand for energy both from the industrial consumer but also their local employees as they will have less income or may decide or be forced to migrate elsewhere. Under this scenario an operational electricity generating project in a remote non-interconnected electrical system will have a substantially downsized or no market in which to sell electricity and generate revenue to service its debts thereby going into default.

A project revenue guarantee would ensure the potential project developer that they do not need to bear the risk of an external shock such as the closure of a primary employer as they would be insulated from the revenue shortfall for the duration of the guarantee. With a project revenue guarantee in place the energy installation would continue to service the community and would not be mothballed while the revenue guarantee remained valid. This would also allow time for an alternative use to be found for the electricity generated.

9. Resource Assessment to Encourage Project Development

Initial resource evaluation is often one of the highest risk activities associated with project development, because in this phase, there is no guarantee a project opportunity exists. Using public funds to compile information related to the resource and making this information publicly available can be an effective strategy for risk reduction, and is a common strategy for incentivizing private investment in energy projects. In Alaska, resource evaluations have been conducted through a number of programs over time, and project-level information exists for some technologies, particularly small hydropower. The National Renewable Energy Laboratory has produced resource maps of wind, solar, and ocean energy resources in Alaska, but the resolution of these maps is not adequate for assessing the preliminary feasibility of a project. Attempts to develop geothermal resource maps of Alaska have also been undertaken through the Alaska Center for Energy and Power and Southern Methodist University, but the lack of subsurface data has hampered these efforts.

Since its inception, resource evaluation has been a primary function of the REF grant program. While the resource information generated through this program does not always become part of the public record, it is obviously a key step in project development. The Alaska Energy Authority has also worked to compile data about potential projects at the community, regional, and statewide level, but these efforts have generally not been funded at adequate levels to generate new data sets.

ESMAP - Example of a Resource Assessment Program applied elsewhere

The Energy Sector Management Assistance Program (ESMAP) is a global knowledge and technical assistance program administered by the World Bank. ESMAP was founded in 1983 as a multi-donor technical assistance trust fund to help low and middle-income countries address challenges in the development of sustainable energy projects. ESMAP is funded by 13 bilateral donors; Australia, Austria, Denmark, Finland, France, Germany, Iceland, Lithuania, the Netherlands, Norway, Sweden, and the United Kingdom, as well as the World Bank.

The overall rationale for the program is to address the lack of resource data for potential renewable energy projects in targeted countries or regions in the developing world. This lack of data and general knowledge related to the possible location of and general economic viability of projects is seen as a key barrier to investment in the buildout of large-scale sustainable energy projects. As well as fitting with the general development agenda of the World Bank and its donors the program also supports the core business of the World Bank as it contributes to the formation of a pipeline of future projects for which financing can be provided.

One of the principal activities of the ESMAP program is to carry out country- and regional-level resource assessments and mapping of renewable energy potential – primarily for biomass, small hydro, solar and wind energy technologies. The resource assessment program focus is currently on conducting 12 'Country Projects' which entail "comprehensive mapping and geospatial planning, including ground-based data collection" where this does not currently exist. The objective is to map resources at the country level rather than carry out site-specific resource assessment - more detailed project-level assessment is carried out by individual project developers. ESMAP also assists in other technical areas essential to the scaling up of investment in renewable energy such as design of subsidy programs, strategic commercial guidance and identifying and addressing possible environmental and social concerns.

Resource Assessment applications in Alaska

Information gathered through systematic resource evaluations conducted under the REF should be compiled and made publicly available. Computerized models of resource potential are a relatively low cost but effective tool to encourage development of renewable energy resources in a given region. The greatest value appears to be delivered by maintaining a 'high-level' focus over a larger geographical area and leaving more in-depth, location-specific assessment to private actors interested in project development. The goal is to identify the most promising energy options but value exists even for investigations that lead to the conclusion that resource potential is below a level likely to merit development either at present or in the future. An improved understanding of all available options clarifies the picture for policy makers in terms of simplifying the task of prioritizing specific technologies or areas for development.

Conclusions and Recommendations

The goal of this study was to seek strategies that address specific barriers to private investment in rural Alaska energy projects by leveraging the state's resources to attract private investment. Our findings indicate that there is no need to create new financing programs if existing state programs can be modified through legislation and adequately funded. For renewable energy projects, the Renewable Energy Fund can be used for funding high-risk early stages of project development, and construction can be funded with private money. For conventional technologies such as diesel powerhouses, grant programs like the Rural Power Systems Upgrade Program can be transitioned to a loan program. For both conventional technologies and renewable technologies, the Power Project Loan Fund is an ideal funding source, since the program is tailored to the needs of rural borrowers and offers low interest rates, long payback periods, and minimal collateral requirements.

Facilitating public-private partnerships in ways that protect community interests can also provide an important avenue for funding future projects. Assessing how the regulatory environment could be adjusted or clarified to promote future development of public-private partnerships in ways that protect consumers would be a positive step. In addition, establishing a Rural Energy Project Development Portal would allow potential borrowers to understand available financing options and could help relieve some of the budgetary pressure on the state if qualified borrowers use federal and private financing. While some barriers to private investment such as scale are nearly insurmountable, other barriers such as poor bookkeeping and low financial literacy are resolvable through capacity building. Strong training, education, and mentorship programs could help communities and utilities that are nearly bankable, become bankable.

Attracting private investment for rural energy infrastructure presents challenges, but tools to overcome these challenges are available and should be pursued. Reducing the need for purely grant-funded programs by leveraging public money to attract private investment is the financially prudent path to take to ensure the long-term viability of Alaska's rural communities.

Specific recommendations developed through this study are detailed on the following pages. In general, what is required is not new programs, but rather new ways of thinking about infrastructure investment that is more self-sustaining over time and includes these foundational components:

1. A reliance on loans, rather than purely grant funding for continued build-out of critical basic energy infrastructure.
2. A greater willingness to explore public-private partnerships, particularly in the development of renewable energy projects, as a means to attract capital and reduce community financial risk.
3. Expanded use of the Power Cost Equalization (PCE) Endowment Fund to better serve rural Alaska by addressing the high cost of energy in PCE-eligible communities (any action would need to be carefully analyzed to determine if the potential downsides outweigh the potential benefits).

Recommendation #1: Rebrand and Expand the Power Project Loan Fund

The Power Project Loan Fund (PPLF)[19] is designed to provide a viable, cost-effective option for energy project financing, and is an ideal mechanism for transitioning public funds away from grants, rebates, and subsidies by shifting funds toward self-sustaining financing tools that generate returns. In fact, the PPLF serves many of the same functions as infrastructure or green "investment" banks[20] in other states, with the exception that it does not fund end-use energy efficiency projects. We recommend that the PPLF be rebranded as the "Alaska Energy Infrastructure Bank," that an effort is made to increase awareness of the program and its benefits, and that steps are taken to ensure the program is attractive to the full spectrum of borrowers in rural Alaska.

The PPLF needs to be recapitalized if it is expected to be an important financing tool for future Alaska energy infrastructure development. Currently, an uncommitted cash balance of $9.7 million is in the fund, available for new energy projects. Given that fiscal resources for new state appropriations are limited, near-term recapitalization will in all likelihood need to come from existing sources of funding. Two options include:

1. AIDEA could purchase some of the loans in the PPLF portfolio, with the proceeds used to recapitalize the PPLF. This has been done in the past with some of the lower-risk PPLF loans; however, it is important that AIDEA maintain its credit rating and thus not add a disproportionate number of loans perceived as high risk to its portfolio. It is unknown how many PPLF loans AIDEA might be willing to purchase or their total value, but this number is clearly less than the total portfolio currently held by AEA, which is currently $6.3 million in outstanding loans ($28.9 million including pending loan commitments).[21]

2. A portion of the PCE Endowment Fund could be used as means for recapitalization of the PPLF, with these funds specifically directed at loans supporting project development in PCE-eligible communities. As of June 30, 2016, the PCE Endowment Fund held a balance of $946 million, and is invested to earn a minimum 4% nominal rate of return over a five-year period. In comparison, the average rate of return for the PPLF is currently 3.5%. Despite a potentially reduced average rate of return, restructuring the PCE program as a tool for investing in rural energy projects while simultaneously generating revenue to subsidize high energy costs would be a more efficient use of state resources.

In the future, the PPLF could potentially receive federal loan guarantees for eligible projects through the DOE should the North American Energy Security and Infrastructure Act of 2016 be signed into law. The bill amends the Energy Policy Act of 2005 to make state energy financing institutions such as AEA eligible to receive financing support or credit enhancements including loan guarantees and loan loss reserves for eligible projects (Congress.gov, 2016). To be eligible, a project must avoid, reduce, or sequester air pollutants. The Act permits state energy financing institutions to enter into partnerships with private and tribal entities as well as with Alaska Native Corporations to carry out a project receiving a loan guarantee. The Act has passed both U.S. Senate and House of Representatives and is currently in conference.

[19] See page 28 for additional program detail about AEA's Power Project Loan Fund

[20] See page 34 for additional detail about investment banks

[21] In addition, since AIDEA has previously purchased loans in AEA's portfolio, it is likely that only newer loans not previously reviewed will be of interest, which further reduces the total value of potentially transferable loans.

Next Steps

AEA and AIDEA should inventory the PPLF Program and recommend options for recapitalizing and expanding the program. Some of these options, such as use of the PCE Endowment Fund, would require legislative action. In addition, a needs assessment of potential future users of the PPLF should be completed.

Nacelle of a 900 kW EWT direct drive wind turbine being lifted into position during construction of the second phase of the Banner Wind Peak Farm near Nome. Photo by Gwen Holdmann, ACEP.

Recommendation #2: Develop a project Specification Process that Facilitates public-private partnerships for energy projects

Public-private partnerships such as those represented by independent power producers (IPPs) can provide access to new sources of capital, tax credits, and expertise beyond what may be locally available. In addition, because IPPs are typically responsible for all construction and operation and maintenance costs, a significant portion of project risk is transferred from the utility to the developer.

Alaska Native Corporations are an example of organizations ideally situated to serve as IPPs in rural Alaska, though other prospective developers have also actively pursued project opportunities. Nonetheless, overtures from prospective IPPs are generally viewed skeptically at the local level because utilities prefer to maintain control of their system and because the scope or scale of the proposal is often not well aligned with community needs or with the operating capacity of the utility. Frequently, there is a perception that if revenue is earned from a project, then the cost of energy delivered must be higher. When agreements have been negotiated, they are often based on personal relationships and trust that have been established over time. In some cases, these negotiated deals have not been in the best interest of the community. Examples are numerous of developers who have acquired exclusive rights to a particular project or resource but "sit" on this asset without making any real progress, sometimes for a period of decades. There are opportunity costs to the community when these types of sole-source contracts are negotiated. These costs occur not only because of project delays, but also because when a potential project is not competitively bid, there is no way to assess what the best deal actually might be.

Evidence indicates that some of the proposals submitted through AEA's Renewable Energy Fund have been developed entirely by or in close consultation with private developers. This is due to the lack of technical and/or grant writing expertise that communities have access to, which requires collaboration with outside entities. Under these circumstances, the developer, who has invested time and effort without recouping costs in the proposal development process, naturally and reasonably expects to receive the contract to develop the project if the funding request is successful. However, developer motivations are not always perfectly aligned with community best interests, and occasionally projects are designed in ways that may maximize developer profit, but create long-term operation and maintenance challenges for the community.

Existing state technical resources, such as those provided through the AEA, the Alaska Center for Energy and Power, or other not-for-profit organizations could assist communities and utilities in developing project specifications and releasing requests for proposals (RFP) for prospective developers. This process would benefit private investors by decreasing the transaction costs and making it easier to respond to opportunities that have the support of local stakeholders, including the local electric utility. At the same time, this process would protect the community by ensuring that the project is right-sized for the application and that project parameters are designed to meet local conditions.

Next Steps

In addition to the project underway in Cordova, detailed in the case study on the following page, several other examples of a specification-driven process exist or are under development. For example, NANA Regional Corporation is leading a project to develop solar energy in the Northwest Arctic Borough through partial use of federal grant funds, combined with planned private investment solicited through a competitive bid process. In addition, Golden Valley Electric Association's Battery Energy Storage System procurement process may provide an informative example. Information on best practices and outcomes should be compiled, and a process and template that could be transferable to multiple projects should be developed. ACEP is currently exploring such a process through the ACEP/SNL/CESA partnership, described in the Cordova example on the following page.

Project Specifications Case Study: Cordova Electric Cooperative

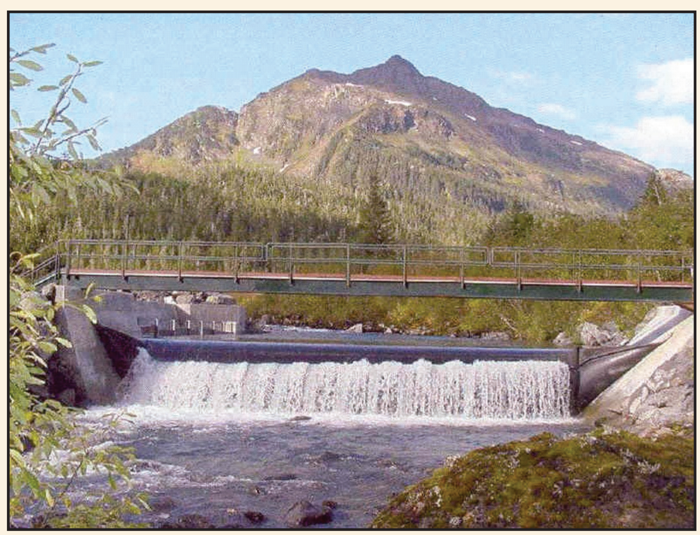
To facilitate private investment opportunities in Alaska, existing expertise within the state could be used to help rural communities and utilities develop requests for proposals (RFPs) for economically viable projects. Outlining a project's technical specification upfront allows a vendor to decide whether the project is an attractive investment opportunity and reduces project risk, since the early stage work of resource assessment and project design are already complete.

Cordova Electric Cooperative (CEC) is partnering with the Alaska Center for Energy and Power (ACEP), Sandia National Laboratories (SNL), and the Clean Energy States Alliance (CESA) to study the impact an energy storage system could have on increasing the contribution of hydropower in the energy mix for the remote microgrid in Cordova. CEC uses both run-of-the-river hydropower and diesel to generate electricity. The utility currently does not have any means of storing hydropower. During off-peak times, water is diverted away from the turbines. An energy storage system would allow the utility to store the hydroelectric energy generated at off- peak times. This stored hydroelectric energy could be supplied back to the grid during the day instead of switching on the diesel generators when the load exceeds the capacity of hydroelectric generation.

The ACEP/SNL/CESA study[22] is designed to determine the availability of excess hydropower and the demand of supplemental generation to optimally size an energy storage system. CEC will use the output from the study to determine whether a viable business case for energy storage in its grid exists, and if so, develop an RFP, asking energy storage vendors to make offers for providing an energy storage system. This model can be applied to energy storage projects in other hybrid-diesel grids in Alaska, and provide a mechanism for utilities to generate detailed RFP documentation to attract investment. If the terms are attractive to vendors, the RFP will attract bidders.

These types of assessments may attract private investment and help stabilize the cost of power in small communities, with minimal risk to the community. The state could fund technical support to outline project specifications and generate requests for proposals from third-party vendors. This will reduce transaction costs and risk for potential investors since the project specifications are predetermined. The investor will be able to assess the project based on the specifications outlined in the RFP to determine if the investment is worthwhile.

With this model, risk is transferred from the utility to the vendor. The utility specifies the price at which it is willing to purchase power and enters into a power purchase agreement. The utility does not take on additional debt. The vendor owns, operates, and maintains the system. Any cost overruns are borne by the vendor. There is very little risk to the community other than the risk of the price of diesel falling low enough to make diesel-fired power cheaper than the negotiated price of power purchased from the energy storage vendor.



Power Creek is one of Cordova's run-of-the-river hydro projects.
Photo courtesy of Clay Koplin, CEC.

[22] This project is funded by the U.S. Department of Energy, Office of Electricity Delivery and Energy Reliability Storage Program

Recommendation #3: Develop and maintain a Rural Energy Project Development Portal

Information about financing tools allows potential borrowers to identify options that best suit their needs. However, online information specific to Alaska is scarce, and few individuals contacted for this report were well versed on more than a handful of available financing options, which are not "one size fits all." Financing options have differing requirements for collateral, equity, interest rates, and maximum term. It appears that many available financing options are underused by project developers, at least in part due to lack of awareness. While we have attempted to catalog existing financing mechanisms relevant to rural Alaska, this list is almost certainly incomplete, and information relevant to each program is far from static. For this reason, having a single, easy to access portal that can be regularly maintained and updated would be a significant asset to communities and utilities, and was one of the specific recommendations that resulted from discussions with lenders.

Developers often have an imperfect understanding of the specific opportunities associated with projects in rural communities. Many prospective investors or developers are not familiar with the Alaska market, and may see the high cost of delivered power in some rural communities as a "low-hanging fruit" business opportunity for renewable energy development without realizing that only a portion of the published rate is attributed to fuel costs. A high proportion of electric power rates in rural Alaska correspond to fixed, non-fuel costs associated with operations and maintenance, including servicing any existing debt. In addition, significant challenges are associated with integrating high contribution levels of renewable energy—particularly from variable sources such as wind or solar power—in small, islanded electric grids. Larger projects, which could achieve better economies of scale, often create new costs associated with additional equipment, such as energy storage or more advanced control systems.

The Alaska Energy Data Gateway is a tool that can help prospective developers better understand the general landscape of energy production, distribution, and sales in Alaska, but the platform was not designed specifically to support project financing or development. As detailed in the case study on the following page, an active project is underway to expand the capabilities of the Gateway to meet project development needs, both for communities and interested investors.

Next Steps

We recommend that AEA/AIDEA partner with federal agencies such as the National Rural Electric Cooperative Administration, USDA Rural Development, the Denali Commission, and/or U.S. Department of Energy National Laboratories to develop and maintain a loan and resource assessment clearinghouse so that prospective borrowers can clearly understand all of their options and lenders can identify potential opportunities in rural Alaska communities.

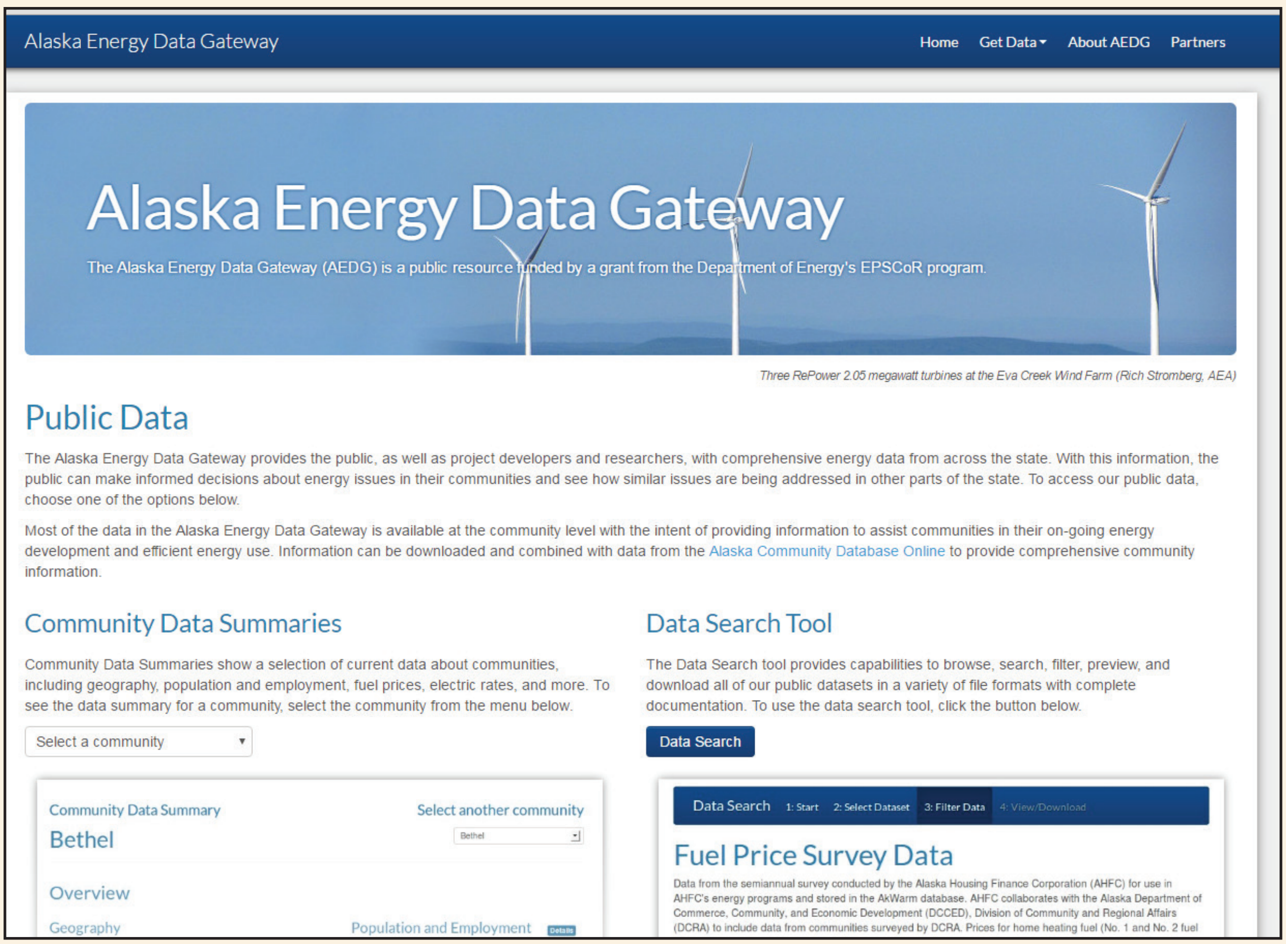
The Alaska Energy Data Gateway, managed by the Institution for Social and Economic Research (ISER) at the University of Alaska Anchorage, may provide a ready platform for a hypothetical project development portal, and efforts are underway to add this function (see case study on following page).

In addition, there appear to be opportunities for AEA/AIDEA to play a more proactive role in educating lending institutions about the specific needs and circumstances of rural Alaska, and advocating for changes that can broaden the suite of potential lending tools available to utilities and communities.

Case Study: Alaska Energy Data Gateway

The Alaska Energy Data Gateway (https://akenergygateway.alaska.edu/) is managed by the Institution for Social and Economic Research (ISER) based at the University of Alaska Anchorage. The Gateway is designed as a resource to provide the public, as well as project developers and researchers, with comprehensive energy data from across the state.[23] Most of the data in the Alaska Energy Data Gateway are available at the community level, with the intent of providing information to assist communities in their ongoing energy development and energy efficiency initiatives. Information can be downloaded and combined with data from the Alaska Community Database Online to provide comprehensive community information. Specific information through the Gateway includes population, employment, school enrollment, fuel prices, electric utility rates, sales, and revenue, PCE status and subsidy rate, and energy production information (as well as any renewables).

The ISER, together with partners at the Alaska Center for Energy and Power at the University of Alaska Fairbanks, is negotiating a contract with Lawrence Berkley National Laboratory to expand the capabilities of the Gateway to include an electricity development portal, with the goal of attracting private and public sector interest and financing for renewable energy, energy storage, and energy efficiency projects for rural Alaska. Information will be presented in a way that is consistent with how financiers/project developers view the factors that affect project risk and reward, as well as how rural community members understand their energy and electricity systems.



Home page of the Alaska Energy Data Gateway, developed and maintained by ISER and publically accessible at https://akenergygateway.alaska.edu/

[23] The Alaska Energy Data Gateway as part of a U.S. Department of Energy EPSCoR grant (Award DE-SC0004903, Duration 2012-2016).

Recommendation #4: Assess how RCA Statutes and Regulations Align with the State's Renewable Energy Target, and Federal Statutes that Promote Renewable Energy Development

Assess how RCA statutes and regulations align with the state's renewable energy target, and federal statutes that promote renewable energy development.

The state's budget crisis has made it unlikely that Alaska will make the kind of investments in renewable energy that it made through the Renewable Energy Fund between 2008 and 2015. Without grant funds available for project development, communities and utilities will seek investment and partnerships with independent power producers (IPPs) and developers. Those arrangements raise questions of whether or not those IPPs and developers are acting as utilities, and should be economically regulated by the Regulatory Commission of Alaska. Alaskans will have to balance the desire to invite investments that can displace diesel with the protection of the public, particularly in cases where a small community may lack the resources to negotiate power purchase agreements and other contracts with entities that have more access to legal and utility expertise.

There are also questions of how the state's target to obtain 50% of its electricity by 2025 and federal statutes such as the Public Utility Regulatory Policy Act (PURPA) interact with the state's regulatory regime. Recent decisions by the RCA to grant independent power producers exemptions from regulation raise questions about the Commission's future intentions for both developers and communities. It may also be worth considering whether the 50% Renewable Energy for Electric Power by 2025 target is still reasonable given the fact that the Susitna hydroelectric project has been put on hold.

Next Steps

Given that there will likely be an increase in interest from IPPs and developers to invest in rural Alaska, it would be useful to get a legal opinion from the Attorney General's office about how the objectives of state utility regulation, the state's renewable energy target and federal law align, or are in possible conflict. The goal of such an opinion would be guide parties toward a clear predictable legal and market framework, or signal possible statute changes. Communities, local utilities, developers and independent power producers all need rules that they can rely on to make future agreements and decisions.

Recommendation #5: Build Capacity and Create Opportunities for Mentorship to Improve "Bankability" of Alaska Communities

The lack of financial literacy, inconsistent bookkeeping, and subpar operations and maintenance practices of many rural communities and utilities were noted as major concerns for program managers, lending institutions, and private investors interviewed for this report. Past and current programs for on-the-job training and mentorship have proven successful, including the Alaska Department of Commerce, Community, and Economic Development Rural Utility Business Advisor program, AEA's Utility Clerk Training, (Allen, Brutkoski, Farnsworth, & Larsen, 2016), ad-hoc groups such as the Rural Alaska Maintenance Partnership (RAMP) and Alaska Rural Manager Initiative (RAMI) among others, but workforce retention and a continuum of training continues to be a challenge.

In reviewing the efforts of rural development globally it seems that a more sustained enterprise development intervention is necessary. An overriding goal would be to encourage more mainstream learning via distance or leverage of other community training initiatives. A critical outcome would be the reduction of costs associated with scaling and then preparing the business development for sustainability. Concurrently, there is a need to shift reporting associated with rural development from solely focusing on project implementation progress and constraints and to focus more on the human resource side of project implementation.

There is a need for a more systematic approach towards supporting rural enterprise development and simultaneously customization for training based on where a client or client project is at in the business life cycle. This systematic approach would give more attention towards meeting a business development team at the level they are at, as opposed to offering a static series of classes as has been the traditional practice across Alaska. The provision of continuous, relevant, and easily digestible business development technical assistance and professional development trainings will provide for the greatest level of development sustainability.

Considering three stages of business growth and associated training modules:

Start-up or Launch – financial literacy; entrepreneurial thinking; financial management; business management and even customer orientation. In many cases a rural Alaska community requires help making a transition from the traditional orientation of sharing all community assets to one of selling and collecting necessary revenues for the service of benefiting from the community asset. Likewise, a new business can require the development of numerous systems financial to human resource related and this can be challenging to establish for a seasoned business owner.

Ongoing Maintenance or Survival – ongoing operations and maintenance; business planning; supply chain management; renewal and replacement of assets; financial management (budgeting, credit management, investment management).

Growth or Transition – strategic planning, investment finance, financial statement (interpretation, investment options).

In all cases, an overriding goal would be to advance local level business development capacity across a community

[24] The report "Sustainable Energy Solutions for Rural Alaska," published in April 2016, documents many of these programs and others available through the Department of Energy beginning on page 38. In addition, the RUBA website provides a complete listing of training participants from each community, along with additional resources such as templates for business planning.

as a means of ensuring development sustainability.

It is also recommended that initial audits of community readiness be conducted to determine a community's readiness for business development intervention. Activities might include:

- Business orientation seminars
- Skills audits
- Business management onboarding
- Rural finance and project risk management audits

Based on the outcomes there may be need to develop a more formal referral service protocol.

Improving financial literacy alone will not address all of the needs project development initiatives face. There is a need for a specialized loan program and/or lending network that is not only better familiarized with the complexities of rural remote community development initiatives, but prepared to support the complex needs of the projects. This is a role that an Alaska energy infrastructure bank can play (see recommendation 1).

A Regional Energy Provider (REP) network could take several potential forms based on the specific needs of a region. For example, it could take the form of a regional virtual utility with delegated responsibility for operating and maintaining energy infrastructure in participating communities. Alternatively, it could be designed as a loose network of autonomous utilities that join together to pool resources for scheduled maintenance, training an mentorship, or book keeping and financial assistance for utilities within the same region. This Provider Network could also potentially serve as a non-profit Energy Services Company (ESCO) that could address a range of energy project needs in the region from energy efficiency and conservation, to weatherization and energy infrastructure.

Next Steps

Recent funding to develop an Alaska Network of Energy Educators (ANEE) under the Renewable Energy Alaska Project may provide an opportunity to complete a comprehensive inventory of existing education and training programs. In addition, it will provide a venue to identify gaps that could be addressed by modifying existing programs or drawing from resources in the University of Alaska system. It has been recommended that a program be developed in which larger utilities within a region mentor smaller community-based utilities within the same region by providing technical and administrative guidance. Through mentoring, the successful business practices of the larger utility can be passed to and implemented by the smaller utilities in the region, which may result in cost savings for the smaller utilities. One example of this sort of relationship has been pioneered by Kotzebue Electric Association, which has provided mentorship and occasional management and oversight to small communities in its region. A case study of lessons learned from the Kotzebue experience could be beneficial to other regions considering a similar approach.

Recommendation #6: Use the Renewable Energy Fund (REF) to Finance the High-Risk, Early Stages of Project Development

The Alaska Legislature created the Renewable Energy Fund (REF) Program in 2008. As of June 1, 2016, the REF had funded 287 projects across a range of technologies, totaling $259 million and leveraging hundreds of millions in matched funds from a variety of local, private, and federal sources.[25]

Since its inception, the REF has been an important source of funding for renewable energy projects in rural Alaska. Project selection is based on a number of factors, including economic feasibility. Using the methodology developed by AEA to score projects, the most economic projects with the least risk are often the first to be selected to receive a grant within a particular geographic region. These projects are also the ones most likely to be attractive to lenders or private investors. In a May 2016 Status Report, AEA estimated that currently generating REF projects have an overall benefit cost ratio of 2.50,[26] meaning that for every dollar spent there is typically a realized benefit of $2.50. In the past, the REF has been used to fund every stage of project development, from reconnaissance and feasibility studies through construction. With declining state funding, it may be necessary to re-evaluate the program and consider whether a more prudent use of limited state resources would be to fund earlier, higher-risk stages of projects rather than the entire spectrum of project development (see example 9 on page 46 of this report).

Next Steps

We recommend that the Renewable Energy Fund Advisory Committee consider restructuring the REF to emphasize:

1. **Reconnaissance and feasibility studies** - Reconnaissance and feasibility are the highest risk stages of a potential energy project, because there is no guarantee that a viable project will be developed to generate a revenue stream and recoup the initial investment.

2. **Partial construction funding** - For less economic projects in high-energy-cost communities, grant funding for a portion of the construction cost may be needed to make the project attractive to lenders or public-private partnerships to finance the bulk of the project.

[25] AEA will not be issuing a Request for Applications (RFA) for the REF program in 2017. In 2016, AEA recommended 39 projects to the Alaska Legislature for funding, but the legislature did not appropriate funding for any of these projects. For this reason, AEA will resubmit these same projects to the legislature for 2018.

[26] A project's benefit cost ratio is the ratio of the benefits of a project or proposal, expressed in monetary terms, relative to its costs; also expressed in monetary terms, based on the present value of money.

Recommendation #7: Continue to Administer the Power Cost Equalization (PCE) Program

The Power Cost Equalization (PCE) Program provides a subsidy to reduce the high cost of electricity for rural residential customers, and partially mitigates the credit risk of rural energy projects. The PCE Endowment Fund, established in 2000, is managed by the Alaska Department of Revenue. The fund is invested to earn at least 4% per statute nominal rate of return over a five-year period. Up to 5% per statute of the fund's three-year monthly average market value may be appropriated annually to fund the PCE and Rural Electric Capitalization Fund from which PCE payments are disbursed, although during the FY16 legislative session, a bill was passed that would authorize "excess" money from earnings to be transferred to the State's general fund, and also fund the Renewable Energy Fund. As of October 31, 2016, the fund held a net value of $928.54 million.

In interviews, lenders expressed that the stream of PCE payments is considered a credit positive when considering whether to grant a loan. Additionally, the PCE annual report helps lenders with the underwriting process. Finally—and perhaps most importantly—lenders view the PCE Endowment Fund, which funds the annual PCE payments, as an important financial reserve that assures the viability of the program into the future.

Next Steps

The PCE Program appears to be a critical component in attracting private capital for Alaska energy projects, whether through traditional loans or through PPPs. It is critical that the PCE Endowment Fund remains in place; however, there are likely opportunities to better leverage these funds to benefit communities. The AEA should explore whether it would be possible to use a portion of the PCE Endowment Fund to recapitalize the PPLF, or as a reserve fund for a loan guarantee program for energy projects in rural Alaska. The guarantee program would reduce lender risk by shifting some of the risk to the State via the guarantee, thereby expanding access to capital to businesses interested in borrowing funds to construct energy projects in rural Alaska.

The City of Kaltag lies on the upper Yukon River. Photo by Amanda Byrd/ACEP.

Solar PV array in Bethel. Photo by Gwen Holdmann/ACEP.

Recommendation #8: Continue to Fund the Rural Power Systems Upgrade (RPSU) Program and Transition the Program from a Purely Grant-Funded Program to a Flexible Loan-Based Program

For some rural communities, the barriers to private investment may be insurmountable or infrastructure needs too dire to rely on traditional loans or private investment. A source of funding is needed for these communities to prevent unexpected failure of the power system, which could result in additional costly damage to publicly funded infrastructure, such as water and wastewater treatment facilities, schools, and health clinics. Historically, the Rural Power Systems Upgrade (RPSU) Program has served a critical role in updating or replacing outdated or failing infrastructure. Similar to the Power Project Loan Fund (PPLF), which offers flexible loan terms and conditions to meet the needs of rural borrowers, the RPSU Program could be transitioned from a purely grant-funded to flexible loan-based program. This would assure the continued operation of the program even as state appropriations for energy projects dwindle, because the loans would be repaid and those funds could be used for other RPSU projects. Replacing a diesel powerhouse is a low-risk project, because diesel generators are a proven technology and the power sales provide a revenue source for the utility. In theory, the loan could be serviced with the money saved from reduced fuel costs that result from the efficiency improvements achieved through program participation.

Next Steps

The AEA should consider whether there are options to shift some or all of the RPSU Program to a loan-based model, potentially through the PPLF. Where direct public infrastructure subsidies are needed because a utility is unable to take on additional debt, it may be prudent to consider requiring the local utility to merge or affiliate with a larger cooperative or regional utility. This action would increase the likelihood of long-term technical and operational support to protect the state's investment and ensure that equipment is well maintained over time.

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