

Sustainable Energy Solutions for Rural Alaska

Executive Summary • April 2016

Rural Alaska is “a world away” from the state’s more populated Railbelt, where homes and businesses benefit from connection to abundant and inexpensive power from hydroelectric dams, natural gas, and other sources. By contrast, Alaska’s rural communities stretch across hundreds of miles of remote landscape. Harsh weather conditions and long distances make electrical interties between communities impractical.

About 200 of the state’s rural villages have unsustainably high electric utility and energy costs. Each of these villages has its own power microgrid, and for decades they have relied almost entirely on diesel fuel to power and heat their homes, businesses, and community buildings.

The price of diesel in rural Alaska is higher than nearly every region in the U.S., because of the expense of shipping fuel via air transport or barge. As a result, rural utilities can pay up to four times more for fuel than utilities elsewhere in Alaska. Maintenance costs are also higher than other places, and keeping the lights and heat on is a must in winters when temperatures fall as low as 70 degrees below zero—making power outages potentially life-threatening.

The State of Alaska recognizes the challenges these rural communities face and provides financial support via the Power Cost Equalization (PCE) program. The PCE subsidizes the electricity prices paid by customers of these high-cost utilities. The PCE program is designed to spread the benefits of Alaska’s natural resources more evenly throughout the state. Yet even with this subsidy, electricity is still much more expensive for these rural customers. And beyond the PCE, other forms of assistance to rural utilities are becoming scarce given the state’s current fiscal environment. Nearly 90 percent of Alaska’s unrestricted

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budget funds in recent years have been tied to oil royalties—a sector experiencing significant declines in production and oil prices. Consequently, as Alaska looks to tighten budgets, the challenge of lowering rural utility costs, while encouraging self-sufficiency, has become more urgent.

In recent years, many of these communities have started to integrate alternative sources of energy into their diesel-based power systems as a way to increase self-sufficiency and lower energy costs. These efforts are fostering innovation at a local scale and could be shared with other communities throughout rural Alaska. Emerging renewable energy technologies, combined with storage and energy efficiency, offer the promise of lower costs, as well as an increase in the self-sufficiency of communities.

The Project: *Sustainable Energy for Rural Alaska*

The U.S. Department of Energy (U.S. DOE) Office of Indian Energy Policy and Programs, in partnership with Lawrence Berkeley National Laboratory and the Regulatory Assistance Project, set out to understand the current challenges and identify opportunities for rural utilities to move toward a more sustainable future. Throughout 2015, the team visited more than 30 communities across all regions of Alaska. The team met with local leaders and utility managers and toured facilities—along the way gaining a strong sense of both the challenges and the potential in these communities.

The research team recently completed its study report, *Sustainable Energy Solutions for Rural Alaska*. This report recommends more than a dozen strategies to help rural utilities become more self-sufficient given the challenging





Alaska's smallest rural communities, such as Karluk on Kodiak Island, need help to achieve economies of scale.

fiscal environment confronting Alaska. The research team found that, in many cases, Alaska energy policies are already having a positive impact on rural communities—but there are additional recommendations that should be considered.

Key Recommendation #1: **Encourage Rural Utilities and Communities to Achieve Economies of Scale**

Small communities struggle because their size and remoteness do not allow for the economies-of-scale needed to lower energy costs. The team identified numerous state and regional efforts to overcome this challenge, which could serve as models for other communities to follow. Utilities operating in hub communities have been able to provide support to neighboring systems; Kotzebue Electric, for example, handles management and technical services for Buckland and Deering. Alaska Power Company serves a number of small communities in the central and southeastern part of the state. A number of cooperative utilities, including the Inside Passage Electric Cooperative (IPEC) and the Alaska Village Electric Cooperative (AVEC), also support a broad range of communities across other parts of the state. Economic development agencies such as the Norton Sound Economic Development Corporation, as well as Alaska native corporations, have played important roles in their respective regions.

These efforts have been valuable, but they fall short of the need for a comprehensive approach to reduce costs across rural Alaska. Communities should work with regional stakeholders to pool their resources in order to apply for loans and grants; coordinate fuel and equipment purchases; attract investment from independent power producers; and receive assistance from third-party service providers. Joint

action agencies, comprised of municipalities and/or other stakeholders, could also help provide reliable, reasonably-priced electric service to rural communities.

Key Recommendation #2: **Strengthen Investment in Rural Workforce Development**

Increased rural workforce capacity, especially among utility and community leaders, will improve the collective ability to strengthen utility management and attract investment. The Alaska Energy Authority (AEA) already provides entry-level and more advanced training courses for power plant operators to help ensure that rural utility staff have the essential skills to operate their power plants. The Rural Utility Business Advisor Program provides managerial and financial training to Alaska's rural water and wastewater utilities. And the U.S. DOE Office of Indian Energy Policy and Programs provided critical funding to develop a curriculum for the Alaska Rural Managers Initiative (ARMI). Goals of this initiative include making training more accessible to tribal administrators, utility managers, and municipal managers in rural communities.

These training programs should be expanded to help rural utilities improve their billing and financial operations, grant and loan applications, capital planning, and ongoing maintenance activities.

Key Recommendation #3: **Improve Accountability and Align Financial Incentives with Performance**

Customer-focused reliability standards and incentives tied to performance will encourage utility management and community leaders to place a greater emphasis on the cost and quality of service that utilities provide. Rural utilities such as Gwitchyaa Zhee Electric, Tanadgusix Corporation (TDX Power), IPEC, and Gold Country Energy, which are subject to higher standards of oversight and accountability, are among the strongest performers in rural Alaska.

Utilities that participate in the PCE program already report some performance metrics (e.g., basic utility financial, production, and consumption information). Utility performance on these basic performance metrics helps determine their annual rate support and eligibility for cost recovery, creating an incentive to reduce utility system losses. Incorporating additional performance metrics into the PCE program would better align incentives for rural utilities to be more efficient while encouraging the widespread adoption of renewable resources and energy efficiency.

Key Recommendation #4:

Increase the Role for Independent Power Producers and Other Third-Party Service Providers

Increasing the role for independent power producers and third-party providers can help rural utilities improve service and reduce costs to the community. Independent power producers bring access to new sources of capital and experience that can accelerate adoption of innovative technologies that have been successful in other communities in Alaska and beyond. For example, TDX has successfully integrated wind power on Saint Paul Island, using a combination of flywheel technologies and load management. Policies that allow independent power producers, like TDX, to provide technologies to other rural communities should be encouraged.

Many communities already rely on third parties to help run their utilities. Engineering firms and energy service providers are occasionally used to improve power system design, provide maintenance of the distribution system, and assist with bookkeeping and accounting. Marsh Creek LLC, for example, provides operations and technical support to many rural Alaska power systems. They have played a pivotal role in accelerating the adoption of advanced and pre-paid meters in more than 40 communities—an outcome that has significantly improved the rate of collections and the local utilities' financial health. We recommend that regional and community-level service that is contracted through the state be strengthened by outsourcing where most appropriate.

Additional Recommendations

Foster Innovation in Energy Delivery and Conservation

- **Accelerate Testing and Adoption of Emerging Technologies.** Alaska's Emerging Technology Fund tests technologies that are "close-to-market." The Cold Climate Housing Research Center plays a central role in ensuring that technologies are appropriately adapted to Alaska's varying weather conditions. Demonstration projects such as a seawater heat pump system at the Alaska Sealife Center in Seward draw support from the Denali Commission and AEA. The State of Alaska and the federal government should continue to support the work of these organizations and similar opportunities for communities to pilot and adopt relevant technologies.



Solar panels in Noatak.

- **Strengthen Commitment to Energy Efficiency.** Alaska should continue to increase its commitment to invest in energy efficiency and to retrofit existing homes, government and community buildings, and commercial structures in rural areas. Energy efficiency offers a least-cost solution to many homes and businesses. Existing programs, including building retrofits and weatherization, serve as an important starting point for investments. However, only a small portion of the opportunity has been realized, creating a need for more effective and well-funded residential retrofit programs. Promising pathways forward also include more emphasis on new construction by adopting and enforcing better building codes and standards and consolidating program administration and delivery where possible.
- **Enhance the Role for Cost-Effective Renewable Energy.** Utilities need assistance in assessing the potential for renewable electricity resources and incorporating powerhouse improvements so that renewable electricity can be integrated effectively into these systems. Financial incentive programs could be designed to encourage the use of "secondary loads" (i.e., demand for electricity) such as water and wastewater systems, and demand response can help the utility system manage its load as intermittent renewable resources are brought online. The Chaninik Wind Group in southwestern Alaska provides a good example of effectively integrating wind energy, new secondary loads (ceramic stoves), rate design, and smart grid technologies to manage their system.

- **Strengthen Energy-Related Communications in Rural Communities.** Utility managers and community leaders could benefit greatly from information sharing about operations and standards. The AEA has proposed an online “dashboard” that provides access to utility system information to facilitate this. Still, rural communications face additional technological hurdles including slow and expensive telecommunications access. Energy system improvements are unlikely without wider investment and more competition in information-technology infrastructure and services.



The research team arrives in Shungnak.

Implement Regional Plans at the Community Level

- **Institutionalize and Implement Regional Plans at the Community Level.** Communities should build on the initial success of the State of Alaska’s regional energy planning process. Regional Energy Plans provide a mechanism for identifying regional solutions and fostering collaboration between communities in order to achieve economies of scale. The U.S. DOE Alaska Strategic Technical Assistance Response Team (START) program is another successful model implementing regional energy plans at the community level.

Improve Operations, Planning, and Access to Low-Cost Capital

- **Strengthen Capital Planning.** The budget challenges facing Alaska mean that state-sponsored grants for rural utilities will become scarce. Accordingly, utility managers will need help in identifying other means to support and implement capital plans to ensure ongoing investment in power system infrastructure. The U.S. DOE, AEA, and the Denali Commission already require training and planning in conjunction with grant-based awards, and these organizations should continue to support rural utilities efforts to develop long-term capital plans.
- **Improve Access to Low-Cost Capital for Rural Utilities.** Well-designed long-term capital plans will improve utilities’ ability to access other forms of funding including loans and bonds. The State of Alaska and federal agencies can help improve access to low-cost,

debt-based capital by providing incentives for capital planning activities; encouraging loan aggregation and securitization; and supporting the design of a rural energy project development portal. Access to low-cost capital can be improved by combining public funds (e.g., U.S. Department of Agriculture Rural Utilities Service loan programs) with commercial loans and other sources of private sector capital. Alaska native corporations and other regional development corporations also have the ability to provide other sources of low-cost capital to rural communities.

- **Improve Power System Efficiency.** Performance data submitted to the PCE program indicates that there are improvement opportunities possible to reduce line losses, increase fuel conversion efficiency, and make better use of heat recovered from thermal generation. The AEA’s Rural Power System Upgrade and Heat Recovery programs have been effective in promoting recapture of heat from diesel generation in small communities. Communities should consider where best to locate new powerhouses (e.g., next to a school or health clinic) to benefit from the recovered heat produced by electricity generation facilities. Federal agencies could play a role in demonstrating the value of efficiency in these systems and provide technical assistance in their implementation.

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