U.S. DEPARTMENT OF ENERGY | Office of Indian Energy

National Strategy for the Arctic Region (NSAR) – Ten Year Renewable Energy Plan

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Ten Year Renewable Energy Plan

Background

The National Strategy for the Arctic Region (NSAR) outlines the United States Government's strategic priorities for the Arctic region. These priorities are intended to position the United States to respond effectively to emerging opportunities – while simultaneously pursuing efforts to protect and conserve this unique environment. The Department of Energy (DOE) Office of Indian Energy is responsible for the section of the NSAR that develops a Ten Year Renewable Energy Plan for the Arctic region. This effort captures existing energy planning and development activities within the context of renewable energy and energy efficiency and identifies gaps or areas appropriate for federal agency engagement as stated in Executive Order 13175 on Tribal Consultation and Executive Order 13689 on Enhancing Coordination of National Efforts in the Arctic.

Renewable Energy in the Arctic: Key Premises

There are certain distinctions about energy in the Arctic that are critical to understand when considering policy decisions. Among these include:

> ***Arctic communities are isolated and not connected to an electrical grid or road system.***

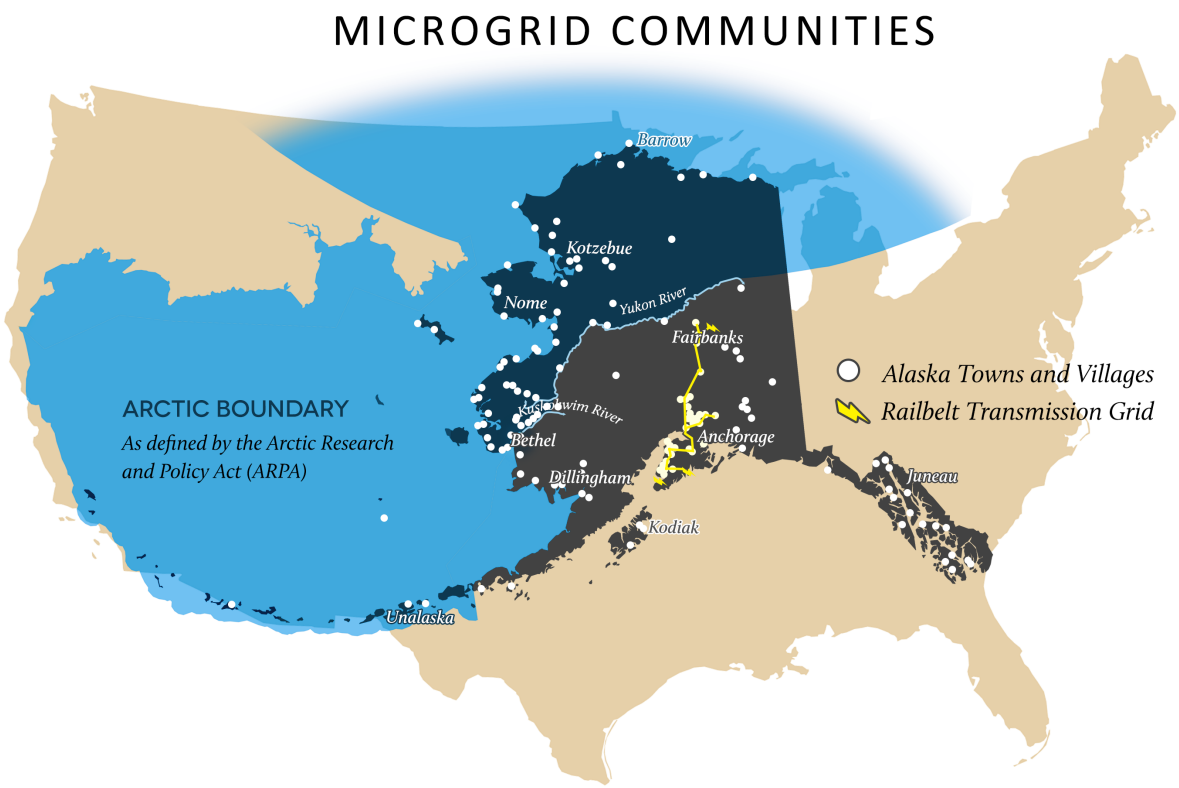
Microgrids – Alaska's Definition

For Alaska and much of the developing world, a microgrid is an electricity distribution system that is "islanded," that is not connected to a larger transmission system serving a region. In Alaska, a microgrid typically serves a single community from a centralized generation facility, and distributes the electricity locally. This is an important distinction from the use of the term "microgrid" in areas where there is a local community system that is connected to a larger electrical grid.

Other Key Premises:

> ***Arctic people*** *represent a substantial proportion of federally recognized tribes. Their subsistence lifestyle and cultural preservation should be prioritized.*
> ***High energy costs*** *for electricity, heat and transportation are a thread throughout all aspects of Arctic communities, and these high costs are a barrier to basic needs including traditional subsistence activities and food security, water and sewer, adequate health care and economic development.*
> ***High cost of living****, and specifically the cost of energy in Arctic communities, is exponentially higher than most of the United States and is not always acknowledged in programs.*
> ***Energy use*** *from electricity is only 27% of total energy for these communities, with heat and transportation representing the majority.*
> ***Deployment of renewable energy systems*** *requires concurrent upgrades to existing diesel generation and transmission systems.*

The following map illustrates the geographic size of the State of Alaska proportional to the continental U.S. The federally recognized Arctic boundary is shown, as defined by the Arctic Research and Policy Act (ARPA). There are few connected road systems or electrical grids in the Arctic, which includes over 125 villages. All of these rely on microgrids for local electricity, and supplies must be transported almost exclusively by air or water.



Other Arctic Strategy Efforts

This project is limited to developing a Ten Year Renewable Energy Plan for the Arctic region, and the plan attempts to acknowledge, support and leverage coordination among other Arctic strategy efforts. Special consideration is given to the Alaska Arctic Policy Commission's work, and it is noteworthy that certain state lines of effort compliment federal priorities. These include:

- Workforce development and training
- Innovative technology development and application
- Basic infrastructure upgrades such as sewer, water and sanitation
- Science-based decision making
- Energy and power testing and research

Coordination with federal agencies tasked with other NSAR efforts is underway. While NSAR efforts will support the 2015-2017 U.S. Chairmanship of the Arctic Council, this document also serves as a stand-alone Ten Year Renewable Energy Plan for all entities with a vested interest in the Arctic region.

Vision Statement

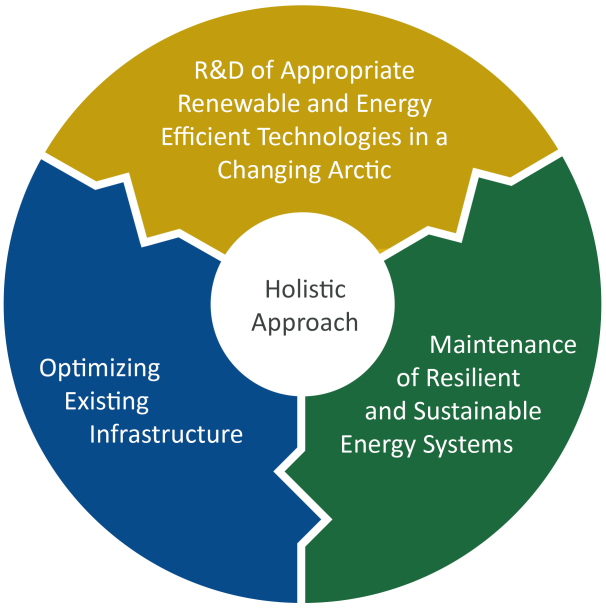
U.S. Arctic energy interests are secured by a holistic approach advancing resilient and sustainable energy systems and by optimizing existing infrastructure and integrating appropriate renewable and energy efficient technologies in a changing Arctic environment, which reduces energy production costs and improves the quality of life for Arctic residents.

Holistic Approach

Holistic coordination of all entities including tribal, local, regional, statewide, federal and international is a priority. **An increased DOE presence in-state will ensure such efforts are approached holistically and through optimal coordination.**

Ten Year Renewable Energy Plan

Priority Areas



Elements of a holistic approach:

- Renewable resources are more accessible and affordable through comprehensive community and regional energy planning.
- Coordination at tribal, community, regional, state and federal levels leverages opportunities for successful deployment of renewable energy systems and federal infrastructure built in the Arctic.
- Project logistics and procurement coordination ensure greater support and likelihood of success.
- Energy infrastructure effectively supports defense, homeland security and economic development.

Priority Area #1: Optimizing Existing Infrastructure

Renewable energy only makes sense if the supporting infrastructure is intact. Because rural Alaska communities operate on microgrid systems, in the long term, diesel generation or some other hybrid fossil/renewable system is a practical expectation when considering how renewables can be successful. Renewable energy is a desirable goal. However, reliable basic infrastructure must also be addressed. A holistic approach is critical in sustaining all basic infrastructure needs as each relies on a robust energy system.

The focus of this report is on developing renewable energy, yet there is interdependence with energy efficiency activities. Improvements to both supply and demand through energy efficiency not only reduce costs but also make renewable energy goals more achievable. Investing in energy efficiency measures is usually the quickest and most cost effective way to impact household, business, or community energy costs. Savings can be reinvested into other energy projects, such as the development of renewable energy generated power and heat. At the same time, the reduced demand due to efficiency improvements also enhances community resilience.

Optimizing existing infrastructure means:

- Appropriate new technologies support small-scale integrated energy systems while concurrently improving existing infrastructure.
- Basic supporting infrastructure is intact and adequately operated and maintained by qualified staff.
- Interconnections with utilities should be done in a way that does not adversely affect other community systems.
- The lack of heat consumption data in Arctic communities is addressed, and this information is used to plan for cost savings and improved infrastructure.
- Increasing conservation and efficiency programs and policies including:
    - Federal facility construction in the Arctic that meets efficiency standards resulting in buildings with a minimum of 50% and a goal of net-zero renewable energy production.
    - Statewide energy efficiency building codes for all non-residential buildings.
    - Building energy audits that bridge the gap between energy and cost saving measures.
    - Streetlight retrofits in Arctic communities.
    - Improved energy efficiency of existing powerhouses.

Priority Area #2: Maintenance of Resilient and Sustainable Energy Systems

There is significant concern over adequate training and a workforce that is appropriately organized to operate and maintain renewable energy systems. Local capacity to operate and maintain existing energy systems, many of which are older technology, is limited. Adding renewable systems to the mix without robust training and capacity building can exacerbate the challenge.

Maintenance of resilient and sustainable energy systems occurs through:

- Training local community members while establishing an operational regional system.
- Developing new models of operations and maintenance for existing and new technologies, including options such as mobile technical and repair training.
- Facilitating innovative partnerships, including university and public-private partnerships.

Priority Area #3: Research and Development of Appropriate Renewable and Energy Efficient Technologies in a Changing Arctic

Research and development is important as renewable energy is expanded in the Arctic region. Continual improvement through pilot projects is critical for the advancement of energy quality, quantity and reliability for the rural communities most in need of new solutions. Furthermore, more research on systems specifically designed to meet Arctic challenges in new and innovative ways is needed. This is not only important for the viability of the Alaskan communities each system serves, and the Arctic climate where those communities are located, but also for the millions of people relying on microgrids in the developing world.

R&D of appropriate renewable technologies in a changing Arctic is accomplished through:

- Testing to optimize Alaska microgrids to be renewable ready.
- Scaling renewable energy systems that are appropriate for Alaska.
- Reducing net carbon through locally sourced energy.
- Exploring the effects of climate change on communities and their existing and future energy systems.

- Increasing knowledge about energy storage, electric and heat hybrid systems and efficient transportation systems.
- Promoting Alaska as a successful testing location for energy solutions that could be exported internationally.

Recommendations

This plan considers how these priority areas, as identified by Alaskans, can best be supported. The following recommendations are made to support a Ten Year Renewable Energy Plan.

Recommendation	**Priority Area(s)**
With Alaska as the strategic energy center of the US, an appropriately sized DOE presence and staff in Alaska is essential to orchestrate and sustain NSAR activities as well as all other DOE efforts in the state.	1-3
Co-fund the State Emerging Energy Technology Fund (EETF) with renewed focus on new microgrid technology development and deployment appropriate for Arctic communities.	1, 3
Co-fund the State Renewable Energy Fund (REF) as a framework for ongoing state support for developing renewable energy projects.	1, 3
Strategically locate a federal energy research facility and program in the Arctic.	1, 3
Increase Arctic participation in the Science, Technology, Education, and Math (STEM) program targeting the Minorities in Energy Initiative in Alaska to develop current and future generations in these fields.	2
Formalize partnerships with Alaska institutions, including Iḷisaġvik College, Alaska's only tribal college, around the common goal to advance energy system research and deployment and the workforce behind it.	2,3
Pursue locally sourced energy to heat homes, such as biomass and clean coal.	2, 3
Fund the Advanced Research Projects Agency-Energy (ARPA-e) and other federal R&D opportunities, including national laboratory integration.	1, 3
Incentivize private industry to assist in assessing heat usage and infrastructure needs, while piloting a heat usage baseline project.	1, 3
Fund community energy planning and technical assistance to support ongoing regional energy planning efforts.	1, 2
Require energy efficiency as a first step in community and regional energy plans.	1
Advance pilot and demonstration projects in the Arctic including advanced hydro, waste to energy, geothermal, energy distribution, locally sourced energy, sustainable training and other energy efforts.	1-3

Conclusion

The Arctic region is a location with unique energy challenges. Many tribal communities are disconnected from any external road system and rely solely on the community microgrid for their very existence. Renewable energy has the opportunity to meet many of the Arctic's challenges over the next ten years. It is imperative, however, that these challenges are met through collaboration with the communities that will ultimately be relying on the integrated energy systems. The DOE plays a critical role in implementing and coordinating these efforts. With the help of the DOE and the recommendations listed above, gleaned from dozens of meetings with Alaskans, this Ten Year Renewable Energy Plan will be a successful and long lasting legacy for the Arctic Region.