

Reliable and Affordable Energy for Rural Alaska Conference
River's Edge Resort
Fairbanks, Alaska
September 17-19, 2002

Conference Overview

The conference on Reliable and Affordable Energy for Rural Alaska was held on September 17 – 19, 2002 at the River's Edge Resort in Fairbanks, Alaska. Sponsors of the conference were the Alaska Energy Authority, the University of Alaska Arctic Energy Technology Development Laboratory, the Denali Commission, and the U.S. Department of Energy.

The recognition that there was a need to bring those in the state dealing with rural energy issues together became apparent as diesel operations have evolved, and the new Arctic Energy Technology Development Laboratory had recently been created to better understand the issues and concerns in rural Alaska. It was timely to bring these interests together and provide an opportunity for them to identify common problems, to learn about new funding sources, share information about technological advances and potential research and development needs, and finally to discuss pending regulatory changes.

The conference drew many diverse interests such as rural utility operators, board members, and managers; regulators; university and national lab researchers; consultants; federal and state agency executives, managers, and staff; manufacturers representatives; association and cooperative representatives; and economic development specialists. Although conference organizers had recognized the need to bring this diverse group together, they had expected that the event would draw about 150 participants. Instead, over 300 people attended and participated in this first time event, which confirmed the need for those addressing and working on rural energy efforts to have such a forum.

A plenary session each morning featured community, industry, and government leaders who spoke about current energy issues and opportunities in rural Alaska. The afternoon sessions were divided into three tracks: *Diesel Generation*, *Utility Management*, and *Alternative Energy*. A variety of technical sessions were conducted in each track.

Issue Identification and Prioritization Process

The last afternoon of the conference, participants worked in breakout or roadmapping groups based on the three tracks. The purpose of the roadmapping was to identify issues, ideas, projects and research that participants believed would have the greatest value for Alaska rural communities. Participants first identified issues or ideas most important to them, and they selected their top priorities.

Priorities were determined when each person used three colored dots to designate their highest priority issues or projects. Dots were color coded to identify the following representative groups:

- 1) Blue for utilities and user groups
- 2) Green for agency representatives
- 3) Yellow for consultants and vendors
- 4) Red for members of the academic and research community.

The purpose for using the color code was to identify those issues most important to each of these constituency groups.

A representative from each roadmapping group then reported the priorities back to the full conference. The data sheets list the issues, ideas, and research projects from each of the three sessions. They are listed in order from highest to lowest priority.

Themes and Commonalities that Emerged

The issues listed on pages 4-10 were identified by participants, and reflect each group's thoughts on how to improve energy reliability and affordability in rural Alaska. The issues are organized in priority order in each category within the track, and were determined by the participants in each roadmapping session. In each session, the highest priority projects were largely determined by rural representatives. The ideas, projects and research needs identified appear to have a more immediate impact on effective day-to-day decision-making, costs, and efficiencies. It is important to acknowledge that there was no attempt to ensure that each interest group was fully represented at the conference or in the roadmapping sessions. The priority outcomes from the roadmapping sessions are not meant to be definitive, but rather a starting point to begin discussions on important issues.

With that said, there were several priority outcomes that seem to be crosscutting throughout the three roadmapping sessions. The outcomes identified are:

- ❑ Funding concerns were evident in each of the three breakout sessions. The *Utility Management* session reached full agreement that changes in the PCE formula needed to be addressed. The *Alternative Energy* roadmap group determined that developing the ability to package projects to attract necessary funding was a top priority, while developing local rural energy sources was seen in both the *Diesel Generation* and *Alternative Energy* groups as a common sense means to reduce transportation and environmental costs, thereby reducing energy costs.
- ❑ Economic sustainability concerns, including reducing the costs of small facilities.
- ❑ Controls, monitoring, and information retrieval issues were discussed and considered in all three groups.
- ❑ Education, such as an information clearinghouse and retrieval system, and education programs for public schools and for utilities and consumers (demand side management) were also identified as priorities.
- ❑ Addressing the challenge posed by Alaska's cold weather climate generated several top priority issues in the *Diesel Generation* breakout group.
- ❑ Developing local energy sources was a priority in the *Alternative Energy* session and received interest from the *Diesel Generation* breakout group too.

See pages 13 and 14 for a compilation of the high and medium priorities.

Closing Discussion

After each of the breakout sessions selected their priorities, the three groups then reconvened to hear from the other groups. This then created some discussion and reflections from participants.

From the *Utility Management* breakout session, where they forwarded the need to reconsider the PCE funding formula, some brought up concerns that although they agreed this change was needed, a sudden change would not be welcomed. It was also apparent that Alaska still has cultural issues to bridge, as was exemplified in a conversation about urban energy representatives visiting rural communities, and the difficulties of aligning urban and rural schedules, due to a subsistence lifestyle.

Another person reflected on the outcomes of the roadmapping sessions by saying, "*Now we can start talking,*" meaning that the suggestions and initial discussions from the Conference provided a good starting point, and that the Conference proved the immense interest from many to participate in these issues.

Recommendations

The need to provide a forum such as the conference on Reliable and Affordable Energy for Rural Alaska is apparent. The success of the event was reflected in the high level of networking that occurred and the cross-fertilization of ideas, which provided a substantial learning opportunity. Conference organizers, based on comments and evaluations see a need to conduct this event on a consistent basis, and believe that an every-other year, or a biennial event would meet this need.

Based on reflections from some of the conference participants, it seems that a critical need is to continue conversations and explore those ideas and technologies that will enable rural Alaska to truly have affordable and reliable energy.

Conference organizers have a critical role to play. They could convene a steering group to follow-up on the ideas generated and sort out action items, or they could provide the opportunity for on-going groups to work together, or they could conduct workshops on specific issues. Any or all of these activities can provide opportunities to learn about and address priority ideas that participants brought to the forefront during the Conference, as well as other important issues. For instance, one of the priorities identified in the *Diesel Generation* breakout group was the need to research new tank materials for Alaskan conditions. Other issues that surfaced were reformulating the PCE, wind-diesel hybrids, fuel storage, and data collection and use. None of these issues can be addressed easily, and having on-going forums will be necessary if they are to be addressed successfully.

Without the capability to bring those most interested in an issue together, the status quo will remain. A possible model to consider emulating is from the Northwest and North Slope areas of the state, where together they have begun to address long-term economic concerns by holding annual summits. These summits are supplemented with on-going committee work throughout the year. The summits are then used to provide a report back to the full group – whoever is interested and attends. This system provides a forum to ensure that all those who are interested understand the multiple priorities and how they are being addressed, and further provides an opportunity for those not actively involved in a particular issue to provide their advice and recommendations

Track and Category	Issues/Ideas/Projects/Research NOTE: Highest Priority = ♦(pink) Medium priority = ♦(orange) Low priority = ♦(plum)	Rural Utilities & User Groups (Blue)	Agency Reps (Green)	Consultants & Vendors (Yellow)	University & Research (Red)	Total
Diesel Generation						
▪ Diesel Fuel	1) ♦ Need to conduct further research on cold weather fuel operations, additives, recovered heat, types of fuel and blending to ensure reliable operations and safety in Alaska's cold weather climate.	5	2	2	2	11
	2) ♦ Investigate other diesel products e.g. synthetic diesel from natural gas and other hydrocarbons (especially Alaskan sources) to diversify fuel sources and reduce rural Alaska's dependence on diesel that needs to be shipped in.	0	1	2	2	5
	3) Develop packaged, portable remediation products for maintenance and spill response.	0	0	0	0	0
▪ Controls & Switches	1) ♦ Create a historical data collection of energy systems, including monitoring information to conduct diagnostic and economic evaluations.	4	2	3	0	9
	2) Develop Smart Tools for consumers, such as meters that will provide information on their consumption of energy and will help them make educated decisions about how to conserve energy use.	0	1	1	0	2
	3) Modernize automatic switching to optimize generator load matching.	0	0	0	0	0
	4) Standardize automatic switching systems.	0	0	0	0	0
▪ Diesel Technology	1) ♦ Test and evaluate a) new diesel engine system designs, including diesel engine hybrids, and b) various operational scenarios, and c) system components in order to reduce emissions, increase efficiency and reliability and reduce maintenance and operation costs.	6	1	1	2	10
	2) Standardize rural powerhouses in Alaska.	0	0	0	0	0

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Diesel Generation						
	3) Create a central database that provides a comparison of individual generation sets, fuel efficiency, maintenance costs and capital costs in one location that's easy to access. This would allow purchasers to make more informed decisions. Could AEA or AETDL maintain a web accessible database in coordination with the manufacturers, to make this information available for both 1200 and 1800 rpm?	0	0	0	0	0
▪ Bulk Fuel Storage	1) ♦ Research new tank materials e.g. alloys that are non-corrosive, affordable and approved for Alaska conditions.	2	1	2	0	5
	2) Develop a plan or model for tank farm development (How-to Guide).	1	1	1	0	3
	3) Develop more sophisticated technology for monitoring storage tank fuel levels and leaks.	0	0	0	0	0
	4) Develop a fuel shipping and transport system that more effectively interfaces with storage facilities.	0	0	0	0	0
	5) Require village power generation operation plans to include a section on oil spill containment, systems design, and maintenance.	0	0	0	0	0
	6) Investigate the human health impacts of diesel fuel use in rural Alaska.	0	0	0	0	0

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Alternative Energy						
▪ Natural Gas, Coal & Biomass	1) ♦ Develop capabilities to package projects to successfully attract funding. Funding isn't available to small villages for appropriate technology and small projects.	4	0	4	3	11
	2) ♦ Improve technology to utilize local energy sources, and recognize that conditions and resources are very different in different areas. This will reduce transportation costs and chances of spills as energy sources are local and dependence on diesel is reduced.	1	1	3	2	7
	3) ♦ Develop new and cheaper ways to drill for energy resources.	1	3	0	2	6
	4) ♦ A community's economy is too small and the risk too high to warrant some of these ventures. ACTION: Rural communities need sponsors to try innovations, including regional approaches.	3	0	2	0	5
	5) Introduce natural gas to villages. This will help them to transition to gas and/or hydrogen	2	0	2	0	4
	6) Develop local energy resources that are in excess to export or develop for commercial viability.	0	0	1	0	1
▪ Education	1) ♦ Establish a clearinghouse, e.g. resource database for disseminating information about technology, equipment, software and conservation.	2	1	5	1	9
	2) ♦ Develop and conduct demand-side education programs on issues such as appropriate technology, cross-training the local workers for multiple utility services. All of which will lead to more local control and support.	1	3	1	2	7
	3) Communicate innovations in energy to rural areas, including public school education programs.	1	2	0	0	3

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Alternative Energy						
▪ Transmission	1) ♦ Reduce the cost of transmission lines on permafrost.	2	0	1	2	5
▪ Hydro and New Hydro Technology, & Wind	1) ♦ Develop new hydro-technologies: <i>Run of the River</i> projects	1	2	3	0	5
	2) Reduce the cost of remote wind power through new technology, e.g. written-pole technology.	0	0	1	0	1
	3) Hydro-technology: High costs in small communities.	0	0	0	0	0
	4) New hydro-technology: Address frazzle ice issues.	0	0	0	0	0
▪ Hybrids, Batteries, Fuel Cells & Geothermal	1) Fuel cells: Develop a variety of sources of hydrogen in order to make this technology more feasible. (from wind, solar, geothermal, biomass, biogas, and conventional fossil fuels)	0	1	2	1	4
	2) Hybrids and batteries: Develop controls that interface better.	1	0	1	1	3
	3) Fuel cells: Monitor commercialization of fuel cells and test for use in small villages.	0	0	0	2	2
	4) Geothermal: Develop an economically viable project for geothermal energy for electrical or heat production.	0	0	1	0	0
	5) Geothermal: Geothermal production of hydrogen for export from rural Alaska.	0	0	0	0	0
	6) Geothermal - Monitor a ground source heat pump project to determine economic viability in rural Alaska.	0	0	0	0	0
	7) Monitor the continuing commercialization of fuel cells.	0	0	0	0	0

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Utility Management						
▪ Financial Issues	1) ♦ Revise PCE formula to reward efficiency and capture benefits locally. Increase the endowment, and research true costs including contributed capital, and develop standards to reflect the true costs.	7	4	2	0	13
	2) ♦ Insurance should be mandatory for utilities. This concept is not just purchasing a policy. It encompasses all the activities when the local entity takes responsibility for ensuring the proper operation of the systems. This includes proper operation and preventative maintenance as well as insuring against losses for reasons beyond the control of the local operators. This concept encompasses education., including consequences of lack of insurance.	2	0	2	1	5
	3) To the extent that local revenues don't cover operation costs, determine what state and federal funding should be available.	2	0	0	0	2
	4) Develop guidelines on pricing for retail fuel sales.	0	1	0	0	1
	5) Develop standards for what power costs should be.	0	0	0	0	0
▪ General Issues	1) ♦ Install information collection/retrieval/storage systems to include remote or local metering and monitoring, automatic control systems. Installation of metering and monitoring systems should be designed and implemented to facilitate addition of control, develop agency database to collect, store and analyze information. All of this is done in order to optimize plant efficiency.	4	2	1	1	8
	2) ♦ All projects should increase or drive toward sustainability.	4	2	1	0	7
	3) ♦ Conduct community planning. Develop comprehensive plans that cover power generation, land use, subsistence, roads and airports. These planning efforts should be driven by the local community.	3	4	0	0	7

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▪ Utility Management	4) Need technical assistance programs that are available to travel to communities and provide assistance.	1	1	1	0	3
	5) Mandate consolidation of services (regionalization).	0	1	0	0	1
	6) Conduct capacity building training and mentoring.	1	0	0	0	1
	7) Cooperative purchase of bulk fuel (state, region, private).	0	0	0	0	0
	8) Common business plan (standardize).	0	0	0	0	0
▪ Environmental	1) Develop/find a cost effective way to clean up sites.	1	0	0	1	2
	2) Regional systems for disposal of hazardous wastes (oil, glycol).	2	0	0	0	2
	3) Increase benefits for environmentally friendly fuels.	0	0	1	0	1
	4) PCB transformers cleanup.	1	0	0	0	1
	5) Local disposal plan and education for re-using waste oil.	0	0	0	0	0
	6) Impact of ultra-low sulfur diesel (ULSD).	0	0	0	0	0
	7) Noise and air pollution impacts of power plant. (Balance with location for use of co-generated heat.)	0	0	0	0	0
▪ Conservation	1) Energy efficient construction is most important energy “source.”	0	0	0	0	0
	2) Identify funding sources for starting conservation projects in rural areas.	0	0	0	0	0
	3) Require housing authorities to build to efficiency standards.	0	0	0	0	0
	4) Communities that are more efficient should be able to capture benefits locally.	0	0	0	0	0

The following provide additional discussion on some of the recommendations from the *Utility Management* session.

Financial Issue #1: Revise PCE formula

It was strongly felt by all members of the group that the PCE formula as it is now computed is “broken.” The basis for this recommendation is that the current formula does not provide incentives for communities to become more efficient. It was felt so strongly that this was the number one priority issue with everyone participating in this roadmapping session.

An example given to describe this problem was that if a community has high administrative costs, this can result in a higher PCE rate. It was felt that if the PCE were linked directly to essential base functions of a utility, then anything over the “base functions” would have to be paid by the community. This would then force them to determine if these extra functions made economic sense.

Financial Issue #2 Insurance should be mandatory for utilities

This idea came from several rural utility representatives. It stems from the idea that there should be consequences for not doing things properly. One thing that is “proper” is having insurance. If a utility or community doesn’t have insurance, and a loss is suffered, they SHOULD NOT be given a new facility. This is rewarding bad behavior instead of good behavior. (This recommendation reinforces the group’s #1 priority, revising the PCE formula, to drive towards sustainability.)

Financial Issue #5 Develop standards for what power costs should be

Participants expressed that they thought a model/matrix could be developed to identify what the true cost of operation is for certain types of equipment, levels of service, and size of utility. Once this is determined, it would provide standards or benchmark points for utilities to compare their operations and to evaluate their efficiency. The underlying premise is that the benchmarks would create a goal or an incentive for a utility to operate efficiently. It would also provide agencies with a tool to clearly communicate the expected performance by the utility.

General Issue #1: Install information collection/retrieval/storage systems

A current problem was identified as data from utilities across Alaska is not standardized enough to collect and compare, and the data that is sufficiently standardized is not being reported to a central agency.

With the development of reliable, remote sensing equipment and development of communication systems, funding agencies should include the requirement of remote sensing equipment in capital construction projects. Some (an) agencies should then collect and store the data in a way that it could be accessed by other agencies and researchers. This not only holds true for electric facilities, but also bulk fuel, and water/sewer.

In some cases the remote sensing equipment could trigger alarms that warn of dangerous conditions (fuel leakage, temperature drops, low fuel). If an agency or regional entity monitored these critical systems, in addition to the utility, then some emergency conditions could be avoided.

Automated systems should be used for electrical generation systems (not water/sewer). These systems have improved significantly and have proven reliability compared to manual oversight. The use of these systems will increase electrical generation systems efficiencies. Examples cited of when an automated system would be useful are when generation capacity needs to be added, or to switch from one capacity source to another.

General Issue #2 All projects should increase or drive toward sustainability

Funding and regulatory agencies should evaluate a utility's program to see if it moves a utility towards economic sustainability or not. If it does not, it should not be done. Examples: if a community is suppose to get a facility that will require a trained operator, but nobody in the community can be found willing to get the training, the facility should not be built. Building it when the community is not ready to accept responsibility to maintain it supports dependence, not sustainability. Things that demonstrate sustainability would be development of a single comprehensive plan, realistic completed business plans, charging and collecting of user fees for current services, and trained staff.

General Issue #3 Conduct community planning

True community planning should be done. Currently, each utility (sanitation, fuel, electricity) does its own planning without coordinating with other utilities, other infrastructure such as schools, private developers or economic development planning efforts. To maximize long term sustainability of a community, this planning needs to be done as an overall or comprehensive plan, with utilities fitting into the plan. This may require that some projects be delayed until such a plan is in place.

HIGHEST Priority Issues Based On The Roadmapping Sessions

Track and Category	HIGHEST PRIORITY Issues/Ideas/Projects/Research	Rural Utilities & User Groups (Blue)	Agency Reps (Green)	Consultants & Vendors (Yellow)	University & Research (Red)	Total
▪ Financial Issues	1) ♦ Revise PCE formula to reward efficiency and capture benefits locally. Increase the endowment, and research true costs including contributed capital, and develop standards to reflect the true costs.	7	4	2	0	13
▪ Diesel Fuel	1) ♦ Need to conduct further research on cold weather fuel operations, additives, recovered heat, types of fuel and blending to ensure reliable operations and safety in Alaska's cold weather climate.	5	2	2	2	11
▪ Diesel Technology	1) ♦ Test and evaluate a) new diesel engine system designs, including diesel engine hybrids, and b) various operational scenarios, and c) system components in order to reduce emissions, increase efficiency and reliability and reduce maintenance and operation costs.	6	1	1	2	10
▪ Natural Gas, Coal & Biomass	1) ♦ Develop capabilities to package projects to successfully attract funding. Funding isn't available to small villages for appropriate technology and small projects.	4	0	4	3	11

MEDIUM Priority Issues Based On The Roadmapping Sessions

Track and Category	MEDIUM PRIORITY Issues/Ideas/Projects/Research	Rural Utilities & User Groups (Blue)	Agency Reps (Green)	Consultants & Vendors (Yellow)	University & Research (Red)	Total
▪ Controls & Switches (Diesel)	1) ♦ Create a historical data collection of energy systems, including monitoring information to conduct diagnostic and economic evaluations.	4	2	3	0	9
▪ Education (Alternatives)	1) ♦ Establish a clearinghouse, e.g. resource database for disseminating information about technology, equipment, software and conservation.	2	1	5	1	9
▪ Education (Alternatives)	2) ♦ Develop and conduct demand-side education programs on issues such as appropriate technology, cross-training the local workers for multiple utility services. All of which will lead to more local control and support.	1	3	1	2	7
▪ General Issues (Utility Management)	1) ♦ Install information collection/retrieval/storage systems to include remote or local metering and monitoring, automatic control systems. Installation of metering and monitoring systems should be designed and implemented to facilitate addition of control, develop agency database to collect, store and analyze information. All of this is done in order to optimize plant efficiency.	4	2	1	1	8
▪ General Issues (Utility Management)	2) ♦ All projects should increase or drive toward sustainability.	4	2	1	0	7
▪ General Issues (Utility Management)	3) ♦ Conduct community planning. Develop comprehensive plans that cover power generation, land use, subsistence, roads and airports. These planning efforts should be driven by the local community.	3	4	0	0	7