

**Diesel Efficiency and Alternative Energy Program****FY2004 Request:****\$250,000****Reference No:****32591****AP/AL:** Appropriation**Project Type:** Construction**Category:** Health/Human Services**Location:** Statewide**Contact:** James McMillan**House District:** Statewide (HD 1-40)**Contact Phone:** (907)269-3000**Estimated Project Dates:** 07/01/2002 - 06/30/2007**Brief Summary and Statement of Need:**

This program's objective is to lower the cost of power and heat to predominately rural communities while maintaining system safety and reliability. This is done by funding projects such as fuel efficiency improvements, wind resource development, biomass development, and geothermal energy resource development. A portion of this appropriation will be used to provide the required state match to federal grants also used to fund this program.

<b>Funding:</b>	<b>FY2004</b>	<b>FY2005</b>	<b>FY2006</b>	<b>FY2007</b>	<b>FY2008</b>	<b>FY2009</b>	<b>Total</b>
Gen Fund	\$250,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$2,750,000
<b>Total:</b>	<b>\$250,000</b>	<b>\$500,000</b>	<b>\$500,000</b>	<b>\$500,000</b>	<b>\$500,000</b>	<b>\$500,000</b>	<b>\$2,750,000</b>

<input type="checkbox"/> State Match Required	<input type="checkbox"/> One-Time Project	<input type="checkbox"/> Phased - new	<input type="checkbox"/> Phased - underway	<input checked="" type="checkbox"/> On-Going
0% = Minimum State Match % Required		<input type="checkbox"/> Amendment	<input type="checkbox"/> Mental Health Bill	

**Operating & Maintenance Costs:**

	<u>Amount</u>	<u>Staff</u>
Project Development:	0	0
Ongoing Operating:	0	0
One-Time Startup:	0	0
<b>Totals:</b>	<b>0</b>	<b>0</b>

**Additional Information / Prior Funding History:**

Refer to the funding matrix in the detailed description.

**Project Description/Justification:**

This program's objective is to lower the cost of power and heat to predominately rural communities while maintaining system safety and reliability. This is done by funding projects such as fuel efficiency improvements, wind resource development, biomass development, and geothermal energy resource development. The Program is funded from capital appropriations with funding from the general fund and multiple federal agencies such as U.S. Department of Agriculture, U.S. Department of Energy, and the Denali Commission.

Currently, the program is funding \$1,646.2 in projects. Of that total, \$364.5 is funded from the General Fund and \$1,281.7 from federal funding for an approximate ratio of 1 to 3.5. Current projects include:

- ? Assisting UniSea Inc. with a successful fish oil/diesel fuel test for diesel power generation
- ? Supporting waste heat recovery projects in two communities
- ? Initiating a data acquisition (metering) program for remote diesel generation
- ? Performing energy audits in 100 facilities in 33 communities
- ? Initiating a project with UAF and power utilities to design suitable towers for wind energy projects
- ? Preparing an assessment of geothermal energy resources in Alaska
- ? Assessing wind energy resources of over 100 communities using weather station data
- ? Supporting the DOTPF state facility energy conservation program
- ? Performing energy retrofits in 10 community facilities in Chuathbaluk and Tenakee (FY02). Additional retrofits are planned in McGrath, Ruby, Diomedea and Sand Point.

The \$250.0 now being requested for fiscal year 2004 would provide some of the funding and/or "state match" funding required of the federal agencies who will also provide funding for some of the below listed potential projects:

- ? Installation of supervisory control and data acquisition (SCADA) and automatic meter reading systems in rural utilities as a step toward privately-funded diesel efficiency improvements.
- ? Construction of new "waste heat" recovery and distribution systems for conventional diesel power plants in rural villages.
- ? Battery storage demonstration projects.
- ? Identification and installation of energy conservation measures in rural schools and other large buildings.
- ? Development and testing of wind energy projects.
- ? Operational testing and air permitting of fish oil and diesel blends.

Over the last two years the AEA and its partners - the Denali Commission and the U.S. Department of Agriculture Rural Development - have sponsored the development of the *Alaska Rural Energy Plan*. AEA diesel efficiency/alternative energy capital funding requests are consistent with Plan recommendations to be finalized in January 2003 in the areas of diesel efficiency improvements, end use conservation, wind energy, and waste heat recovery. The Denali Commission has clearly expressed its interest in contributing federal grant funds for construction of the most cost-effective efficiency and alternative energy projects that emerge from this process.

A more detailed description of the individual sub-programs follows:

### Fuel Efficiency Improvements

- ? *Diesel Generation Efficiency Improvements.* Larger rural utilities are making increasing use of new high efficiency diesel generating units and automated switchgear, which transfers power from the most efficient unit available to varying electrical load. Analysis in the state's Rural Energy Plan indicates that almost all rural communities present attractive opportunities for replacing old diesel generators and that private and public non-grant financing is a viable alternative for support in most cases. Lacking in many communities, however, is accurate and detailed electrical load and system performance data on which to base decisions on feasibility and design of diesel efficiency projects. The Energy Plan recommends allocation of \$300,000 toward grants and contracts for developing additional metering and supervisory control and data acquisition (SCADA) systems for obtaining accurate baseline data in communities most likely to benefit from diesel efficiency improvements. State funds would be used to match USDOE funding through the UAF Arctic Energy Technology Development Laboratory (AETDL), local contributions, and other funding for this purpose.
- ? *"Waste Heat" Recovery from Diesel Generators.* Currently there are over 100 systems in rural communities that recover jacket water heat from diesel generators and distribute it to nearby schools, water treatment plants, and other facilities. Over the last decade, upgrade and replacement of diesel power plants in rural villages have created new opportunities for heat recovery as many of these projects have been designed for easy connection to a waste heat system. This includes the diesel power plant upgrades that AEA is now developing under its RPSU (Rural Power System Upgrade) program. The Energy Plan recommends a diesel heat recovery development program on the order of \$1.1 million over two years including \$250,000 technical support to heat users such as schools and water utilities and \$800,000 to utilities and others for heat recovery design and construction. Capital funds would provide matching funding for the development of these systems, where possible in conjunction with the installation of new diesel power plants.
- ? *Energy Storage System Development.* A successful diesel battery-photovoltaic hybrid energy system was completed in Lime Village in 2002 through an AEA partnership with BP Exploration Alaska, USDOE/Sandia National Laboratories (SNL), and McGrath Light and Power. Diesel-battery hybrid systems offer potential fuel savings, reduced maintenance, and improved reliability over multiple diesel configurations in a number of rural applications. The energy storage and conversion systems can replace spinning reserve, reduce engine start-stop cycles, and allow use of a smaller, less costly diesel generator. Further demonstration of the value of energy storage, and energy conversion systems is needed as an option for small communities with wide variations in load, and with difficulty balancing the load throughout the distribution system.

Based on the Lime Village system, AEA is working with SNL, the University of Alaska, and local utilities to construct a computer model for designing and developing energy storage systems. SNL has requested and expects to receive \$400.0 in federal funds for developing two energy storage systems in Alaska.

AEA requests \$60.0 to match \$120.0 in AETDL or other funding for installation of automated metering and SCADA systems in rural communities.

AEA requests \$100.0 to match \$400.0 in potential Sandia National Laboratory funding for energy storage systems. Although no hard requirements for match to SNL funds are established for this program, some level of state funding is necessary to facilitate continued state-federal partnership in this area.

### **Conservation**

The Rebuild America program provides federal funds primarily to conduct energy audits of commercial and institutional buildings. Energy "auditors" examine these larger buildings, analyze energy use, recommend cost-effective energy conservation measures, and provide training of facility operators. The Rebuild America program requires a 1:1 match of federal and state dollars.

To date, AEA has conducted energy audits in 138 rural communities. The largest 3 structures, including the school, are examined in each community. The audits have identified conservation measures that would save schools and other rural facilities over \$2 million per year at a capital cost of \$3.5 million. These are very cost-effective investments. Typical measures include retrofitting to efficient lamps and ballasts, installing setback thermostats and occupancy sensors, controlling boiler water temperature based on outdoor temperature, tuning and upgrading heating systems, installing energy efficient motors, and improving building envelope and insulation.

AEA requests \$100.0 to match \$100.0 in USDOE funds for the Rebuild America program and \$40.0 to match an estimated \$160.0 that will be available from USDOE's State Energy Program through an RSA with Alaska Housing Finance Corporation.

### **Wind**

? *Wind Development Program.* According to a preliminary model, the Rural Energy Plan has identified 47 communities in rural Alaska that are promising locations for cost-effective wind projects. Site-specific information is needed to characterize available resources, costs and system designs, so that wind energy can be incorporated into near-term projects. Work over the next 2-4 years will include initial site screening based on analysis of existing data for 180 communities (\$100,000); preliminary site visits to 67 locations (\$200,000); detailed siting and local wind resource monitoring at 30 sites (\$900,000); and wind system component selection and sizing, hybrid system operating analysis, overall preliminary system design and final feasibility assessment at 30 sites (\$400,000).

In addition, AEA plans to evaluate field results from operating wind-diesel systems to benchmark and optimize proposed designs. This work is necessary to qualify for additional federal construction funds. Funding will improve the cost-effectiveness of wind installations by making information available to designers for early inclusion in upcoming power system improvements. In addition, this work will expand opportunities for coordinating and combining wind projects with the other ongoing or proposed community projects, such as bulk fuel system improvements.

The estimated cost of the wind development program is \$1,600,000 over 2-4 years. State capital funds are requested for matching federal and local contributions.

? *Medium Penetration Wind Systems for Western Alaska Demonstration.* Recent experience with wind energy systems in Kotzebue and Wales has demonstrated the viability of wind-diesel energy systems as a supplement to diesel fuel for a large number of rural communities. These wind projects have clarified many cost and technology issues related to the effective use and optimization of wind energy. Proposed by AVEC, the project will incorporate wind turbines into the design of a new village energy system in conjunction with the construction of a new diesel power plant. Building on the experiences of the Wales and Kotzebue projects, this system will form the basis for broader application of wind diesel technology.

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The estimated project cost of the 150 to 250 kW wind energy component is \$680,000. Candidate communities in Western Alaska include Shishmaref, Brevig Mission, Gambell, Savoonga, and Scammon Bay. AVEC has indicated that it will contribute \$200,000 to the project.

AEA will seek \$700.0 in USDOE Wind Powering America or other federal funds for wind resource assessment and project development activities. Based on the approximate 1:4 state to federal matching ratio, \$175.0 in capital funds are requested for this purpose.

**Biomass**

During FY03 UniSea Inc., completed a first round of testing on air emissions and performance of fish oil and diesel blends as fuel in a Fairbanks-Morse generator with assistance of AEA, the Alaska Science and Technology Foundation, BF Goodrich, and USDOE. Testing has been very successful, with approximately 1.2 million gallons of 50-50 fish oil-diesel blend consumed over a 12-month period; no noticeable impacts on engine wear; and decreases in particulates, carbon monoxide, and sulfur emissions. Despite a slightly lower energy content per gallon than #2 diesel, use of fish oil for power production offers substantial savings over diesel for some processors, given spotty markets and difficult logistics for shipping overseas.

Further work is planned for FY03, testing performance of fish oil "biodiesel" blends in generators more commonly used for power production in rural communities, such as Caterpillar and John Deere. Successful performance tests would facilitate potential use and cost savings at rural utilities. State capital funds are proposed to be used for cost share with USDOE, ASTF, UniSea or other processors, local utilities, generator manufacturer(s) and other interested parties.

Based on long experience with the Biomass Energy Program, AEA expects that \$50,000 in federal funds will be available with a state matching requirement of \$25,000.

**Funding History (includes both State and Federal Funding for these projects)**

Year	Amount	Legislation
FY 1997	1,000,000	SLA 96 Ch 123 Page 45 Line 31
FY 1998	10,000,000	SLA 97 Ch 100 Page 42 Line 20
FY 1999	30,000,000	SLA 98 Ch 139 Page 40 Line 21
FY 2000		None
FY 2001	30,450,000	SLA 00 Ch 135 Page 3 Line 9
FY 2002	5,487,000	SLA 01 Ch 61 Page 3 Line 17
FY 2003	200,000	SLA 02 Ch 1 Page 3 Line 22
FY 2003	30,000,000	SLA 02 Ch 1 Page 3 Line 32