

Alaska Renewable Energy Fund Grant Recommendation Program

Preliminary Assessment of Project Performance

February 4, 2012

Background

Alaska Energy Authority (AEA) has at least one year of operational data for 14 of the 21 Renewable Energy Fund (REF) projects that were producing energy at the end of 2011. The following assessment is based on the technical and economic performance of these 14 projects summarized in table 1.

This assessment is preliminary. It

- Reports on only a portion of the 73 construction projects that have been funded by the REF since inception. Status of all projects funded by the REF is available in the 2012 REF Program Status Report at http://www.akenergyauthority.org/RE_Fund_Applications-V.html.
- Is based on one year of production (2011). As is common to most energy projects, some of the projects—particularly biomass and small wind systems—require additional time for operators to debug and integrate the equipment into the existing fossil system.
- Does not address non-fuel operation and maintenance (O&M) cost increases or savings. For the purposes of this assessment, the costs of O&M for diesel-fired power and heat generation is assumed to be equal to that of renewable energy generation.
- Does not address positive or negative impacts on overall system efficiency. For example, higher penetration of wind energy into a diesel power system may decrease diesel generation efficiency. More detailed study is required to assess such an impact in a particular location.
- Does not address impacts on the cost of electricity, the Power Cost Equalization program, air quality, greenhouse gas emissions, fuel spills, economic development, community stability, or other more complex environmental and socioeconomic issues.

Despite these limitations, however, AEA believes it is appropriate to focus, at least initially, on quantity and value of fuel displacement as a program metric given the overwhelming impact that fossil fuel usage has on energy cost.

AEA maintains an ongoing program to monitor energy production, operation and maintenance issues, and economic performance of construction projects funded by the REF and other programs. As more data becomes available AEA will expand the analysis of project performance to include additional projects, assess cost of electricity impacts on ratepayers, and analyze distribution of benefits to the public. AEA will continue to coordinate this work with the University of Alaska and make results publicly available.

As part of the REF program evaluation that is in progress, AEA contractor Vermont Energy Investment Corporation is conducting an assessment of program impact versus cost that will address project cost versus savings, jobs, development of infrastructure, and other public benefits. A draft report will be available in March, while the final report is due in June.

Overall Results

Table 1 indicates that the 14 projects displaced 1.46 million gallons of diesel in 2011—approximately 84% of the amount of fuel that was expected by AEA, UAA Institute of Social and Economic Research (ISER), and private economists that reviewed REF applications. (This expected amount of fuel is termed “Goal” in the table.)

The value of the fuel displaced in 2011 was \$4.87 million. Dividing the total unsubsidized cost of all projects (\$55.6 million) by the \$4.87 million in savings 2011 indicates a simple payback of 11 years for projects that AEA expects have a 20-year useful life (except for the hydro project that is assumed to have a 50-year life). Dividing the total REF grant for these projects (\$20.65 million) by the \$4.87 million in savings indicates a payback on the grant portion of the projects of 4 years.

2011 fuel prices may be rather low in the long run. Based on the USDOE Energy Information Administration’s mid-case projection of the cost of crude and other (see Alaska Fuel Price Projections 2011-2035 ftp://ftp.aidea.org/ReFund-5/4_Program_Update/Fuel_price_projection_2011-2035_final.pdf), ISER estimates that the average price of fuel in rural areas will increase by 42% during the next 20 years over 2011 levels.

The following sections provide more detailed information on project performance. Information is organized by renewable energy resource.

Biomass

The Tok School Biomass system reported fuel displacement for 2011 at 48% of the estimated displacement from their application. The Tok boiler only operated from January to May in 2011, when it was shut down to be retrofitted for steam, and a steam turbine-generator was added to the system. The heating system was not restarted until January 2012. Therefore thermal production was substantially less than expected. During 2013 the wood-fired system is expected to produce both heat and power during the year. The Alaska Gateway School District has used fuelwood harvested in wildfire mitigation efforts to date. Thus biomass fuel cost has been limited to handling and processing.

The Native Village of Eyak processed 75 cords of local logs in 2011. Although this is only 13% of the original goal, payback time of the REF investment appears short.

The Gulkana Central Wood Heating system displaced fuel at 40% of the goal. This is a basic biomass system with minimal instrumentation, so the estimates for displaced fuel are derived from quantity of harvested wood. This system’s lower-than-expected performance may be caused by less than 100% utilization of the system. AEA will monitor the system with the Native Village of Gulkana. Despite this apparent underperformance, the project saved the Village approximately \$24,000 in fuel cost. Similar to Tok, the project is firing the boiler with wood stored from earlier harvest operations.

Geothermal

The City and Borough of Juneau's ground source heat pump is performing at 126% of its fuel displacement goals using figures from a recent preliminary report prepared by the CBJ for AEA. Simple payback is 8 years for total cost and 4 years for REF funding. The CBJ report assesses economics more fully and includes costs of increased power consumption and benefits of reduced snow removal costs.

Heat Recovery

Golden Valley Electric Association's (GVEA's) heat recovery facility at its North Pole power plant is performing well, if somewhat below the original goal. Having saved \$172,000 in naphtha fuel during 2011, the \$1 million project promises to be highly economic.

McGrath Heat Recovery System reported fuel displacement for 2011 at 72% of goal. In late 2011, the new McGrath Clinic was connected to the district heating system and will increase the fuel displaced by approximately 5,400 gallons. The system is operating well and saved the community \$157,000 in fuel during 2011.

Hydroelectric

The City and Borough of Wrangell's electric boilers are operating as planned and displaced \$230,000 of fuel in 2011.

Gustavus Electric Company's Falls Creek hydro project produced 117% of its energy goal. The 50-year, \$8.4 million project offset fuel worth \$583,000 in 2011. It should be noted that hydropower is subject to yearly weather, and annual energy may vary by +/- 20% of the predictions based upon a "normal" water year.

Solar

GVEA's McKinley Village solar thermal project offset less than a third of the amount of fuel expected during 2011. GVEA staff and contractors established a data collection system for the \$193,000 demonstration project, however, and are working on understanding and improving performance.

Wind

The AEA wind program publishes a quarterly report card of all utility-scale wind projects in the state. The first report card was released in late September 2011, while the second report was completed in early January 2012.

Wind energy varies seasonally with greater wind turbine output in the winter and less in the summer. Therefore a 12-month average is needed to accurately assess wind project performance.

Kodiak Electric's Pillar Mountain Wind Farm continues to meet or exceed energy goals. In 2011 it displaced over 870,000 gallons of diesel fuel, saving \$2.9 million. With a total installed cost of \$21.4 million, payback by fuel savings is 7 years.

Alaska Environmental Power's Delta wind project resolved some key equipment issues last summer and produced 82% of its energy goal. The project, which displaced 95,900 gallons of naphtha worth \$256,000 in 2011, appears to be on track to reach its energy goal in 2012.

Alaska Village Electric Cooperative installed a third Northwind 100 turbine with funding from the REF in Toksook Bay. Based on prorated generation figures the project generated at 77% of goal and saved \$43,000 in fuel.

The privately owned Banner Peak Wind project experienced equipment issues and produced at only 28% of its capacity in 2011. No state funds were used for the wind farm. The REF-funded intertie, however, performs as expected and will provide additional benefit when Nome Joint Utility System installs larger wind turbines if REF round 5 funding is received.

Unalakleet Valley Electric Company's project produced near its expected energy goal. However system cost payback remains high. UVEC and AEA staff is working to improve system performance and turbine downtime. The project saved \$211,000 in fuel during 2011.

Figure 1. 2011 Energy production and diesel cost savings vs goals from RE Fund projects with at least 12 months of operation.

Resource	Grantee	Project Name	Energy Performance					Economic Performance					
			2011 Energy Production		Diesel Displaced (gal x 1000)		Actual / Goal	Project Cost (\$ x 1000)		2011 Fuel Savings (\$ x1000)	Simple Payback (Years) on:		Project Life
			Electrical (MWh)	Thermal (mmBtu)	2011 Actual	Goal		Total Cost	REF Funding		Total Cost	REF Funding	
Biomass	Alaska Gateway School District	Tok Wood Heating	-	3.2	24.4	50.4	48%	3,260	3,245	92	35	35	20
	Native Village of Eyak	Cordova Wood Processor	-	1.5	11.4	88.7	13%	78	75	42	2	2	20
	Gulkana Village Council	Gulkana Central Wood Heating	-	0.8	5.9	14.6	40%	500	500	24	21	21	20
Geothermal	City and Borough of Juneau	Juneau Airport GS Heat Pump	-	5.1	37.1	29.5	126%	1,026	513	131	8	4	20
Heat Recovery	Golden Valley Electric Assoc	North Pole Heat Recovery	-	5.2	61.5	89.6	69%	1,022	817	172	6	5	20
	McGrath Light & Power Co	McGrath Heat Recovery	-	2.9	23.0	32.0	72%	1,179	712	157	8	5	20
Hydro	City and Borough of Wrangell	Wrangell Hydro Electric Boilers	-	6.9	66.0	69.6	95%	2,082	2,000	230	9	9	20
	Gustavus Electric Co	Falls Creek Hydroelectric	1,933	-	138.1	118.3	117%	8,400	750	483	17	2	50
Solar	Golden Valley Electric Assoc	McKinley Village Solar Thermal	-	0.1	1.8	5.7	31%	194	193	7	27	27	20
Wind	Kodiak Electric Association	Pillar Mountain Wind	12,448	-	870.7	852.0	102%	21,400	4,000	2,873	7	1	20
	Alaska Env Power	Delta Area Wind	1,425	-	95.9	117.0	82%	2,802	2,000	256	11	8	20
	Alaska Village Electric Coop	Toksook Wind Farm	187	-	12.6	16.3	77%	1,253	1,038	43	29	24	20
	Nome Joint Utility Systems	Banner Pk Wind Transmission	955	-	53.9	191.3	28%	6,390	801	152	42	5	20
	Unalakleet Valley Electric Co	Unalakleet Wind Farm	958	-	58.2	61.9	94%	6,000	4,000	211	28	19	20
TOTAL			17,907	25.8	1,460.4	1,736.8	84%	55,585	20,645	4,872	11	4	

Notes:

1. Includes projects in operation for at least 12 months
2. Assumes that operation and maintenance costs of new and existing projects are the same.
3. Assumes no impact on existing oil-fired system efficiency.