

Kotzebue Electric Association
Solar Thermal Alternative Residential Heating Methods
Quarterly Report

9/29/2011

Prepared by Jesse Logan (KEA)

Funding

Denali Commission	\$127,000
KEA ¹ In-Kind	\$5,000
CETF ² In-Kind	<u>\$12,000</u>
Total	\$144,000



Heliodyne Flat Plate Solar Collector.
Jesse Logan (KEA).

Project Summary:

This project will assess the feasibility of solar hot water heating systems on residential units in the NANA Region of Kotzebue. The Kotzebue Community Energy Task Force (CETF) had identified up to ten (10) Elders homes which are most in need of home heating assistance. System design and budget were considered for each home as well as southern exposure. After detailed review of designs and costs six (6) homes were identified to serve as test sites where solar-thermal systems, some using flat plate and some using evacuated tubes, have been installed (see figure below for manufacturer, installation contractors, collector type and system type). If the technology proves feasible above the Arctic Circle, these systems could be installed in homes throughout the region and serve as a model for alternative methods to heat homes without the use of fossil fuels.

¹ Kotzebue Electric Association

² Community Energy Task Force

Manufacturer	Installer	Collector Type	System Type
Viessmann	SES	1 evacuated tube	DHW
Viessmann	SES	2 flat plate	DHW
Heliodyne	ABS	1 evacuated tube	DHW and Space Heat
Heliodyne	ABS	2 flat plate	DHW and Space Heat

A. Administration, Management, and Reporting

KEA is responsible for the short- and long-term management, operations and maintenance of the solar thermal systems, in cooperation with CETF, NIHA³ and NANA⁴. The Alaska Technical Center will have the opportunity to offer hands on training of the operation and maintenance of the installed systems, however only peripheral discussions have taken place so far. No students were available during installation. Additionally, the Chukchi Campus, a University of Alaska satellite campus, has recently developed a renewable energy training program. While no classes were offered at the Chukchi Campus during the semester of installation, discussions have taken place with program directors regarding a possible role for Chukchi's long term involvement with data collection and analysis.

B. Progress Update

At present all six (6) systems are operational. Due to technical issues acquiring data from the different system's data loggers the Heliodyne systems will soon be connected to WiFi internet for remote access. The data from both Veissmann and Heliodyne control systems are recorded in 3-5 second steps. There are gaps in the annual 3-5 second step data for the Heliodyne systems. However, the annual totals are complete. There has been no loss of data on the Veissmann systems, though acquisition has proved to be hit or miss.

The three Heliodyne systems are equipped with short range WiFi on their control unit. ACEP and KEA are moving forward with the work necessary to allow remote access to the control units and the data sets. This will comprise of installing cable internet into the house (from OTZ in Kotzebue), a modem, and a small alteration to the control unit on the solar thermal system

³ Northwest Inupiaq Housing Authority

⁴ Northwest Alaska Regional Native Association

itself. Currently, parts are on order and it is expected that these units will be online in October, 2011.

Data sets are being acquired and sent to ACEP for analysis.

a. Analysis

The production values, overall, are below what KEA was expediting to see. However, KEA's main goal with this project is to reduce the use of fossil fuels for residential systems. KEA has obtained historical fuel usage for five (5) of the six (6)⁵ homes. KEA will evaluate fuel usage for 2011 beginning in December. The production values shown in data collection may or may not correspond to heating fuel saved.

Several factors may contribute to the seemingly underproduction and KEA has solicited the advice of both Heliodyne and Viessmann corporate offices as well as the contractors to narrow the possibilities.

There may be a discrepancy between the control unit's calculated BTU input and the actual fuel saved. KEA and ACEP will analyze fuel savings versus heating degree days beginning in December of 2011. KEA is currently still exploring other options to modify the systems to gain better performance. These options include, but are not limited to: changing the angle of the collectors, increasing/decreasing pump speeds, modifying the Viessmann systems to provide space heating as well as DHW, re-calibrating the thermistors, and adding flow meters to understand DHW usage.

ACEP and KEA have ordered flow meters for the Heliodyne system to better understand the DHW usage in the households. Still, the main criteria for judging the appropriateness of this technology will be reduced diesel fuel use.

⁵ Historical fuel data not available for one of the homes.

C. Conclusion

This demonstration project proved to be somewhat complex due to the coordination of several entities as well as several home owners with different equipment. As with any complex project unforeseen problems arose (see KEA's March 2011 and June 2011 quarterly report for details) and KEA has worked diligently to address each problem in a timely and cost efficient manner.

Production data is available and will be sent to the Commission via ACEP. There may be several causes contributing to the lower than expected production values. KEA has solicited advice from industry experts and will continue to monitor each system. As well, KEA feels that more observation is needed and that data over the course of a full year will be necessary to fully evaluate the economics of these systems.