

Department of Energy
Office of Energy Efficiency and Renewable Energy
TRIBAL ENERGY PROGRAM
FY2003 Program and Project Review Meeting
Golden, Colorado

POWERING REMOTE NORTHERN VILLAGES WITH THE MIDNIGHT SUN

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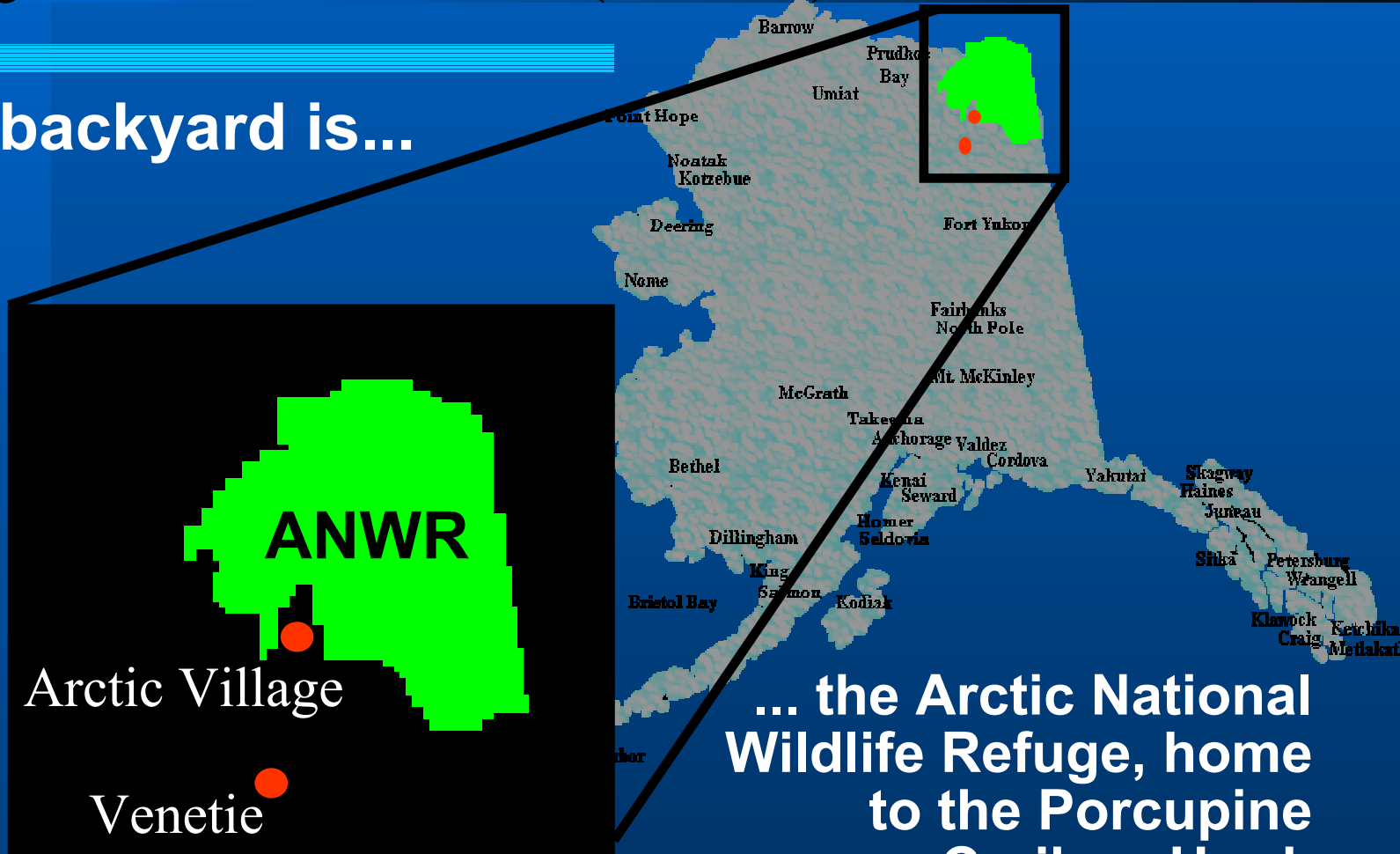
Project Location

- Alaska Native Gwich'in communities of Arctic Village and Venetie are in northeast Alaska.
- There are no roads to our communities.
- We are north of the Arctic Circle.



Project Location (cont.)

- Our backyard is...



Arctic Village

Venetie

... the Arctic National Wildlife Refuge, home to the Porcupine Caribou Herd.

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Project Overview

- **The Native Village of Venetie Tribal Government, is the governing body of the 1.8 million acre Venetie Indian Reserve, our tribal homeland, part of the Gwich'in Nation.**



- **Our culture, tradition, and subsistence depend upon the Porcupine Caribou Herd.**

Project Overview (cont.)

- **Our remote communities are dependent on diesel fuel for most of our energy needs.**
- **We want to reduce our dependency, and increase our self-sufficiency.**

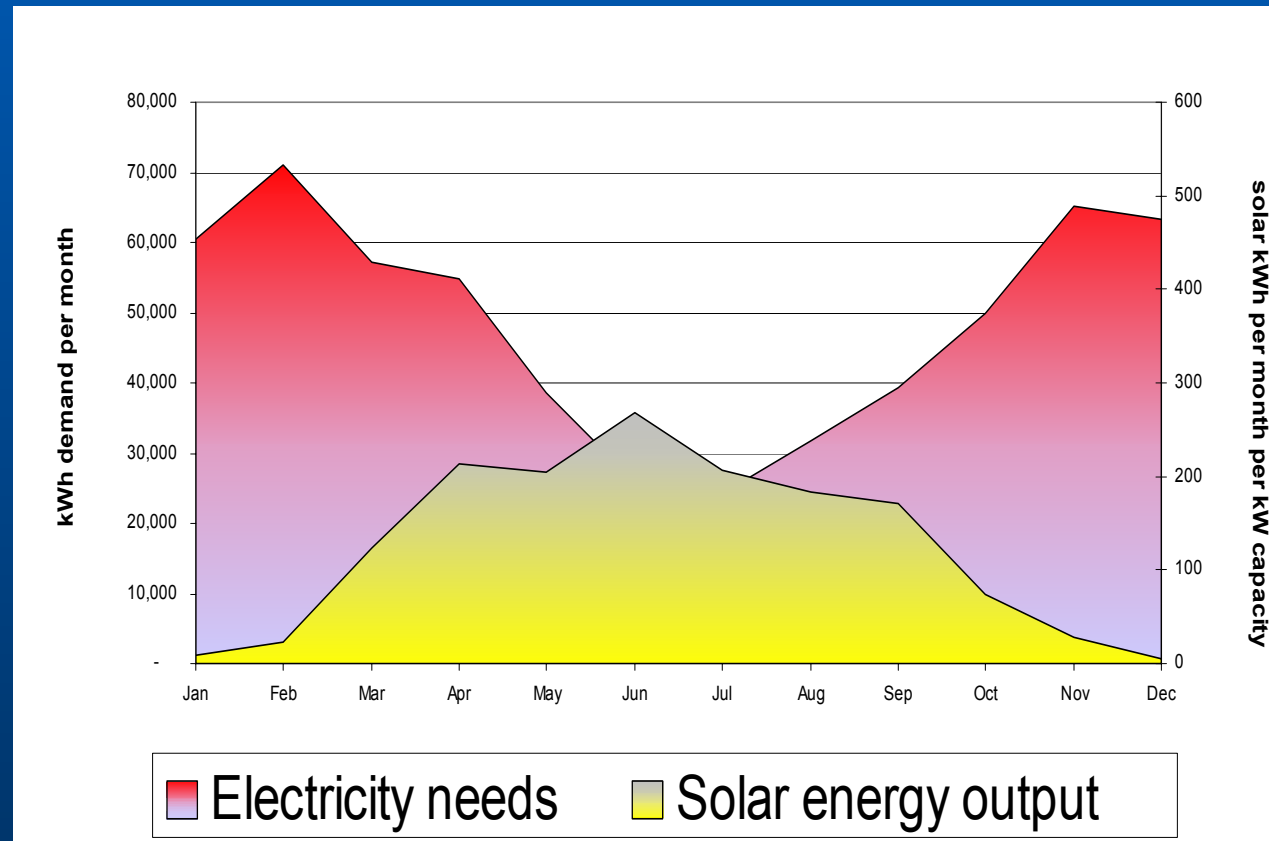


Project Overview (cont.)

- During the summer...

we use
much less
electricity

and we have
sunlight
24/7.



Project Overview (cont.)

- **We believe solar electricity, together with better energy efficiency, can:**
 - **teach our young people new skills**
 - **maintain our subsistence ways**
 - **save fuel and money in our villages**
 - **lessen environmental risks of fuel use**

Project Team

- **NVVTG**

Native Village of Venetie Tribal Government

- **Arctic Village Electric Utility**

- **Venetie Electric Utility**

- **EES**

Earth Energy Systems

- **IPEC**

Independence Power & Energy Consulting

- **NREL**

National Renewable Energy Laboratory

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Project Objectives

- **Develop new skills among our young people to help maintain our subsistence way of life.**



Project Objectives (cont.)

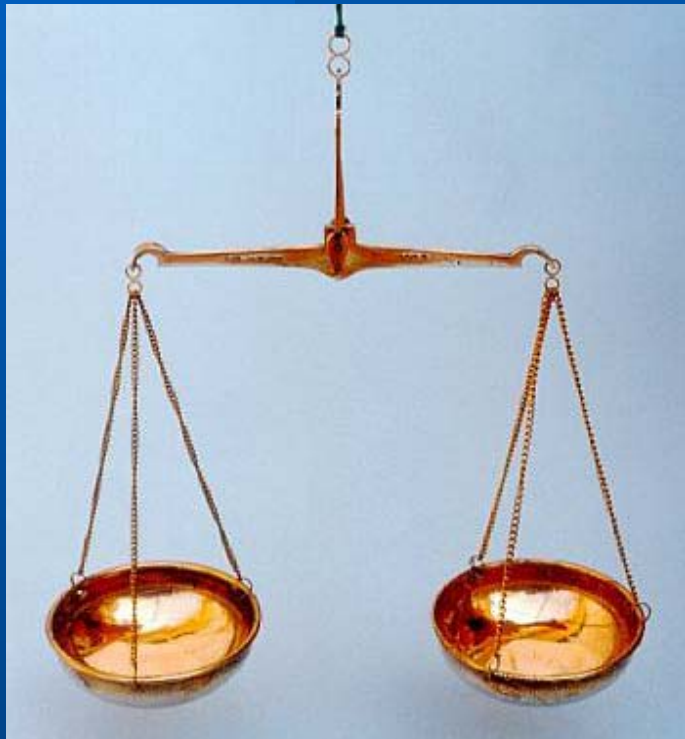
- **Assess our current energy use and growth to better know how and where we use our fuel.**
- **Evaluate our existing PV systems' fuel savings and integration with our village electricity grids.**

Project Objectives (cont.)

- **Identify & implement energy conservation measures to reduce our electricity and heating fuel use.**



Project Objectives (cont.)



- **Determine costs & benefits for solar electric & energy storage systems that can greatly displace our diesel power during summer.**

Project Objectives (cont.)

- **Identify best sustainable systems for our villages.**



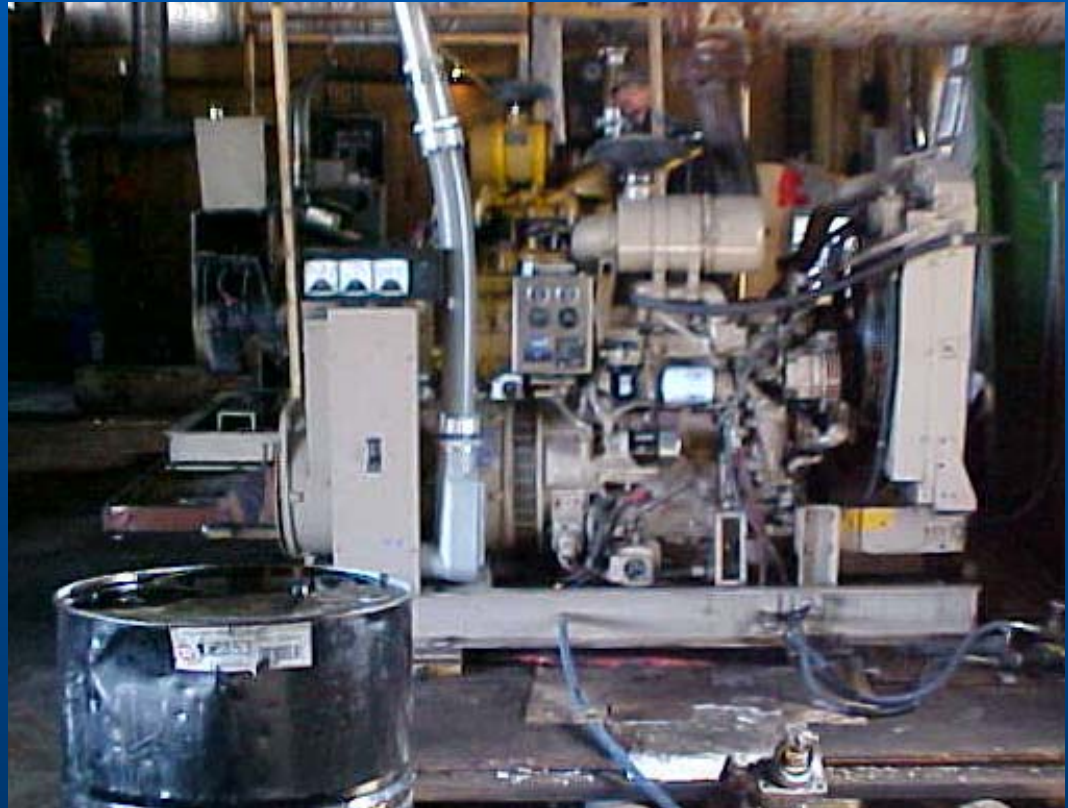
Project Objectives (cont.)

- Develop a business plan to implement the projects.
- Pass our knowledge on to our young people and to other villages.



Project Background

- Our village electric power systems are separate.
- Each village has its own diesel-fired generators.



Project Background (cont.)

- All our diesel fuel is delivered by air tankers.
- There are great risks and costs involved.



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Project Background (cont.)

- Our energy costs are very high:

\$0.51 per kWh electricity

\$4.25 per gallon gasoline

\$3.25 per gallon heating fuel

\$110 per 100 lb propane

Project Background (cont.)

- **In year 2000 we began an examination of our renewable energy resources.**
- **Airport weather histories indicated our wind resources were low quality.**
- **Better wind resources may exist, but not near to our village power systems.**

Project Background (cont.)

- Our Chandalar river is powerful, but hydropower potential cannot be developed easily due to extreme climate and remote locations.



Project Background (cont.)

- In 2001 we installed several small photovoltaic (PV) systems.



- Identical 1.2 kW arrays atop our village washeteria buildings are tied to our electric grids.

Project Background (cont.)

- **Initially we had limited ability to monitor our PV performance.**
- **We did find our small electric grids had unstable power, making integration of PV power output difficult.**
- **Nevertheless our energy programs have reduced our diesel fuel consumption.**

Project Background (cont.)

- In summer 2002, we installed our 3rd PV system.
- 2.2 kW on a 360° tracking-array in Venetie.



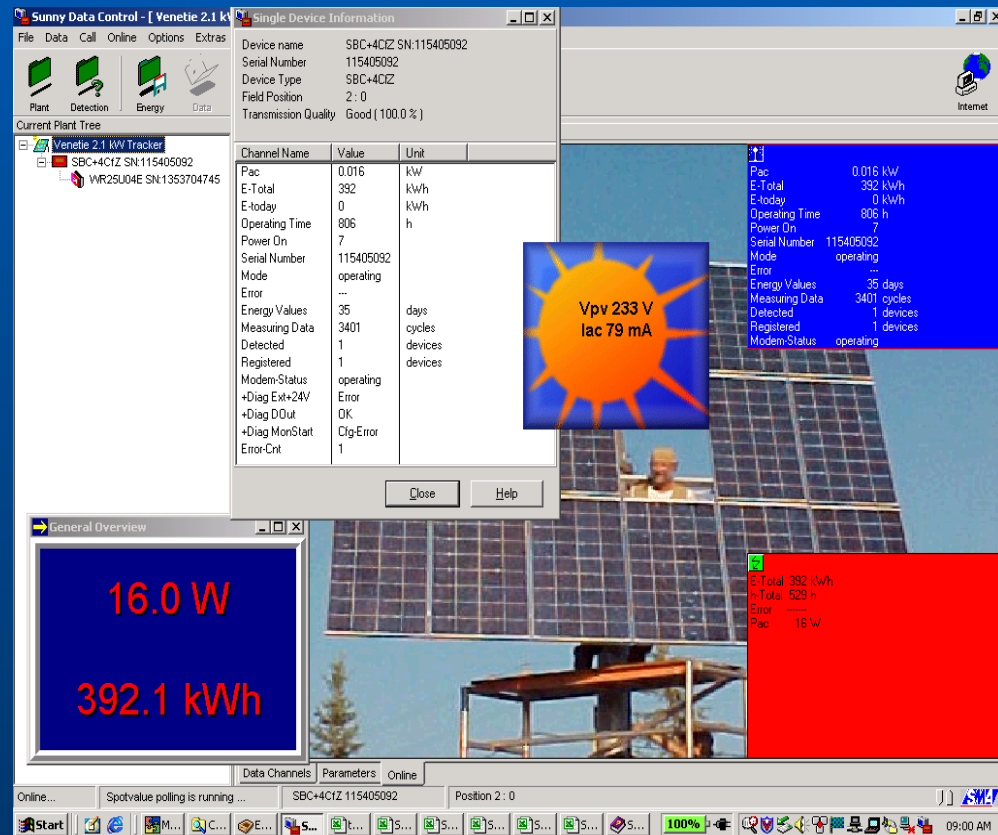
Project Background (cont.)

- Now we can get 24-hour summer solar power.



Project Background (cont.)

- We also installed a PV performance monitoring system.
- We learned how to avoid most of our earlier power system integration problems.



Project Background (cont.)

- **In fall 2002, we upgraded our fixed-array PV system components after a manufacturer's recall.**
- **We integrated the upgraded components with our performance monitoring system.**
- **Upgrades helped to solve earlier power system integration problems.**

Project Background (cont.)

- In summer 2003, we enabled internet viewing of our PV system performance in near-realtime.

<http://www.rusg.com/educational/nrthrsol/stations/stations.shtml>

- We hope to develop a local school curriculum around it.

Venetie Washeteria Solar Arrays

Venetie, AK

[RUSG Home](#) [Project Home](#) [Villages](#) [Contacts](#) [Educational Resources](#) [Links](#)

Station Name: Venetie Washeteria
 Location: Venetie, AK
 Coordinates: 67°0.7N 146°23.9 W
 Elevation: 600 ft above sea level



Notes:

- Elevation measured from mean sea level
- Datum Used: WGS 84

[Current Conditions](#) [Historical Data](#) [Photo Gallery](#) [Station History](#)

Conditions at the Washeteria as of
 September 20, 3: 10 pm

Provisional Data

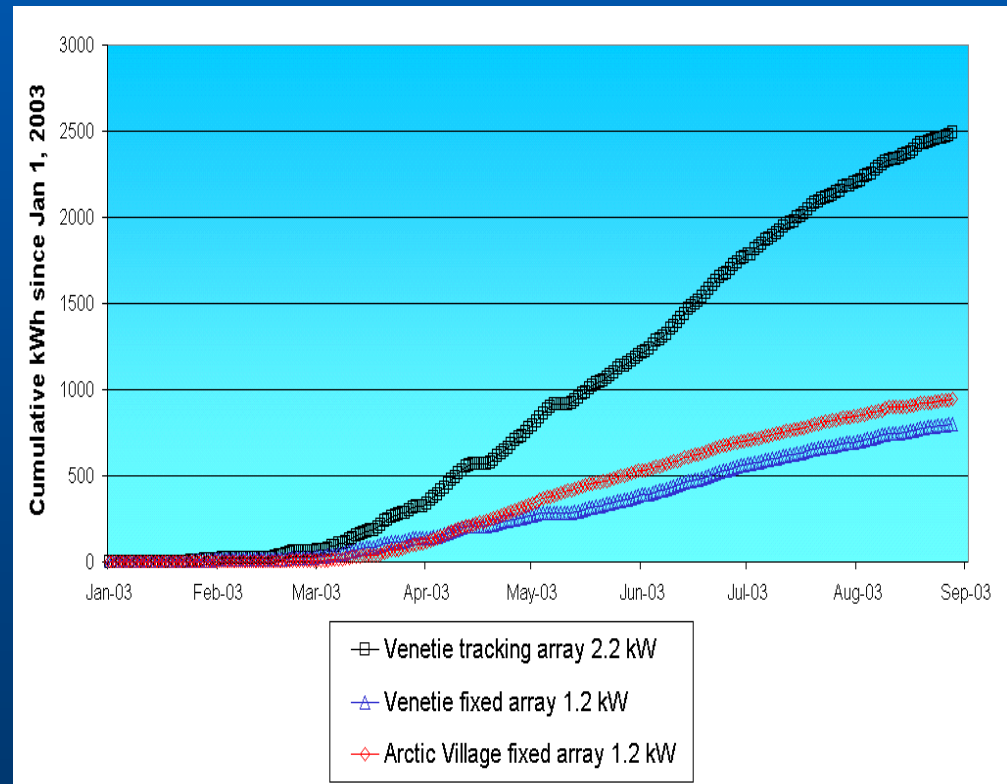
System Summary Data		
Solar Insolation	Output Power	Heat Sink Temperature
[14] W/m ²	[1] kW	[15] Deg F
2 DAY PLOT	PLOT	PLOT
7 DAY PLOT		

Rooftop Solar Array Data

Array Output Voltage	Array Output Current	Array Output Power	Inverter Output Voltage	Inverter Output Current	Inverter Output Power
255 Vdc	4000 mA	1005 W	228 Vac	4350 mA	992 W
PLOT	PLOT	PLOT	PLOT	PLOT	PLOT

Project Background (cont.)

- Our fixed-array PV systems have been working well since our upgrades, but our tracker really delivers.
- In summer 2004, we will install an identical 2.2 kW tracking-array in Arctic Village.



Requested Technical Support

- **Input into developing models of**
 - **our power consumption, especially during summer**
 - **hybrid power generation with PV, energy storage, & diesel to meet our needs all year long**
- **Input into designs and costs of hybrid power systems**

Requested Technical Support (cont.)

- **Help finding ways to reduce our summertime power consumption for refrigeration**
- **Ideas for non-hazmat energy storage technologies we might use**

Questions?



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No more of this!



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