Northern Power Systems, Inc.
Waitsfield, Vermont USA

Hybrid Power for Village Applications

Examples of Medium-Sized Systems:

Joanes, Brazil
Lime Village, Alaska
St. Paul Island, Alaska

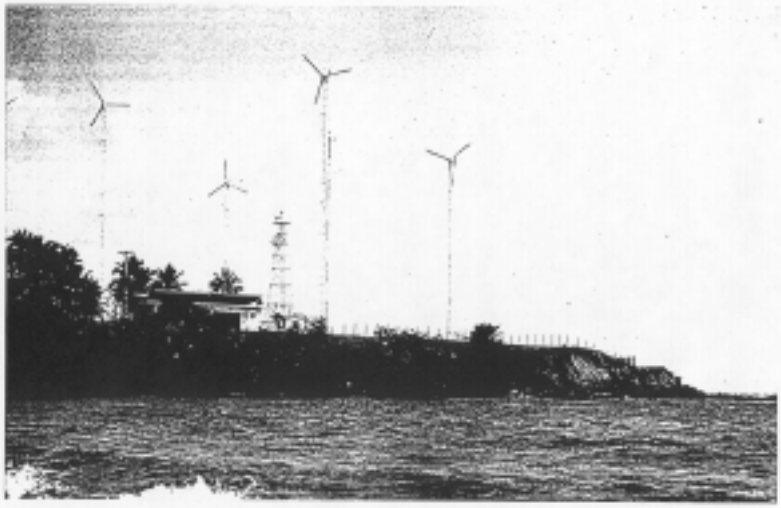
Presented At Village Power '98
World Bank, Washington, DC

Northern Power Systems

- Manufacturer of renewable & hybrid power systems since 1975
- Telecom & village installations in over 30 countries & on all 7 continents
- Integrated power systems engineered for specific applications or sites
- Northern Power components include:
  - ◊ Hybrid System Controllers
  - ◊ Monitoring Systems
  - ◊ Wind Turbines
  - ◊ Controlled Environment Shelters
  - ◊ Photovoltaic Array Frames & Trackers
  - ◊ Rotary DC/AC Power Converters

Hybrid Village Power System
Joanes, Brazil

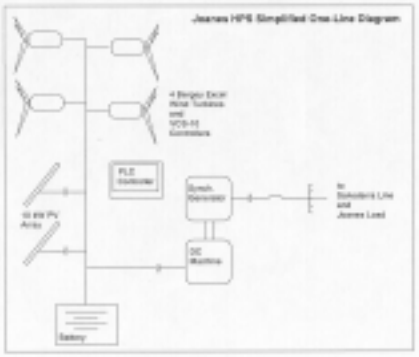
Type of System	50 kW; grid interconnect; wind/PV, battery storage
Application	Support of a weak diesel grid to deliver energy and stabilize power quality during hours of peak demand
Location	Island of Marajo in the Amazon/Toncantins delta
Population	2000
Peak Loads	>75 kW
Funding	NREL; CEPEL (Brazilian renewable energy organization); CELPA (Utility of the state of Para)
Project Status	Commissioned in 1997; being operated by CELPA; satellite link provides access to data

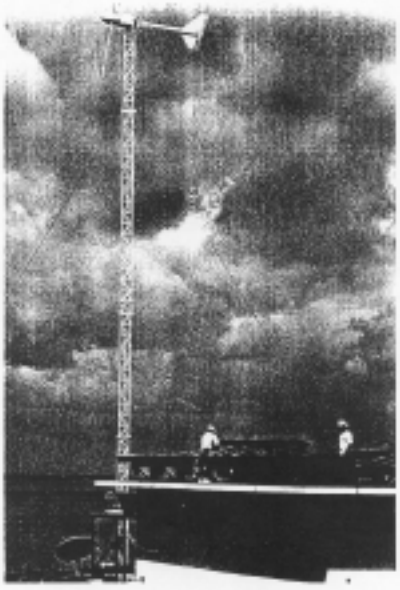


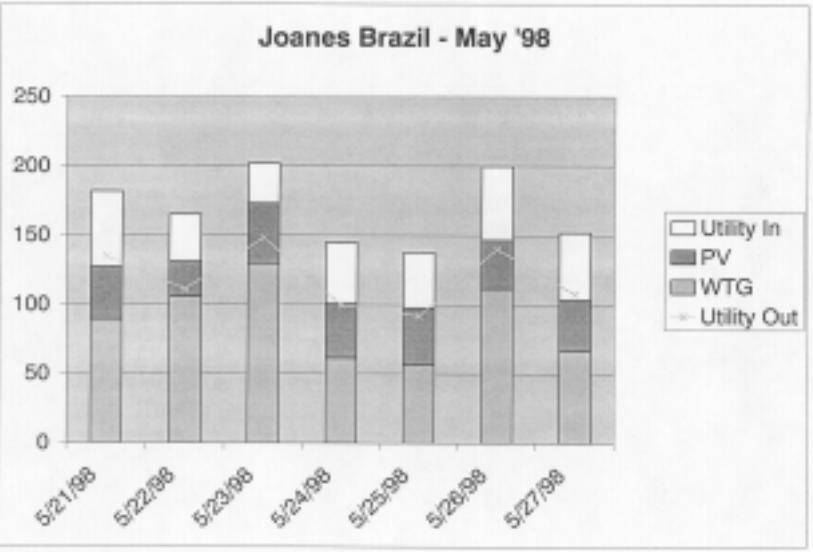
Configuration

NPS Controller/Monitor
Utility Interconnect Switchgear
228 kWh Battery Bank

4 Bergey Excel-R Wind Turbines
10 kW Photovoltaic Array
NPS 50 kW DC/AC Rotary Converter
w/o Engine

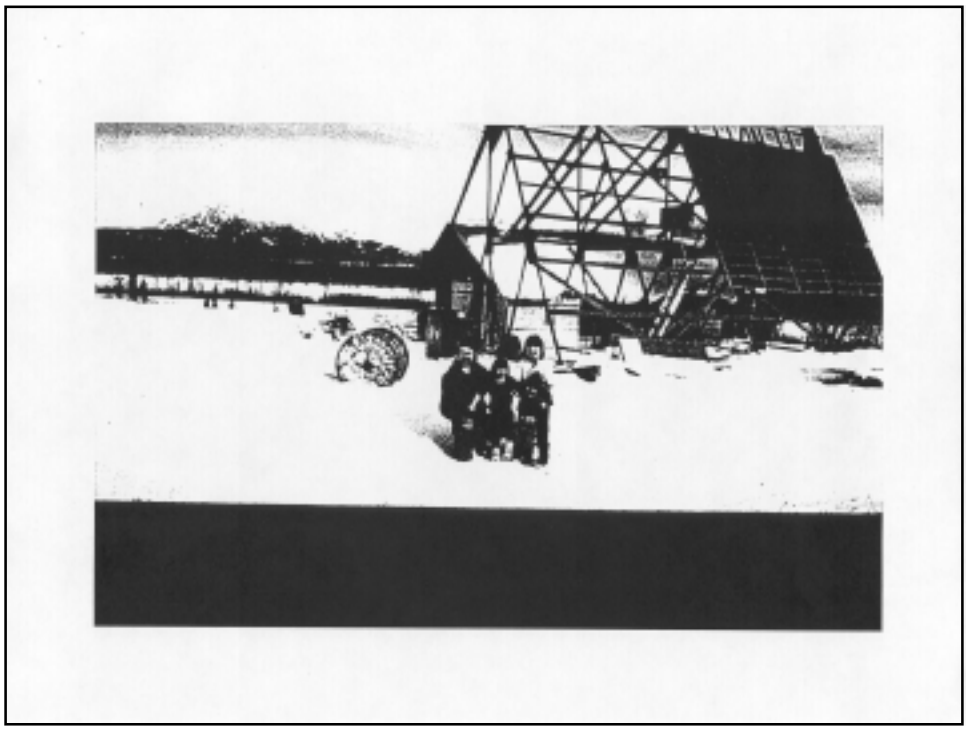






Hybrid Village Power System
Lime Village, Alaska

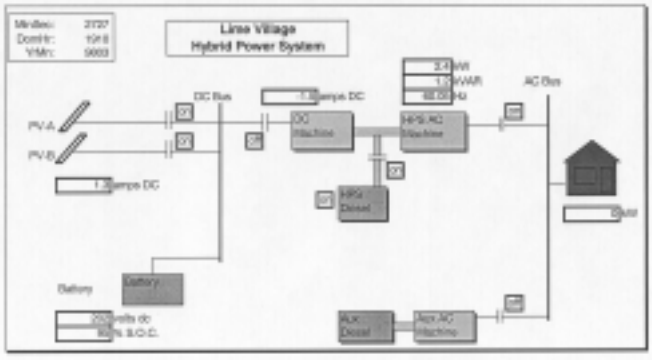
Type of System	50 kW; Stand-alone grid; PV/diesel, battery storage
Application	Village electrification; power previously available only from small individual generators
Location	Roadless interior, approx. 250 air miles from Anchorage
Population	45
Peak Loads	Undetermined
Funding	Alaska Science & Technology Foundation; Lime Village; Univ. of Alaska; State of Alaska
Project Status	Installed in 1998; waiting for generation permit; will be maintained by McGrath Light & Power; phone link provides remote access to operating data

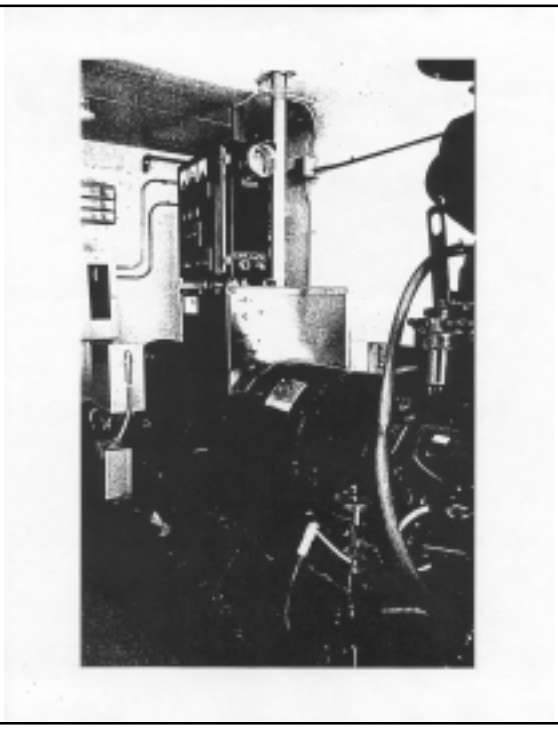


Configuration

NPS Controller/Monitor
NPS 50 kW DC/AC Rotary Power Converter w/ Engine
4 kW Photovoltaic Array
100 kWh Battery Bank
Auxiliary 35kW Diesel AC Genset

Lime Village Remote Monitoring Screen:





Hybrid Village Power System
St. Paul, Alaska

Type of System	300 kW; stand-alone; wind/diesel; heat storage
Application	High penetration wind/diesel system to provide electricity and space heat for village industrial facility
Location	Pribilof Islands in the Bering Sea
Peak Loads	160 kW
Funding	Tanadgusix Corporation (TDX)
Project Status	Equipment shipped from NPS for installation in late 1998; to be maintained by TDX; phone link provides remote access to operating data
Cost of Energy	± $.20/kWh; current diesel grid cost is $.32/ kWh

Configuration

NPS System Controller/Monitor
Vestas V-27 225 kW Wind Turbine
2 x Volvo 150 kW Diesel Gensets
HydroQuebec Dump Load Regulator

NPS Integrated Shelter/Container
NPS Heating & Thermal Storage
NPS Synchronous Condenser
Encorp Engine Controls