

# Hybrid Power Systems

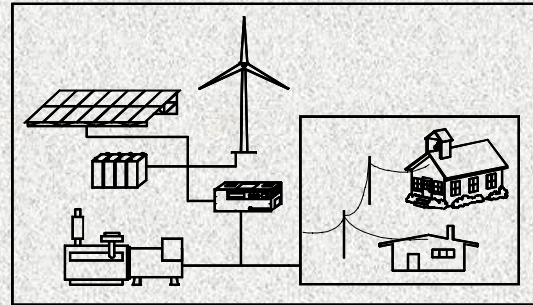
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## Rural Power Development

- Conventional rural electrification relies on grid extension or diesel power plants.
- Hybrid systems are often a less expensive alternative for remote communities.
- Economics depend on the renewable resources, the load profile, and the cost of the conventional alternatives.
- Hybrids range from less than 1 kW to greater than 1 MW.



*Xcalak hybrid power system - diesel retrofit completed in 1995*



*Schematic of potential components in a hybrid power system*

## Retrofit of Existing Diesel Power Plants

- Use of renewable technologies and advanced system control to enhance the economic efficiency of existing diesel gensets
- Applicable to diesel gensets of all sizes
- Five basic system topographies from the installation of more efficient diesel engines to advanced hybrid-system designs.
- Cost of capital equipment is offset by the savings in diesel fuel, systems operation, and maintenance expenses
- Decrease in polluting emissions and reliance on plant personnel because of the use of clean technologies and controls.

## Alaska/Kotzebue Project

- Owned by Kotzebue Electric Association
- Wind-diesel system for predominantly Inupiat Eskimo village of 3000 people
- Three 50-kW AOC wind turbines installed; seven additional 50-kW AOC turbines to be installed
- Several large diesels including 3-MW diesel
- Initial funding by the State of Alaska, additional funding by U. S. DOE
- System reduces life-cycle cost of energy by displacing diesel fuel consumption.



*Atlantic Orient Corporation 50-kW wind turbine provides power to the Alaska Kotzebue Project.*



*Costa de Cocos 11-kW wind-diesel hybrid system*

## Costa de Cocos, Mexico, Wind-Diesel System

- Wind-diesel hybrid system with 7-kW Bergey wind turbine, two 5.5-kW Trace inverters, 50 kwh of Trojan L-16 batteries, and associated hardware
- System supplies 24-hour power for small scuba diving and fishing resort; loads include refrigeration, water desalination (reverse osmosis), kitchen appliances, workshop tools, fans, and lights
- System reduces life-cycle cost of energy primarily through displacement of diesel fuel, but also lowers air and noise pollution associated with diesel
- Turbine retrofitted with complete corrosion-proof package to reduce effects of salt water corrosion.