Wind Diesel in Alaska

August 2006

Alaska Power Association
2006 Annual Meeting
Girdwood, Alaska
TDX is a specialist power generation firm

- Alaskan Native Corporation, 8a & Hub Zone Certified.
- Own, operate & maintain plants of all sizes and technologies
- Supplier of Powerhouse components and complete power generation systems
St. Paul Island has a population of 700 residents, most of whom are native Aleuts. In summer, the community shares the island with thousands of seals.
Technology Neutral

**TDX Power is technology neutral. The company has extensive experience with both fossil fuel and renewable based generation in diverse locations all over the world**

**Fossil Fuel Generation** - TDX Power develops, owns and operates power plants of all sizes utilizing both liquid and gaseous fuels, and has experience with every major vendor of this type of generation technology.

**Renewable Energy** - TDX Power owns and operates the country's largest high penetration wind-diesel hybrid plant on St. Paul Island. The company also has extensive experience with geothermal, solar, biomass, landfill gas, tidal and hydro power technologies.

**Hybrid Technologies** - TDX Power is an industry leader in integrating renewable technologies with base load fossil fuel generation for stand alone, critical system/high-reliability requirements.
TDX Power works with the following types of customers and clients:

**Electric Utilities**
TDX owns and operates regulated utilities in Alaska, and works with the federal government on privatization of military utilities.

**Military Branches**
TDX Power provides custom engineered power generation systems to all branches of the military, including switchgear, system integration controls, and generator sets. TDX also provides field site services for a wide range of power generation facilities.

**Consulting clients**
TDX supplies a wide range of specialized, fee-based power industry consulting. These services include but are not limited to feasibility analysis, economic analysis, technology assessment, project development, design and construction, operations, mergers and acquisitions, project finance or refinance and troubled project work-out.

**Project Developers**
TDX works with companies developing industrial and commercial projects in need of reliable on site power generation.
**TDX Power in Alaska: Deadhorse**

- Acquired merchant utility servicing oilfield support industry at Prudhoe Bay in January 2003
- 10 MW diesel and natural gas electric generating capacity
- Designed & installed 14-mile underground distribution system for harsh arctic, permafrost environment
- Design and engineer diesel conversion to natural gas generation
- TDX Power serves large, industrial customers such as Halliburton, VECO, Nabors and Schlumberger
TDX Power in Alaska: Sand Point

- Community electric utility serving 520 customers
- Diesel-based generation with high penetration wind power integration under design
- 17-mile distribution system (including 12 miles aboveground and 5 miles underground)
- Infrastructure expanding to include new harbor development
Centuries of experience living in the wind have allowed us to merge our culture with this new technology for the benefit of future generations.”

Saint Paul Island

Looking back to find the future

TDX power
In 1999, TDX designed, constructed and commissioned the world's largest high penetration wind diesel plant.

Funded entirely by TDX, this project provides low cost electricity and heat to a 100,000 square foot industrial complex on St. Paul Island.

Lower energy costs have supported economic development for the community at this complex.
**TDX Power in Alaska: Saint Paul Island**

- **System:** 500 kW standalone utility: combined heat and power
- **Configuration:** High penetration/no storage wind-diesel
- **Application:** Public power supply, providing electricity and space heat to industrial/airport facility
- **Avg. Power Generation:** 700,000 kWh per year – 36% capacity factor
- **Funding:** Private commercial, lease based
- **Cost of Energy:** $0.12/kWh (current diesel grid cost is $0.49/kWh)
Saint Paul Island: Performance Summary

- Wind turbine gearbox failures caused by design flaw
  - downtime during peak winter wind resource
  - failure resolved by manufacturer redesign resulting in dramatic increase in wind kWh production

- Overall system performance and benefits strong over five years. 100% availability on 2004 and 2005. Capacity factor over 60% in January 2006.
Saint Paul Island Plant Expansion

• In 2004, TDX committed to expanding the plant to provide additional low cost energy on island.

• Four used V27's purchased from Denmark - remanufactured in California.

• Remanufacturing process includes complete disassembly, inspection and remanufacturing of turbine parts. Also includes generator rewinding, blade resurfacing, and new wiring and cables.
Average Power Costs in the Aleutians: (2005 PCE Stats.)

- Cold Bay 49.93 cents/kwh
- False Pass 48 cents/kwh
- King Cove 38 cents/kwh
- Nelson Lagoon 42 cents/kwh
- St. Paul 46 cents/kwh
- **Sand Point 39 cents/kwh**
- Unalaska 30 cents/kwh
Vestas V39 Turbine:

- 500 Kw wind turbine
- 40 meter tower
- 39 meter rotor (swept area)
- Manufactured in 1991
- Remanufactured by Halus Power Systems 2006
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Proposed System Overview:

- Two (2) Vetas V-39 turbines
- One (1) Low Load, High Efficiency Diesel engine generator set - Caterpillar D-3456
- One (1) Synchronous Condenser
- Thermal or Electric Heat recovery System
- Projected Cost: $2.46 million
Proposed Structure:

- Public-Private partnership with AEA
- Project will be a Qualifying Facility (QF) under PURPA certified by FERC
- Anticipated rate will be less than 50% of existing utility avoided fuel cost
Project Benefits:

- Utility diesel fuel consumption reduced by **126,429** gallons. Current cost of fuel $3.06/gallon. Total fuel savings **$386,872**
- Further diesel heating fuel savings at clinic, school and community building
- Promotes economic development
- All risk of the project resides outside of the utility
- Statewide PCE program and other communities will benefit from decreased fuel use in Sand Point
USAF Tin City Long Range Radar Site (LRRS)

Remote Wind Diesel Project In NW Alaska
Tin City

- $2 million project – funding delayed and now rescheduled for summer of 2008.
- Major issue to address will be rime ice on Vestas V27 turbine
Nikolski

- RUS funded project to add wind power to the new diesel plant.
- TDX Power hired by APIA to install a Vestas V17 wind turbine.
Windpower in Sand Point

Questions?
Contact Information

TDX Power, Incorporated (TDX)

Anchorage Office:
4300 “B” Street, Suite # 402
Anchorage, AK 99508
Phone: (907) 278-2312
Fax: (907) 278-2332
Email: Info@tdxpower.com

Philadelphia Office
715 Folly Hill Road
Kennett Square, PA 19348
Phone: (610) 918-8581
Fax: (610) 918-8583

St. Paul Office
100 Airport Way
St. Paul, AK 99660
Phone: (907) 546-5007
Fax: (907) 278-2332

Ron Philemonoff, Chairman: RonP@tdxnet.com
Nick Goodman, CEO: NGoodman@tdxpower.com
Bruce Levy, President: Bruce@tdxpower.com
John Lyons, Operations Manager: JLyons@tdxpower.com