



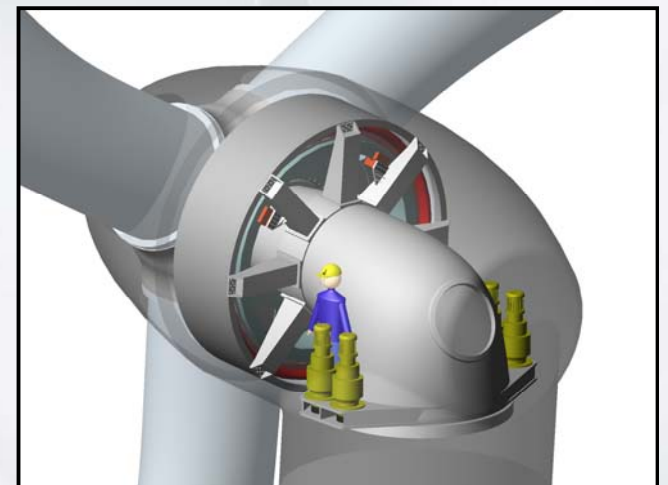
The NorthWind® 100: Wind Diesel Case Studies

Brett Pingree: VP, Community Wind

Direct.

Wind Energy Focus

- Community Wind/Wind Diesel Turbine: **NorthWind® 100**
- 1.5 & 2.2 MW direct drive PM generator
- Advanced MW-scale power converters
- Wind/diesel integration & controls



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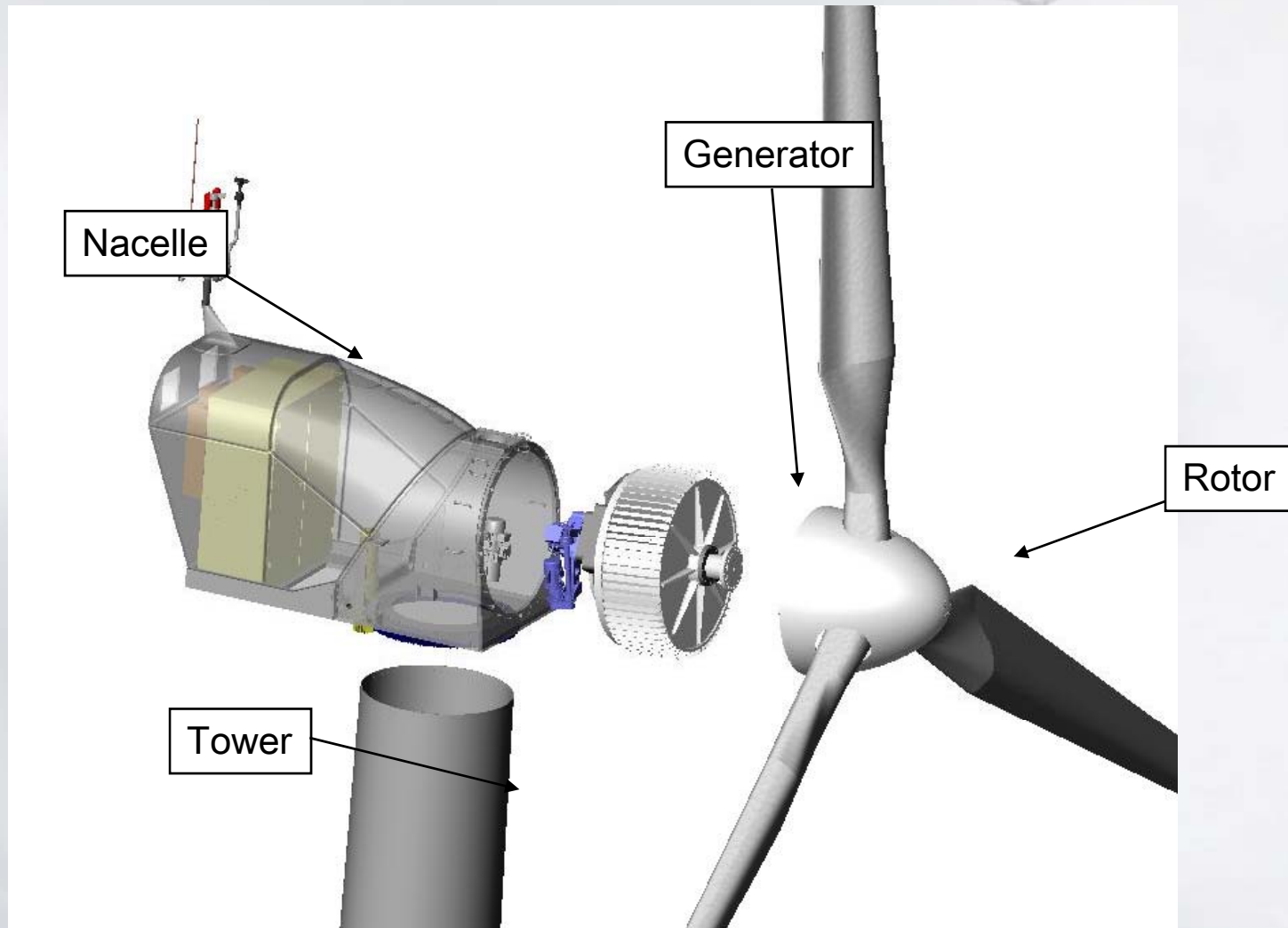
Northwind 100 Turbine Technology

- Direct Drive (Gearless) Architecture
- Permanent Magnet Generator
- Low Maintenance/High Reliability System Design
- Optimized for Remote Rugged Conditions and Low Wind
- Integrated Power Electronics
- Advanced DSP Microprocessor Based Controls
 - *Full Embedded Controller*
- Custom Blade Design
- Tubular “Soft” Tower
- SmartView® Monitoring



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Major Subsystems



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Critical Mass: Northwind100 in AK

Fundamental Change in Market and Operations

- Operational and Market Efficiencies
 - Twenty Sold 2001-2007
 - Twenty Sold 2008-2009
 - *Forty to Sixty 2010-2012*

19 Scheduled Installations: Summer 2009



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Specific Conditions That Support Shift in Market: *New and Existing*

- **Increased Incentives for Market**
- **Growth In Customer Base: AVEC**
- **Highly Capable Partner: STG, Inc**
- **Increase in Additional Opportunities**
- **Energy Crisis in Rural AK**
- **Growing Support Infrastructure**
- **Demand for Employment**
- **Great Natural Resources**



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Examples of Growing Trend

- Funding For Projects in Rise (federal, state and private)
- Highly Concentrated Installations Increasing
- Regional Partner Opportunities Growing
- More Native Training Programs
- Regional Support Hubs
 - Kotzebue*
 - Nome*
 - Bethel*
 - Unalakleet*



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Wind Diesel Case Studies

Alaska and Newfoundland



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Ramea Island, Newfoundland Labrador

- Customer: NLH Utility
- 3 x Northwind 100's
- 5 x 65kW Windmatics Refurb's
- 3 x Diesel Engines
- Med Penetration
- Avg. Annual Wind Speed: 7.3 m/s
- Hydrogen generator integration

Install June 2009



Direct.

Savoonga, AK

- Customer: AVEC
- 2 x Northwind 100's
- 3x Diesel Engines
- Low Penetration (limited controls)
- Avg. Annual Wind Speed:8.5 m/s
- Diesel Consumption Offset:~10%

Extreme Polar Environment



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Gambell, AK

- Customer: AVEC
- 3 x Northwind 100's
- 3 x Diesel Engines
- Supervisory Controls
- Low Penetration
- Avg. Annual Wind Speed: 8.9 m/s
- Expected Diesel Consumption Offset:10%



Install Summer 2009



Direct.

Toksook Bay, AK

- Customer: AVEC (AK Village Elec.)
- 4 x Northwind 100's
- 3x Diesel Engines
- Secondary Load Controller w/Dump Load Boiler (*Sustainable Automation*)
- Intertie w/ Tununak and Nightmute
- Avg. Annual Wind Speed: 7.4 m/s
- Diesel Consumption Offset:~25%



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Kasigluk, AK

- Customer: AVEC
- 3 x Northwind 100's
- 3x Diesel Engines
- Secondary Load Controller w/Dump Load Boiler (*Sustainable Automation*)
- Intertie w/ Nunapitchuk and Old Kasigluk
- Avg. Annual Wind Speed: 6.9 m/s
- Diesel Consumption Offset: ~25%



Direct.

Hooper Bay, AK

- Customer: AVEC
- 3 x Northwind 100's
- 3x Diesel Engines
- Secondary Load Controller
w/Dump Load Boiler
- Med Penetration
- Avg. Annual Wind Speed: ~6.8 m/s
- Diesel Consumption Offset: ~24%

Foundation Challenges



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Kotzebue, AK

- Customer: Kotzebue Elec. Assoc.
- 1 x Northwind 100
- 17 AOC's/Entegriy's
- 1 Vesta V17 Refurb
- 3 x Diesel Engines (5 MW Load)
- Low Penetration (SCADA)
- Avg. Annual Wind Speed: 6.7 m/s



Direct.

St. Paul Island, AK

Wind Only, High Penetration, Wind Diesel

- Customer: TDX Power, Utility
- Northern: (EPC) Engineer, Procure, Construct
- 1x V27 (Vestas 225kW)
- Integration Equipment:
 - Dump Load Boiler
 - Synchronous Condenser



Direct.

Chevak, AK

- Customer: AVEC
- 4 x Northwind 100's
- 4 x Diesel Engines
- Secondary Load Controller w/Dump Load Boiler
- Med Penetration
- Avg. Annual Wind Speed: 6.7 m/s
- Diesel Consumption Offset: 22%

Install Summer 2009



Direct.

Mekoryuk, AK

- Customer: AVEC
- 2 x Northwind 100's
- 3 x Diesel Engines
- Secondary Load Controller w/Dump Load Boiler
- Med Penetration
- Avg. Annual Wind Speed: 6.7 m/s
- Expected Diesel Consumption Offset: 22%

Install Summer 2009



Direct.

Quinhagak, AK

- Customer: AVEC
- 3 x Northwind 100's
- 3 x Diesel Engines
- Secondary Load Controller w/Dump Load Boiler
- Med Penetration
- Avg. Annual Wind Speed: 7.1 m/s
- Expected Diesel Consumption Offset: 21%

Install Summer 2009



Direct.

Kasigluk, AK



Direct.

Kasigluk & Toksook AK



Direct.

Toksook, AK



Direct.

Questions?

