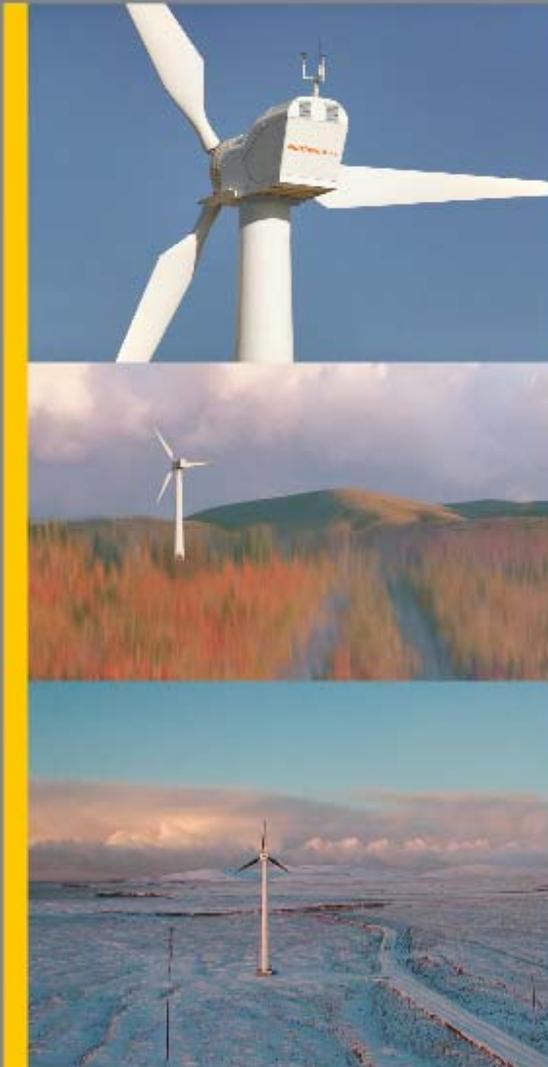




Northwind[®]100



The Northwind100: Proven Reliability

Brett Pingree, Vice President, Northwind100 Sales

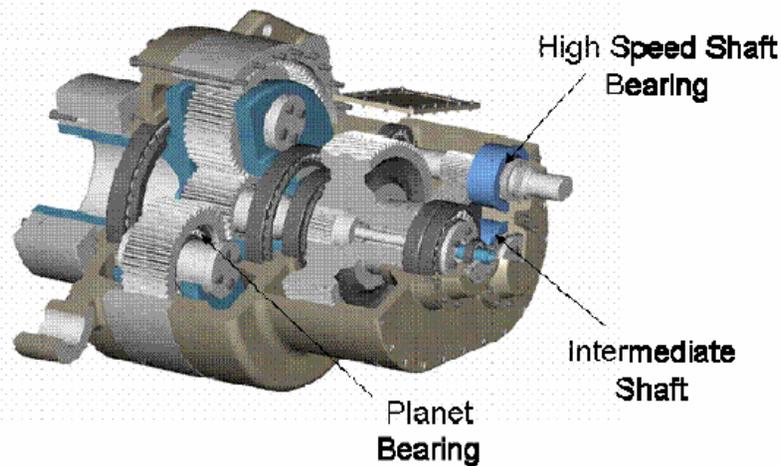


Northwind[®]100

- Why Direct Drive?
- Northern Power: Wind History and Experience
- The NorthWind[®]100 Turbine

Northwind[®]100

Over 80% of the profit warnings in the wind turbine manufacturing industry have come from gearbox issues, primarily malfunctioning bearings but also unforeseen issues with various gearbox designs.

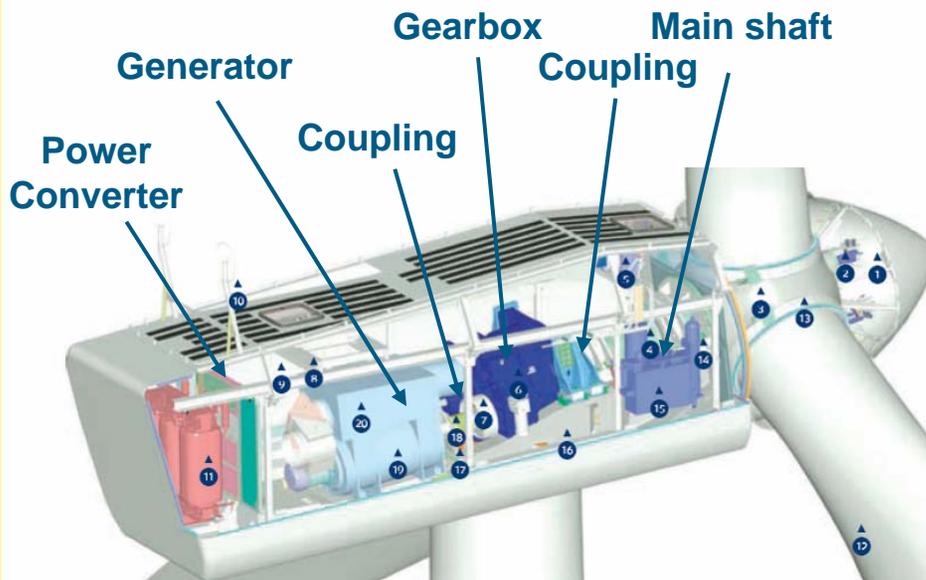


Merrill Lynch Wind Industry Overview,
Here Comes Pricing Power, August 2007

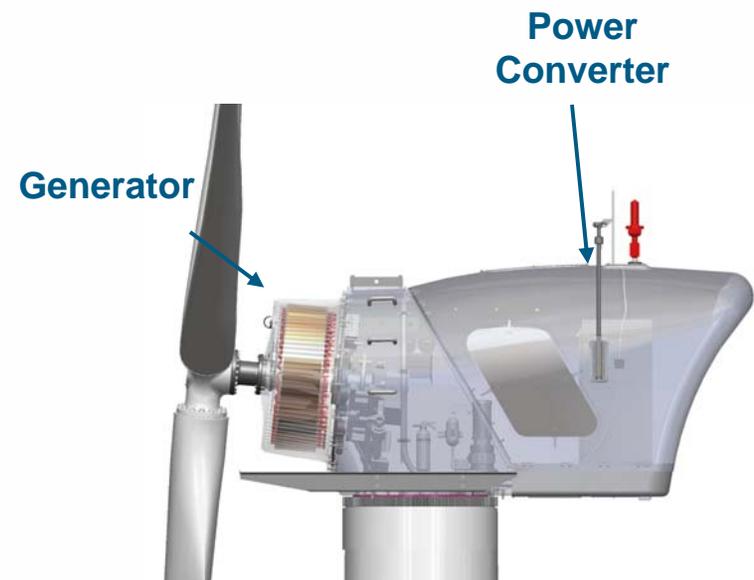
Northwind[®] 100

Direct Drive – Ingenious Simplicity

- Higher Energy Capture + Lower O&M Costs = Reduced COE
- Dramatically fewer moving parts for high reliability
- Better grid support and power quality

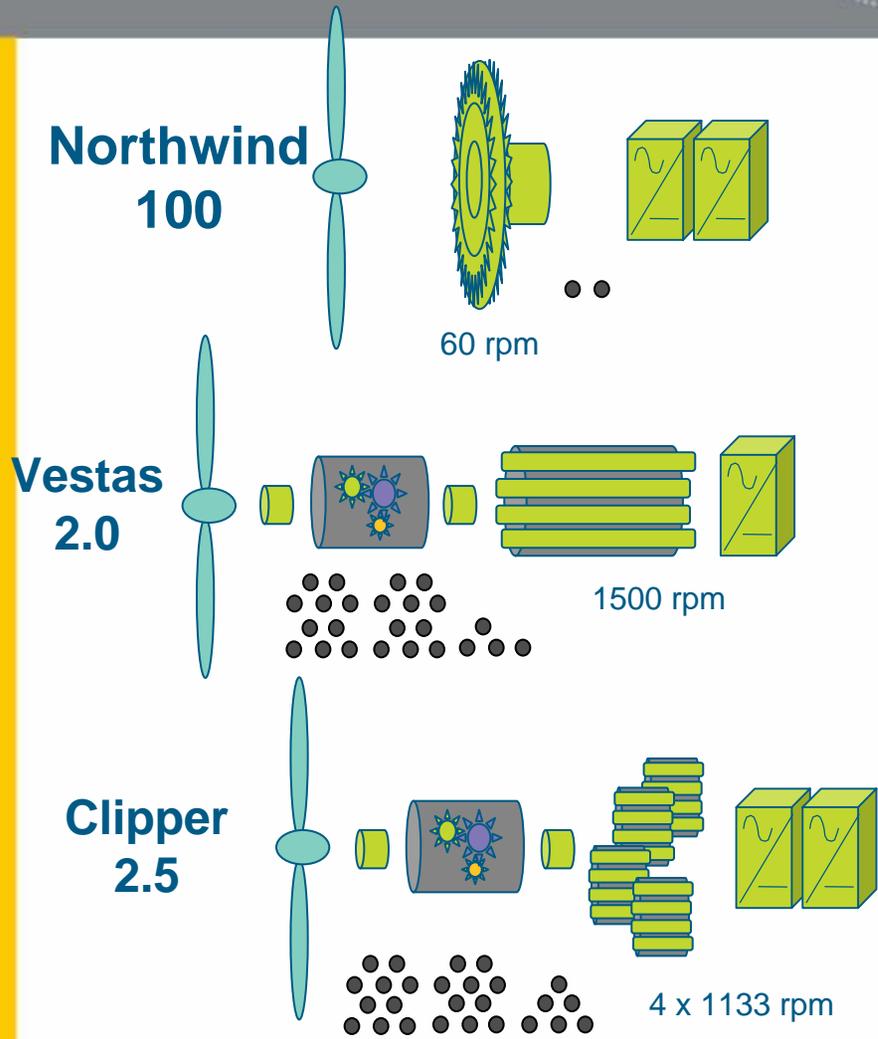


Geared Drivetrain



Direct Drive

Northwind[®] 100

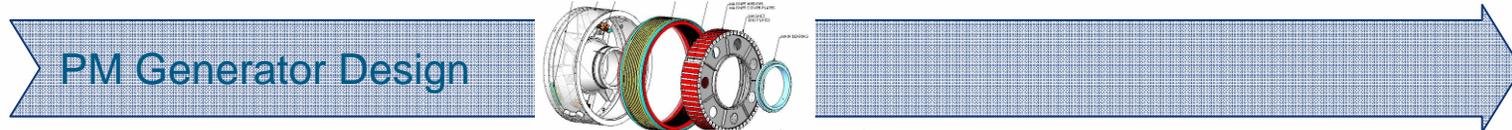
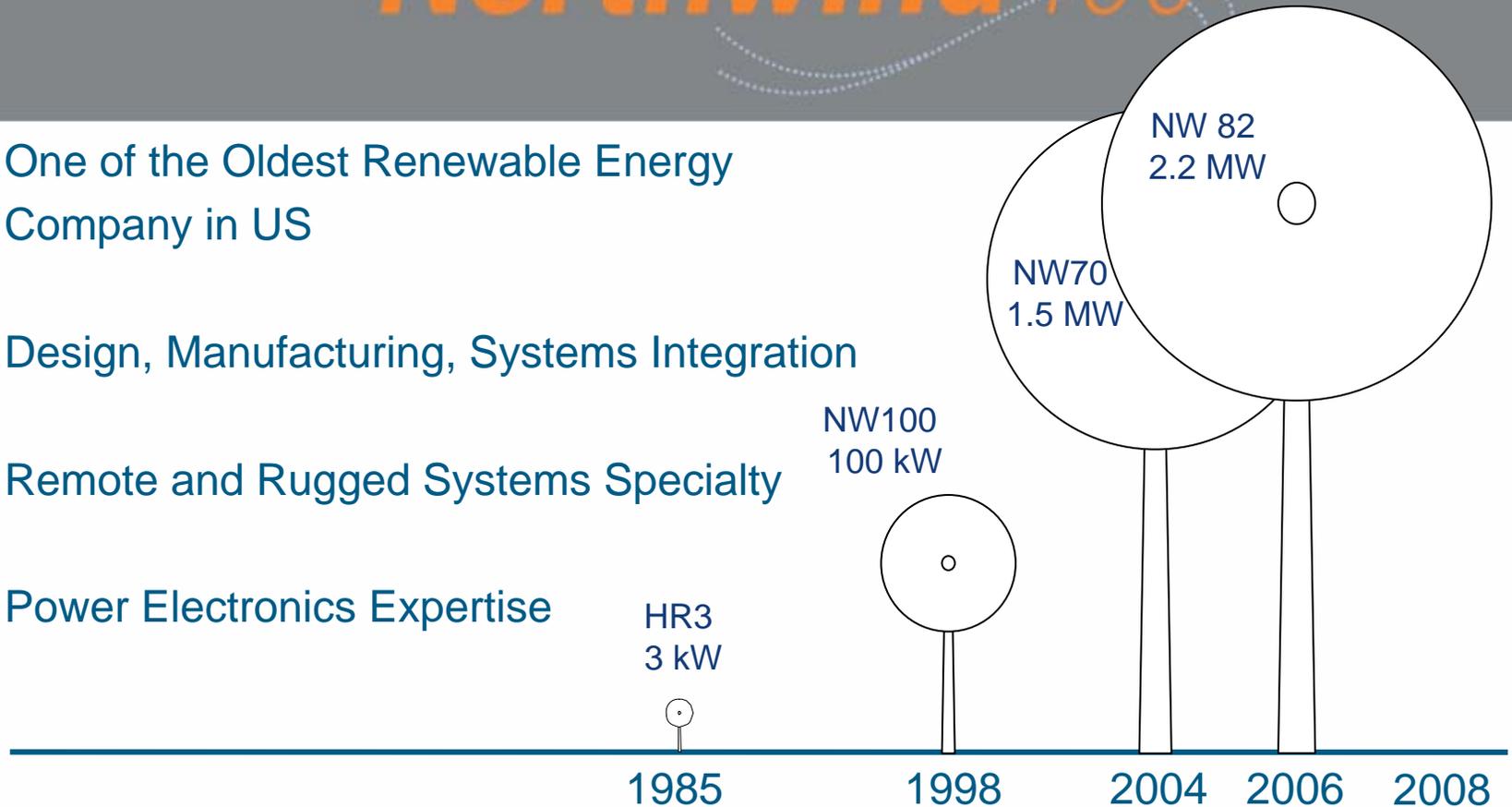


Less is More

	Rotating Mechanical Elements in Drivetrain	Bearings in Drivetrain	Hydraulic Subsystems
Northwind 100	1	2	0
Vestas 2.0	12	24	2
Clipper 2.5	13	26	1

Northwind[®]100

- One of the Oldest Renewable Energy Company in US
- Design, Manufacturing, Systems Integration
- Remote and Rugged Systems Specialty
- Power Electronics Expertise



Northwind[®]100

- 30+ years of wind turbine design, manufacturing, and installation
- Proven NW100kW track record
- Leading US DOE partner for wind technology development
- Selected by DOE for next generation MW class turbine development
- Over 20 key direct drive & power electronics patents issued or pending
- 1 of 4 US companies (GE, Clipper, Southwest) to gain IEC Turbine certification



Northwind[®]100

- NASA, NSF, DOE and NREL Funded
- Power for Military and Science
- Sustainable Quality Power
- Specifically for Extreme/Remote Applications



Northwind[®] 100

- Specs & Features:
 - 100kW
 - 19 & 21m Rotors
 - 30 & 37m Towers
 - VAR Support
 - IEEE519 Power Quality
 - Power Set Point Control
 - Optimized for Rugged/Remote
- Mid-Size Markets:
 - Schools/Municipalities
 - Commercial/Industrial
 - Small & Large Farms



Northwind[®] 100



- NorthWind[®] 100kW Wind Turbines
- Diesel Engines and Controls
- Supervisory Controls
- Secondary Load and Controls
- System Design and Implementation

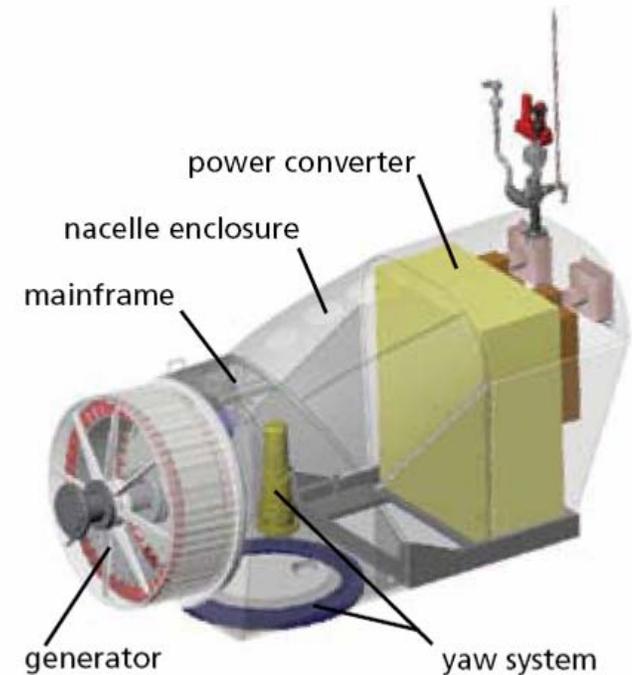


Northwind[®] 100

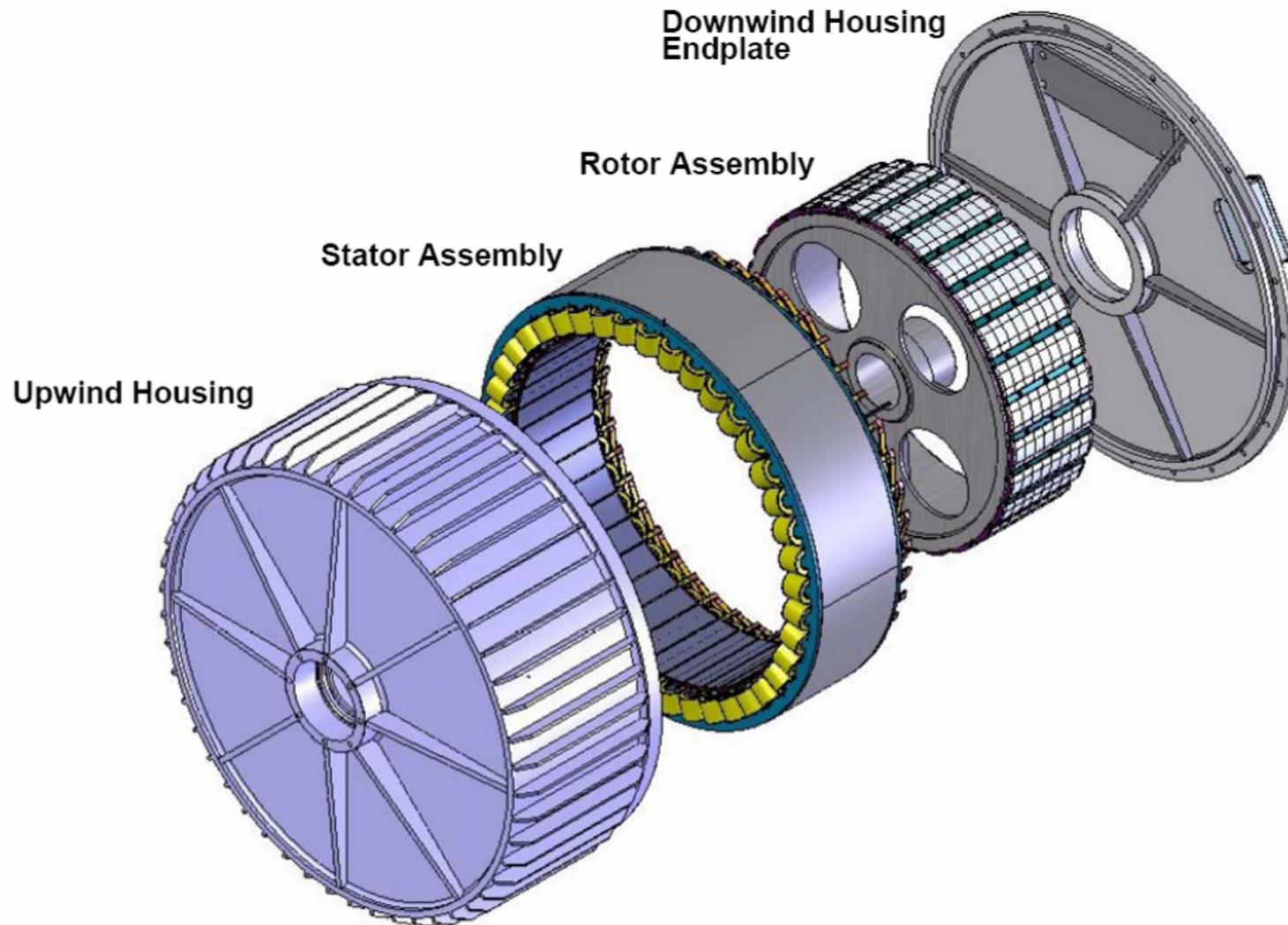


Northwind[®] 100

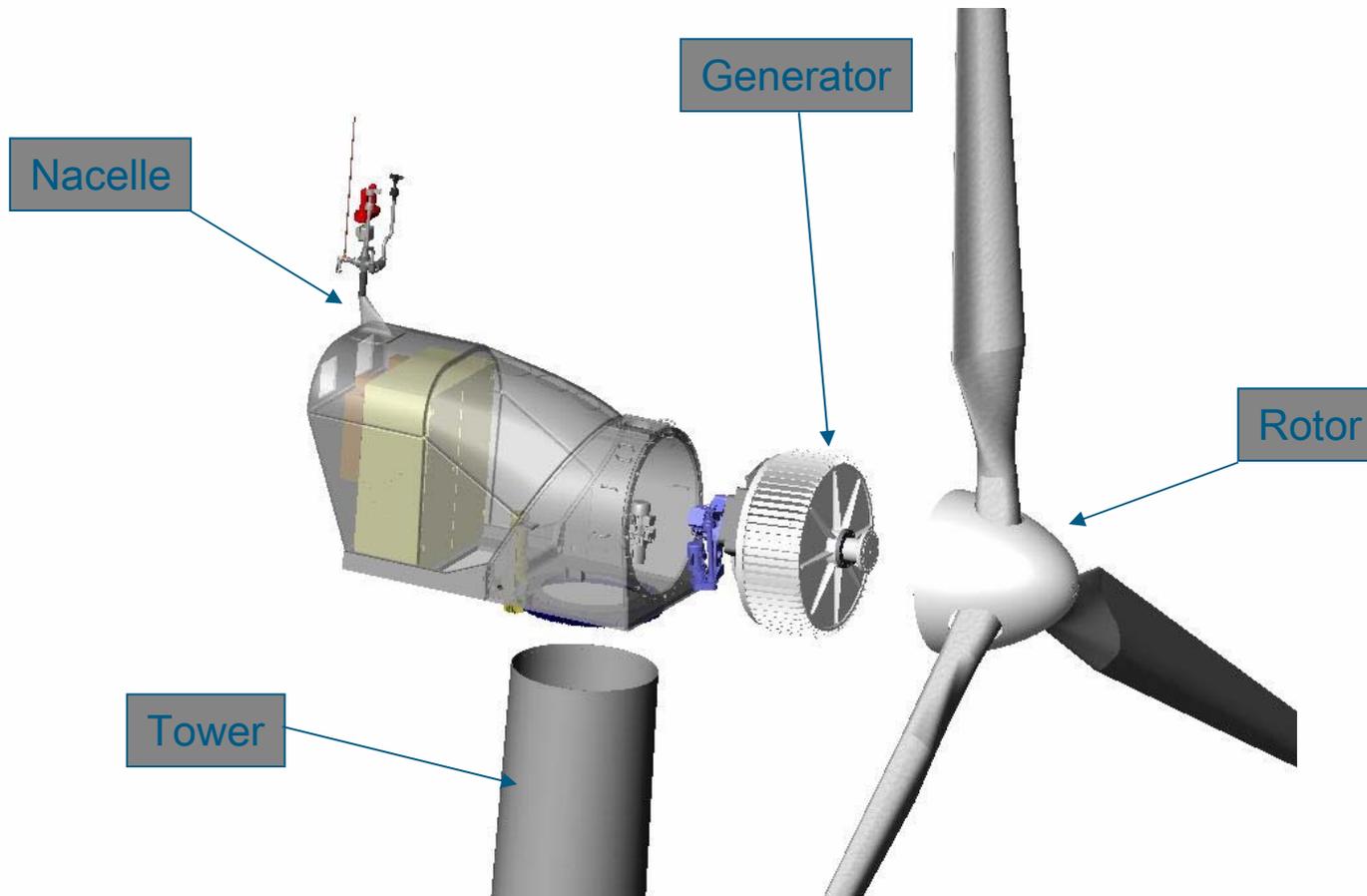
- Permanent Magnet Generator
- Nacelle “Power Plant”
- No Hydraulic Fluids
- Tubular Tower
- Fixed Pitch Rotor
- Inverter Coupled



Northwind[®] 100



Northwind[®] 100



Northwind[®] 100



NorthWind 100 Wind Turbine Technical Specifications

Turbine Design Class	IEC WTGS Class S
Design Standard	Compliant with IEC 61400-1
Rated Power	100kW
Power Regulation	Variable speed stall
Rotor Diameters	19m, 20m, 21m
Hub Heights	30m, 37m
Yaw System	Active upwind
Turbine Electrical Output	480VAC, 3 phase, 50/60Hz
Grid Tolerance	+10/-15% voltage; +/- 2Hz
Grid Interface	115kVA transformer (spec available)
Operating Temperature	-40 °C to 50 °C
Lightning Protection	Compliant with IEC 61024-1
Icing	to 30mm

Northwind[®] 100

- Made in USA
- UL/CE/IEC Certification
- Extended Warranties
- Factory Certified Tech's
- 6 Month Delivery



Northwind[®] 100

Northwind 100 O&M Overview

- 1 year service interval
- No slip rings
- No hydraulics
- Fewer parts
- Automated lubrication for main shaft bearings
- Service boom option for crane-less generator and rotor service
- Integrated SmartView[®] remote monitoring system



Northwind[®] 100

- Proven Technology
- Increased Energy Capture
- Lower O&M Costs
- Lower Lifecycle Costs



