

Wind Turbines in New Hampshire

Mythical, possible, and reality.

Ric Werme Feb 2014

Contents

- Installations: existing to planned
- Attributes and economics
- Advantages and (many) disadvantages
- Reliability and safety
- Other alternative energy

Nacelle Components



- 1) Electromechanical pitch drives
- 9) Hydraulic pitch drives
- 8) Rotor blade condition monitoring systems
- 2) Lubrication system, oil cooler and oil filter

- 3) Main Gearbox
- 4) Output shaft brake
- 5) Hydraulic power units
- 7) Yaw drive
- 6) Yaw brake systems
- ?) Alternator (rare earth magnets)

Lempster Wind

- Operational Oct 2008
- 12 Gamesa G87, 2 MW each
- 396' height to blade tip, 139' blade length
- Power sold to PSNH and then NHEC

Camesa E	ólica GND	NORMAL	G87DT(60 Hz
MACHINE	STATUS	Noise	Level	: 5
SOLSTATU CURREN_STA CONTACTOR YAW: AUTO	US RU ATUS R : UNCOUF		T	M
Avg. Pitc Wind(m/s)	h 3.90 2.66	Gen Rotor HG Pre PoverEKk	/Rpm: /Rpm: ss.:	1146 9.34 196.2 -9
STOP	PAUSE	RUN		MENU
R	JN 1227,0	9/2011	14:02	

Granite Reliable (Dixville)

- Operational Dec 2011
- 33 Vestas V-90 turbines, 3 MW each
- \$168.9 million federal loan guarantee
- \$275 million construction cost
- Power sold to Vermont



Groton Wind

- Operational Dec 2012
- 24 Gamesa G87, 2 MW each
- 396' height to blade tip, 139' blade length
- \$120 million construction cost
- Power sold to Nstar (Boston)



Planned Wind Farms

Name	Where	MW	Status	
North County Wind	Coos County	180	In development	2. Granite Reliable
Jericho Mountain Wind	Berlin	8.5	Seeking permits	Berlin 10. Jericho Mountain
Alpine Ridge	Groton	45	In development	4 . Mountain View Grand
Wild Meadows	Danbury, Alexandria	75	Started SEC review, now "on hold"	
Antrim Wind Energy	Antrim	30	Denied by SEC	3.Groton Wind
Kidder Mountain	New Ipswich, Temple	15	Seeking SEC review	Lebanon B . Alpine Ridge
			1.Le Keene	npster 5 . Antrim

3

9.North

7 . Kidder Mountain

Newfound Area Energy



Attributes and Economics

- Pluses:
 - Wind is free fuel!
 - No CO₂ (At least not at the turbine)
- Negatives:
 - Low density energy Groton is 48 MW, Seabrook is 1244 MW - 25X
 - Huge area requirement
 - High maintenance cost
 - [more]

More Negatives

- Pluses:
- Free fuel!
 - No CO₂ (At least not at the turbine)
- Negatives:
 - Low density energy: Groton is 48 MW, Seabrook is 1244 MW – 25 times more power

Groton Turbine Placement





Seabrook Station 1242 MW Nuclear

NextEra Energy

Map

Traffic

1111年 11115 1111 1111 1111 11115 1115 1115 1115 1115 1115 1115 1115 1115 1115 1115 1115 1115 1115 1115 1115 1115 1115 115 115 115 115 115 115 115 115 115 1

200 ft

(SIRa

Granite Ridge, Londonderry 900 MW Combined Cycle Gas

BUIL

•

+

200 ft

Map

Traffic

More Negatives: Cube Law

- Power varies with cube of wind velocity
 - For Gamesa G87 and Vestas V 90:
 - Connects to grid at 4 m/s (9 mph) wind
 - Produces full power from 13 to 25 m/sec (29 to 56 mph)
- Typical "capacity factor" is 20-35%, so these 2 MW turbines produce 0.4 – 0.7 MW on average.
- Typical "capacity credit" is near 0%, so backup power must be available.
 - Hydro and natural gas plants are best options.

NH Renewable Portfolio Standard

- By 2025, NH legislation targets producing 13% of our electricity from wind energy or sources like tidal, hydrogen, or geothermal.
- On average, NH uses 1,240 MW, (almost exactly what Seabrook produces).
- To match that (on average!) from 2.0 MW wind turbines with a 30% capacity factor, we'd need 1,240 / (2.0 x 0.30) = 2070 turbines.
- We currently have the equivalent of 84, and most of that power is sold to neighboring states.
- 24X the current supply? Won't happen.

Subsidies and Incentives

[Needs work]

- PTC 2.3 cents/kWh and this increases with inflation, currently not available to projects that have not started construction.
- US Loan guarantees allows for low borrowing rates
- RPS requires local utilities purchase renewable energy otherwise pay a financial penalty.

Bird and Bat Kills

- Current estimate: 140,000 and 328,000 birds and 600,000 bats.
- US Interior Dept: 30-year permits allowing wind farms and other projects to accidentally kill federally protected eagles.
- US cats: 1.3 billion to 4.0 billion birds.





Noise Issues

- Vortex shedding whoosh, whoosh sound
 - Blade tips move at nearly 200 mph
- Transmission noise gears meshing
- Generator whir/whine 1800 RPM shaft
- Blade infrasound and wakes poorly appreciated
- Blade pitch and nacelle yaw motors

Infrasound

I first noticed from seeing several similar reports from around the world about:

- Middle ear related: vertigo, tinnitus, ear popping
- Heart palpitations, high blood pressure, nausea, sleep disturbance, foreboding
- Concentration deficit, fatigue, demotivation
- Feeling better away from home and turbines

Inner Ear / Vestibular System



Noise Spectrum



Wild Meadows Sound Contours



Wild Meadows Wind Project Alexandria and Danbury, NH

Epsilon

Longterm Reliability

- Design lifetime 20 years, but it's not being met.
 - Blades: Western NY repairing blades only 2-3 years old. Not recyclable.
 - Transmissions: Portsmouth RI stuck with failed turbine, manufacturer bankrupt, used transmission available. As transmissions wear they get louder.
 - Oil (200 gallons): hot mainshaft bearings ignite oil in the nacelle.

State Actions

- NH Site Evaluation Committee (SEC)
- 2013 HB580 (failed) Establish a moratorium
- 2014 SB281 Firmer guidance for the SEC
- Gov. Hassan supports wind power
- Several environmental groups support wind, but that is beginning to change.

"Alternative" Energy

- Northern Pass Hydro Quebec (large hydro is often not "renewable" in part because it doesn't need subsidies)
- Natural gas increasing supply, needs distribution
- Coal EPA is running that into the ground
- Solar Better for rooftop than large plant
- Thorium atomic power US experiments in the 1960s, China making push now.
- LENR (cold fusion) Andrea Rossi's E-Cat

Additional resources

- http://www.nhwindwatch.org/
- https://www.facebook.com/groups/NHWindWatch/
- http://wermenh.com/wind

