Case Study

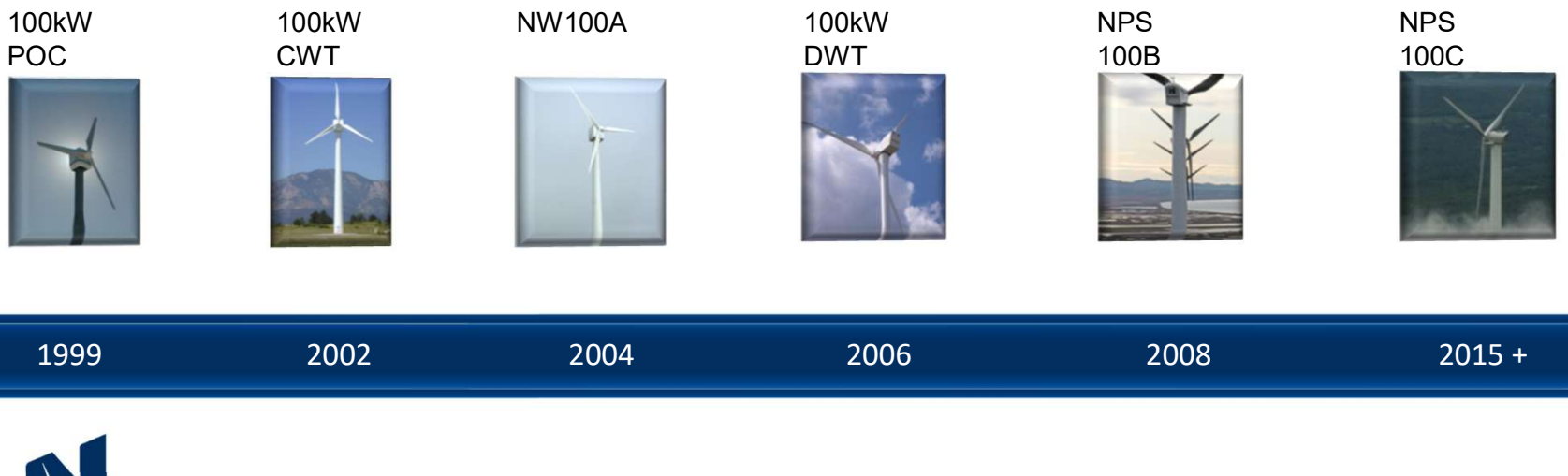
NPS 100C-24 Arctic (2 units)

Deadhorse, AK

July 2024

NPS – Brief History

- Started in Vermont in 1970s. Pioneer in DW and remote power systems, especially in extreme locations.
- In 2019, re-structured and HQ re-located to Italy (Northern Power Systems S.r.l.) under new ownership.
- Producing 100 kW turbines since 1999, commercially since 2004 (originally known as the Northwind 100 or “NW 100” since 2014 known as “NPS 100”)
- The NPS 100 provides unsurpassed reliability and has a flawless track record of surviving extreme winds, from the bitter colds of Alaska to the tropical cyclones of the Caribbean.
- We continue to advance our proven platform, offering larger rotors and reduced cost of energy.
- Our portfolio of wind turbines can provide clear economic benefits in all kinds of wind regimes.
- Excited to be back to our roots in Alaska and the US market!



NPS – Global Deployment

NPS has a foothold in key global markets:

- Europe
- Americas
- Middle East
- Asia

~900 units installed worldwide
>79 million cumulative operating hours

WEG (Partner) 2MW WTGs

Site Details

- Customer: Doyon Drilling
- Site: North Slope (Deadhorse, AK)
- Among the northernmost wind turbines in the world (70.2° latitude)…according to our information the northernmost in North America

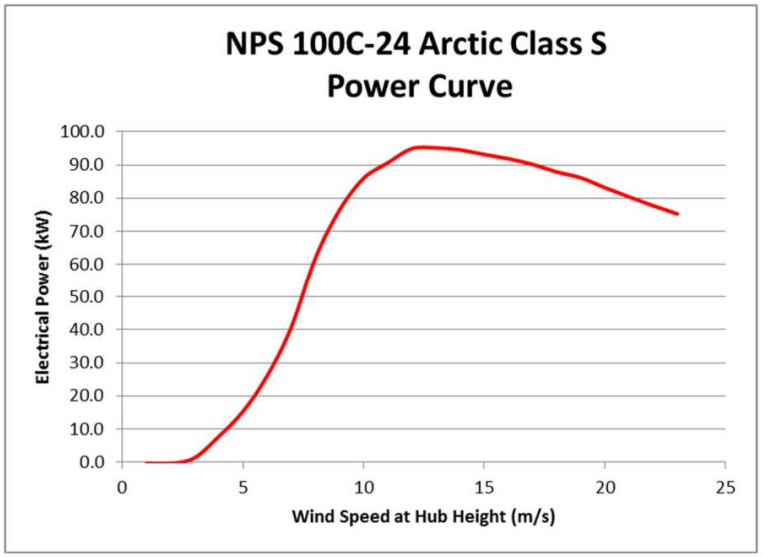
System Details

- NPS 100C-24-30 Arctic (2 units)
  - 95 kW each
  - 24m (80 ft) rotor diameter
  - 29m (95 ft) tower height
  - ~30.5m (100 ft) hub height (including foundation)
- Based on our standard NPS 100C, plus…
  - Operation to -40°C (-40°F)
  - Low-temperature steels
  - Hydrophobic/ice-phobic blade coating
  - Ice detection system
  - Nacelle heating system
- Foundation: Steel freeze piles with concrete cap (STG)
- Electrical: Behind-the-meter, 600Vac

Installation

- Foundations installed summer (piles) and fall (cap) of 2023 by STG, Inc (Anchorage, AK)
- Turbines installed October 2023 by STG, Surepoint, and NPS
- Turbines commissioned October 2023 by NPS
- Overall, very lucky with the weather! Installation completed as the first snow of the year arrived.

Cost & Performance



Annual Energy Production (AEP)	
Annual Average Wind Speed (m/s)	**Annual Output (MWh)**
5.0	206
5.5	251
6.0	294
6.5	335

- Turbine cost: ~$400k each
- Regular Shipping: ~$15k each (to Seatle)
- Pile Foundation, Installation, Electrical and Permitting: estimate ~$500k each
- Total Installed Cost estimate: ~$950k per turbine

- Expected Performance **~300 MWh/year** (nominal, per turbine)
  - ~6 m/s (~13 mph) average wind speed (Global Wind Atlas, checked with nearby airport data)
  - -10°C (14°F) average temperature -> high air density
  - 5-10% losses expected due to icing; but severity not well understood in this region. If more severe, blade heating can be investigated.

Operating History/Data

- Units operating since October 2023 with availability and power performance as expected
  - Some losses (power reduction and/or idling) due to icing.
  - A few faults during initial weeks of operation related to components requiring adjustment and/or modification. All corrected and resolved.
- **Minimum temperature -39°C (-38°F)**
- **Max power ~100 kW**
- **Maximum wind speed ~37 m/s (82 mph)**

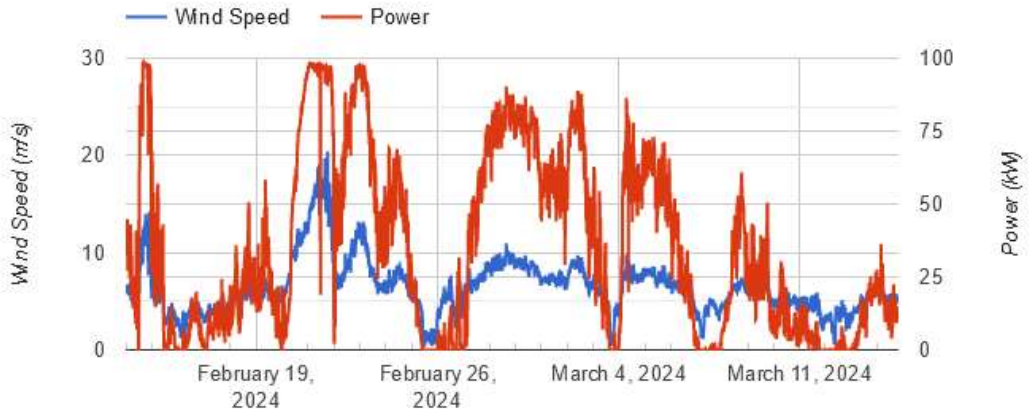
Site	Device	Device Status	Total Power (kW)	Avg Wind (m/s)	Avg Temp (°C)
Deadhorse, AK (1534)	01534		31 / 100	6.3	-19.8
Deadhorse, AK (1535)	01535		31 / 100	6.2	-20.2

Recent Data: WT-1 (01534)

- Data below from 2/14/2024-3/14/2024 (output from NPS' SCADA system)
- Minimum temperature -39°C (-38°F), Max power ~100 kW, Availability 99.9%

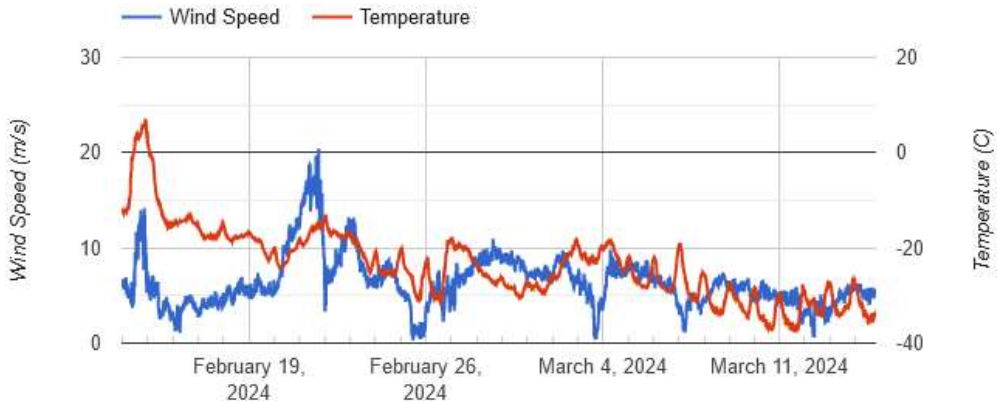
Historical Data

From: 2024-02-14 To: 2024-03-14 Refresh | Power | Temperature | Energy



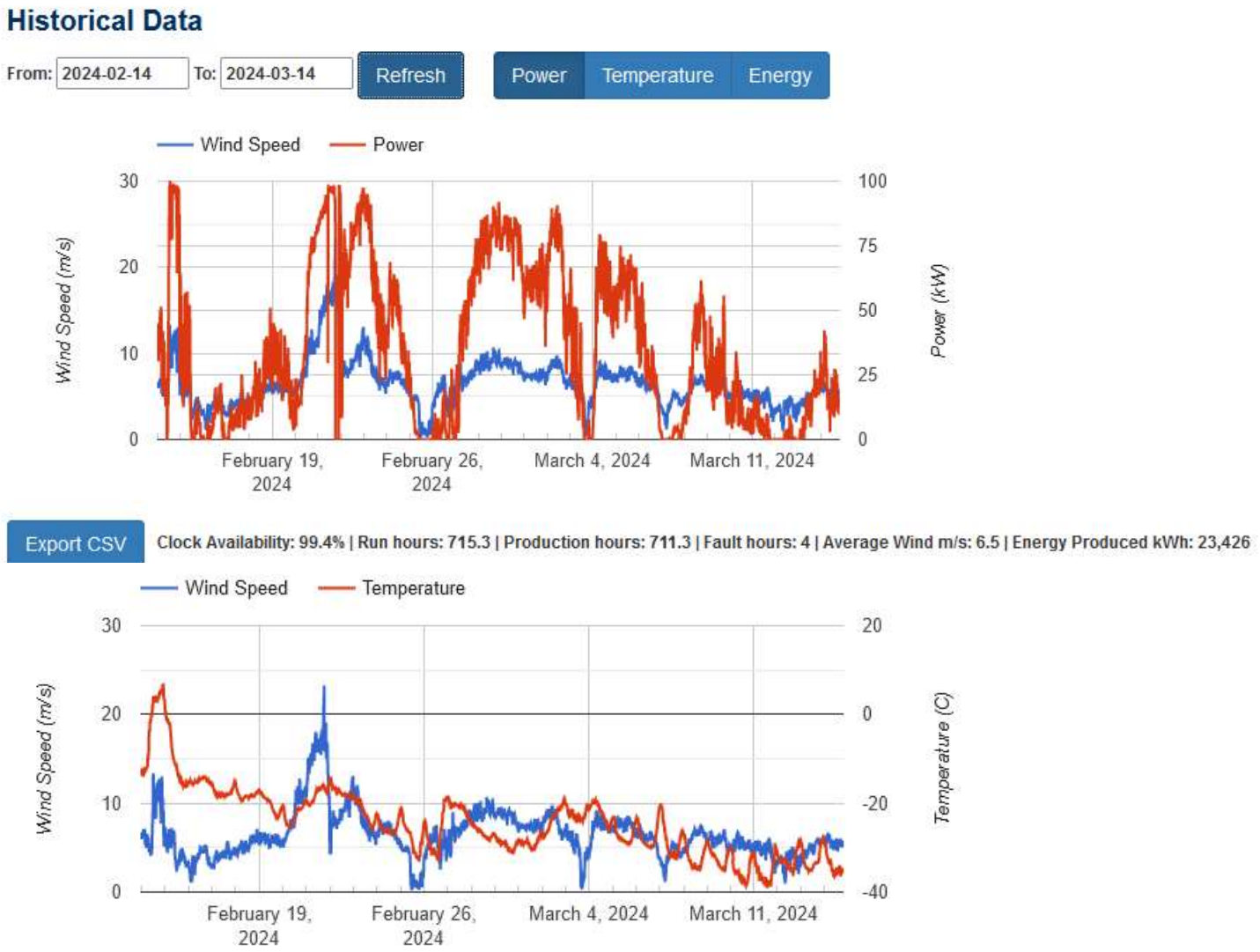
Export CSV

Clock Availability: 99.9% | Run hours: 715.1 | Production hours: 714.7 | Fault hours: 0.4 | Average Wind m/s: 6.4 | Energy Produced kWh: 23,225



Recent Data: WT-2 (01535)

- Data below from 2/14/2024-3/14/2024 (output from NPS' SCADA system)
- Minimum temperature -39°C (-38°F), Max power ~100 kW, Availability 99.4%



Additional Information

- We are excited to be back in Alaska!
- For additional information on our products and services, please visit us: http://www.nps100.com/

Thank You!

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