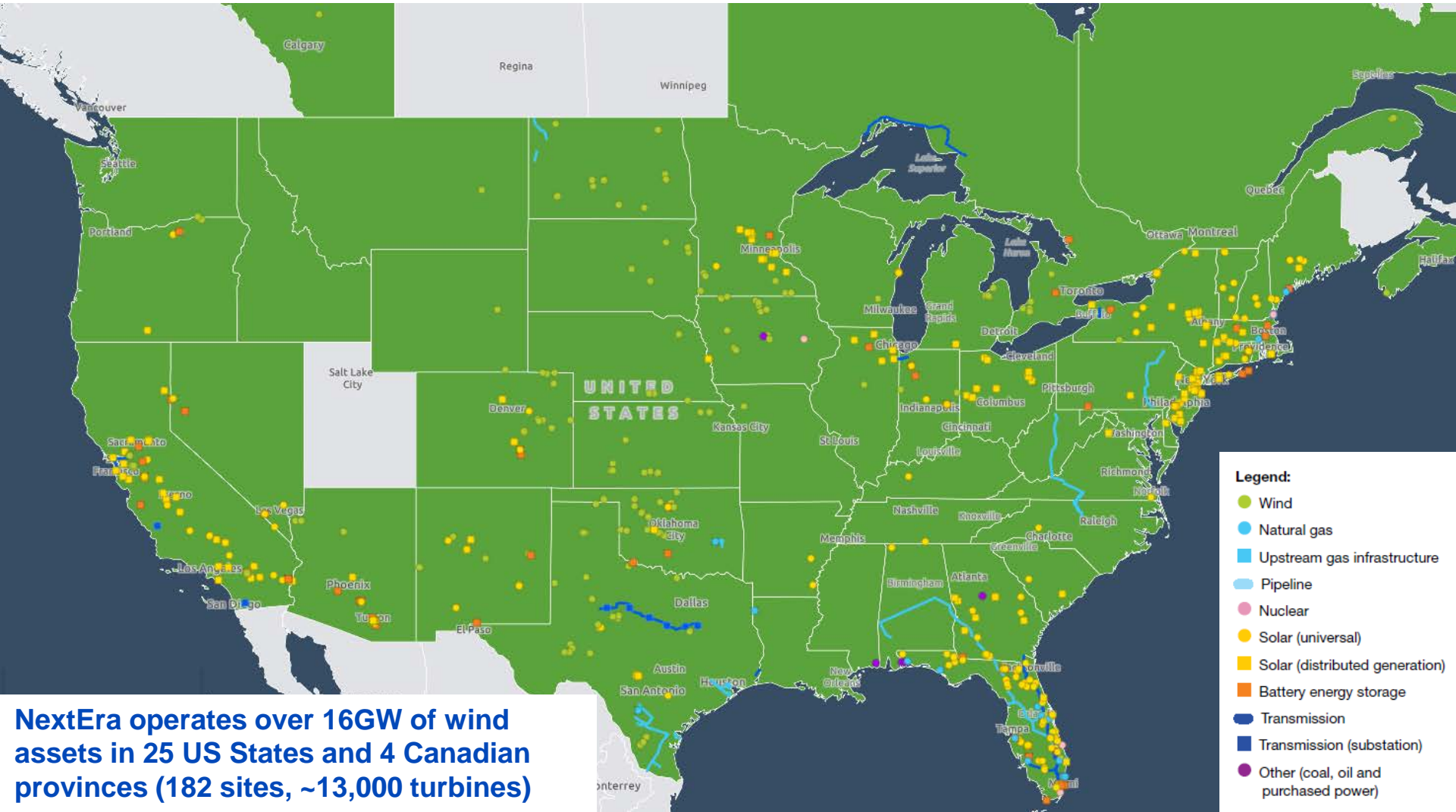




# **A North American Operating Experience**

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**Winterwind 2023 | Are, Sweden**

# Our Portfolio



Map represents areas where NextEra Energy has a presence, operations or development projects. Locations with more than one facility are illustrated with a single dot. Data as of December 2021.

# Where do we see the effects of blade icing?

- **Nearly all of our sites have been subject to some degree of blade icing and/or inoperation due to extreme cold temperatures**
  - Northern ‘Heartland’ sites (ND/SD/IA) experience extreme cold temperatures mixed with snow and precipitation
  - Sites in CO and WY experience mountain effect wind/snow/ice events
  - Sites in the ‘Great Lakes’ region see lake effect snow and ice
  - More southern sites in the ‘Texoma’ region (TX/OK/KS) experience ice storms and freezing rain through the winter season

## Now that's some ice!



### Horse Hollow Site – Wingate, TX

- Winter Storm Uri significantly impacted the ERCOT power grid in Texas in Feb. 2021

## Our approach to operation...

- **Our approach to operating our turbines in cold climates is to continue to allow the turbines to run, within the operational limits**
- **Turbines only come offline during and ice event when:**
  - Ice accretion has overloaded the aerodynamics of the blade
  - Temperatures have dropped below operational limit
  - Periods of low wind speeds arise following icing events
- **In the past, we have attempted pausing turbines during icing events**
  - This typically resulted in increased ALR and turbine downtime

# How we mitigate blade icing...

- **We explored all retrofit options available**
  - Blade heating systems
    - Too costly to implement across our fleet as a retrofit
  - OEM operational methods
    - Implemented on a trial basis with little success or improvement
- **In 2019 we began a pilot using an icephobic coating**
  - Partnered with Phazebreak and installed the NeinIce coating on 100 turbines across 2 sites (1 site in ND and 1 site in IA)
  - Through the first season a significant increase in production was achieved by the coated turbines vs. the uncoated
  - To date we have NeinIce installed on ~1000 turbines (22 sites) with plans to continue application campaigns

