Centralized or Distributed?

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RES Integrated Energy Solutions

DEVELOPMENT | CONSTRUCTION | OPERATIONS

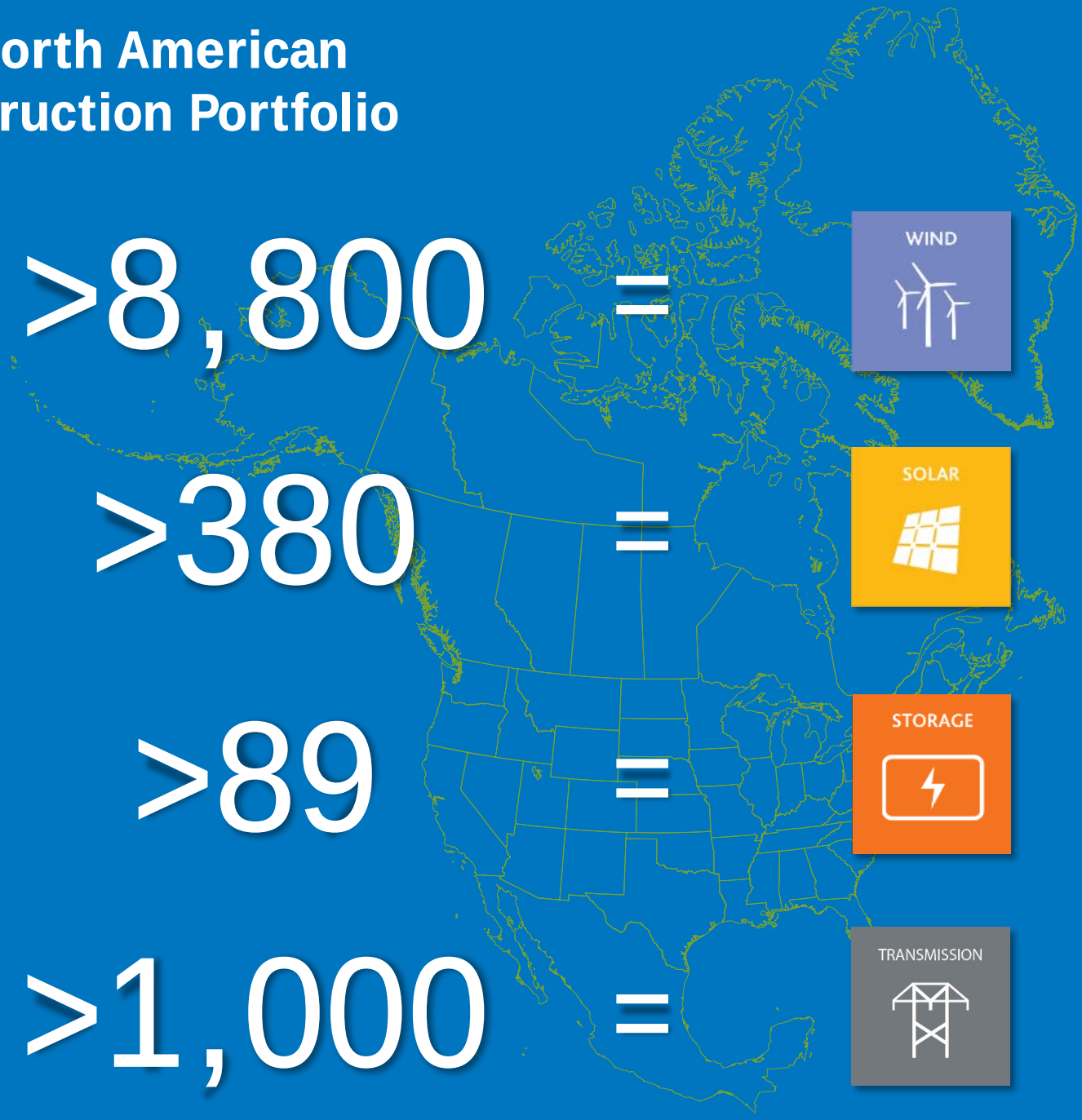
WIND

SOLAR

ENERGY STORAGE

TRANSMISSION

RES North American Construction Portfolio



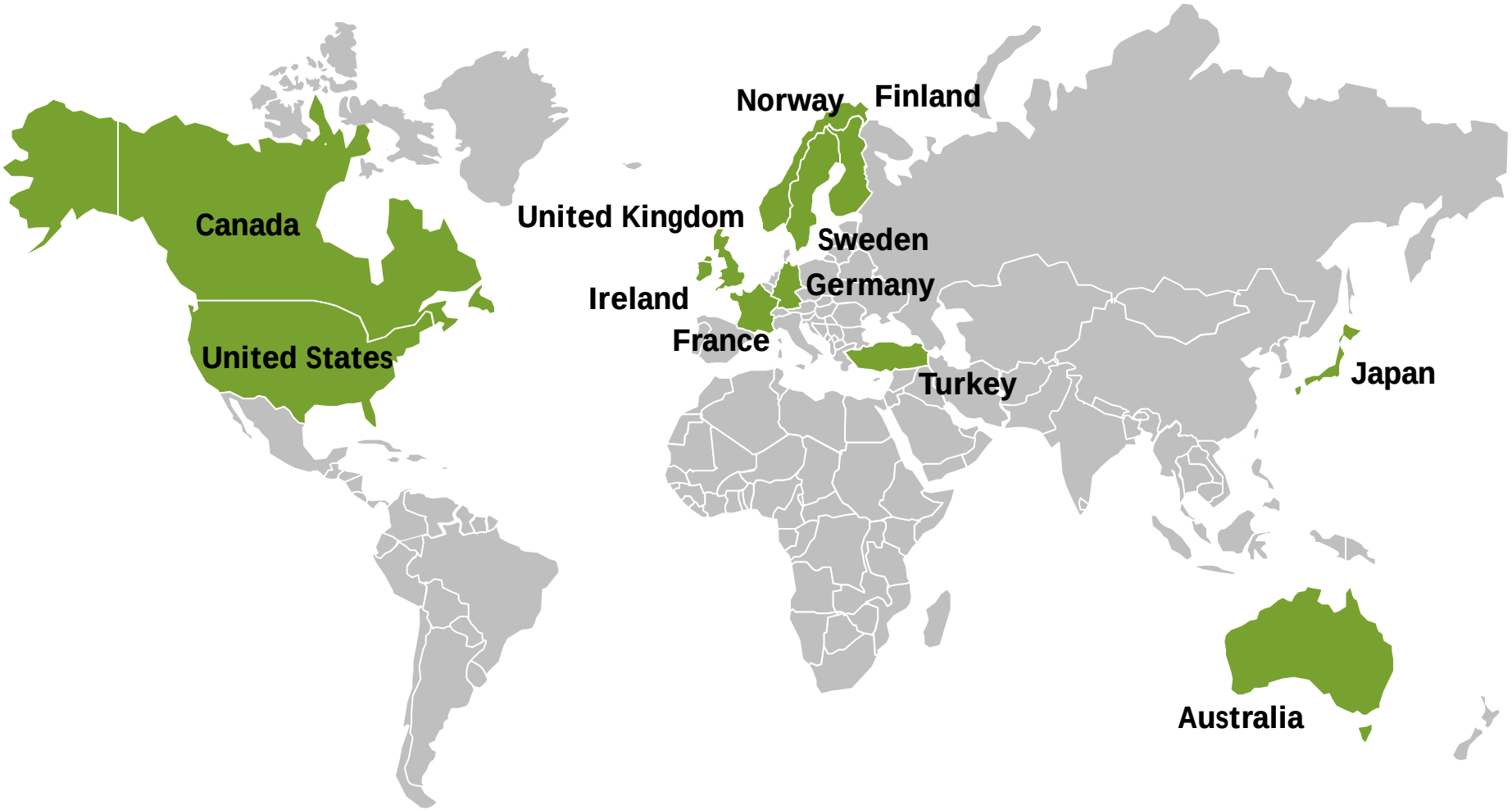
>8,800 = WIND MW

>380 = SOLAR MW

>89 = STORAGE MW

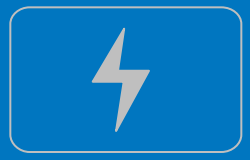
>1,000 = TRANSMISSION miles

RES' Worldwide Presence



Distributed or Utility Scale?






What RES looks for in a Renewable Energy Project

- Low cost renewable product
- Financeable
- The bigger the better

WIND

Rooftop Wind: <1kW Generation Capacity

- Wind resource depends on micro-geography
  - Can not finance w/o good expectation of production
  - Uncertain payback on homeowner investment
- $1k to $10k investment
  - ~$750/MWh Cost of Power

Distributed Wind: Up to 100kW Generation Capacity

- Wind resource depends on micro-geography
  - More expensive turbines, but still not justifying a wind study
- $65,000 investment (12.5Kw Model)
  - ~$520/MWh Cost of Power

Utility Scale Wind: 2+MW units, 50+MW total facility

- Financeable
  - Investment can support extensive wind studies
  - Clear financial payback
- $20/MWh Cost of power in windy places ($50/MWh without PTC)

SOLAR

Residential Solar more expensive per MWh

Table 2: Levelized Cost of Utility- and Residential-scale PV ($ per Solar MWh)

No	Scenario	Utility-scale	Residential-scale Purchase	Cost Difference (Res-Utility)	Residential-scale Lease
Reference	**2019 ITC @ 10%**	**83**	**167**	**83**	**182**
Scenario 1	2019 ITC @ 30%	66	123	**57**	140
Scenario 2	2019 Developer absorbs ITC	66	N/A	**N/A**	140
Scenario 3	2019 Higher Inflation	95	187	**92**	206
Scenario 4	2019 Lower PV Cost	69	137	**67**	149
Scenario 5	2014 Actual PV Cost	117	193	**76**	237

Notes:
1-All Scenarios other than Scenario 2 assume there is a tax equity partner.
2-In Scenario 1, 30% ITC assumption has been applied to all three cases uniformly.
3-Scenario 2 is only relevant to the utility- and residential-scale leased systems and does not to impact residential-scale purchases.

*Brattle Group, July 2015, Comparative Generation Costs of Utility Scale and Residential-Scale PV in Xcel Energy Colorado's Service Area

Why is utility scale solar power less expensive?

- Production efficiency
  - Trackers
  - No obstructions
  - Regular panel cleanings
- Balance of system efficiencies
  - Assembly line approach
  - Installation automation coming soon

Why does distributed get built?

- Competing in different markets:
  - Distributed is off-setting retail energy costs (~$120/MWh Austin Energy Home Rate)
  - Utility scale selling into wholesale power mkt (~$20/MWh ERCOT market)

How does energy storage change things?

- Further shift to utility scale projects
  - Greater transmission line efficiencies lower interconnection costs
  - Solve utility ancillary services challenges
  - Solar + Storage looks like a peaking gas plant

Thank you!

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