Great Lakes Wind Feasibility Study

Public Webinar #3

August 10, 2021

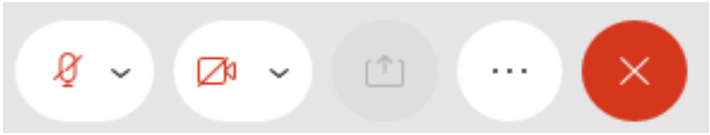
Sherryll Huber

NYSERDA Project Manager

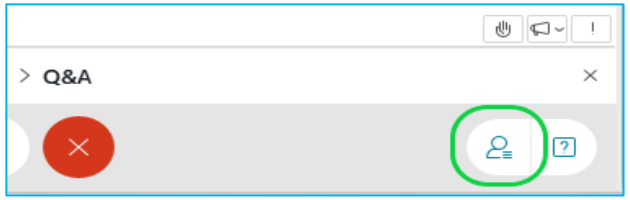
Meeting Procedures

Participation for Members of the Public:

- Members of the public are muted upon entry.
- Questions and comments may be submitted in writing through the Q&A feature at any time during the event.
  - Chat is disabled
  - Today's materials along with a recording of the webinar will be posted to NYSERDA's Great Lakes Wind website.
- If technical problems arise, please contact karen.fusco@nyserda.ny.gov



You'll see  **when your microphone is muted**



Agenda

- Overview of Feasibility Study
- Lake Resource Characterization, Port Infrastructure
  National Renewable Energy Laboratory (NREL)
- Technology, Cost Analysis, Economic Development
  National Renewable Energy Laboratory (NREL)
- Permitting, Risk/Benefit Analysis, Visualization Study
  Advisian
- Interconnection to Electric Grid
  Pterra/Brattle Group
- Stakeholder Input from Public Feedback Session
- Next Steps and Study Timeline
- Q&A

Recreational Fisherman in Winter, Lake Erie

Today's Objectives

> To provide a brief overview of the Study

> To provide a mid-Study update on research to date

> To provide an overview of input received during the Public Feedback Session

> To provide an overview of the remaining timeline for Study completion

> To provide an overview of next steps after Study completion

Public Service Commission Order

Published 10/15/2020

Directs NYSERDA to:

> Conduct a feasibility study for wind energy generation in the Great Lakes

> Commence work with 180 days of Order within a $1 million budget

Viewpoint at Lake Ontario

Study Process

NYSERDA

NREL
Technology and Ice Modeling Costs/Cost Reduction, Economic Development

Advisian
Permitting, Risk/Benefit and Environmental Sensitivity, Sediments and Geohazards, Visual Impacts

Pterra/Brattle Group
Grid Interconnection

Public Webinars and Stakeholder Feedback

New York State Public Service Commission

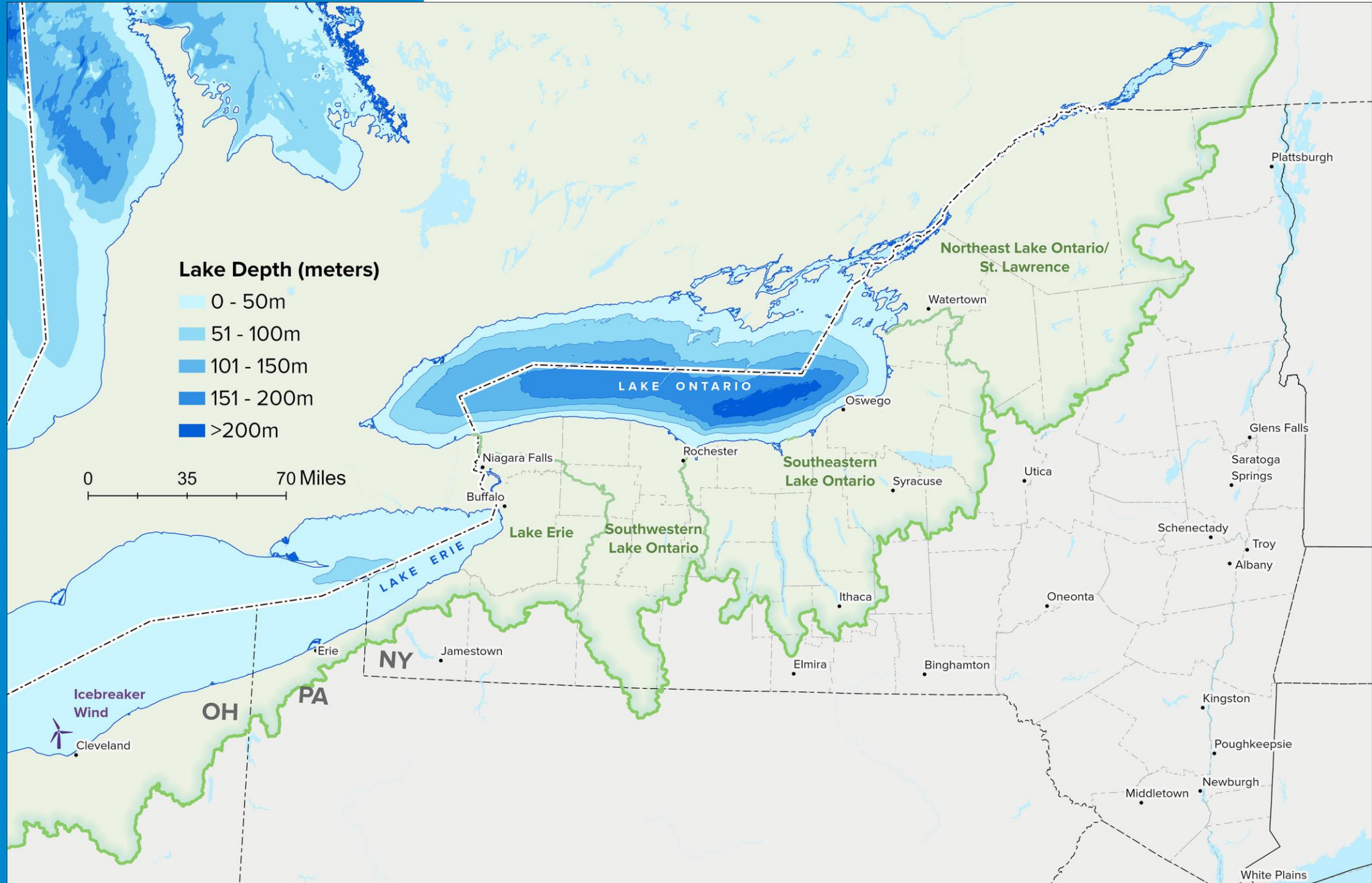
No Action

Further Study

Pilot Projects

Solicit Great Lakes Wind Projects

Great Lakes Wind Feasibility Study



Great Lakes Wind Feasibility Study

NREL
Transforming ENERGY

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Wind Lead

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Research Engineer

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Engineering Analyst

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Senior Atmospheric Scientist

Matt Shields, Ph.D.
Wind Cost Engineer

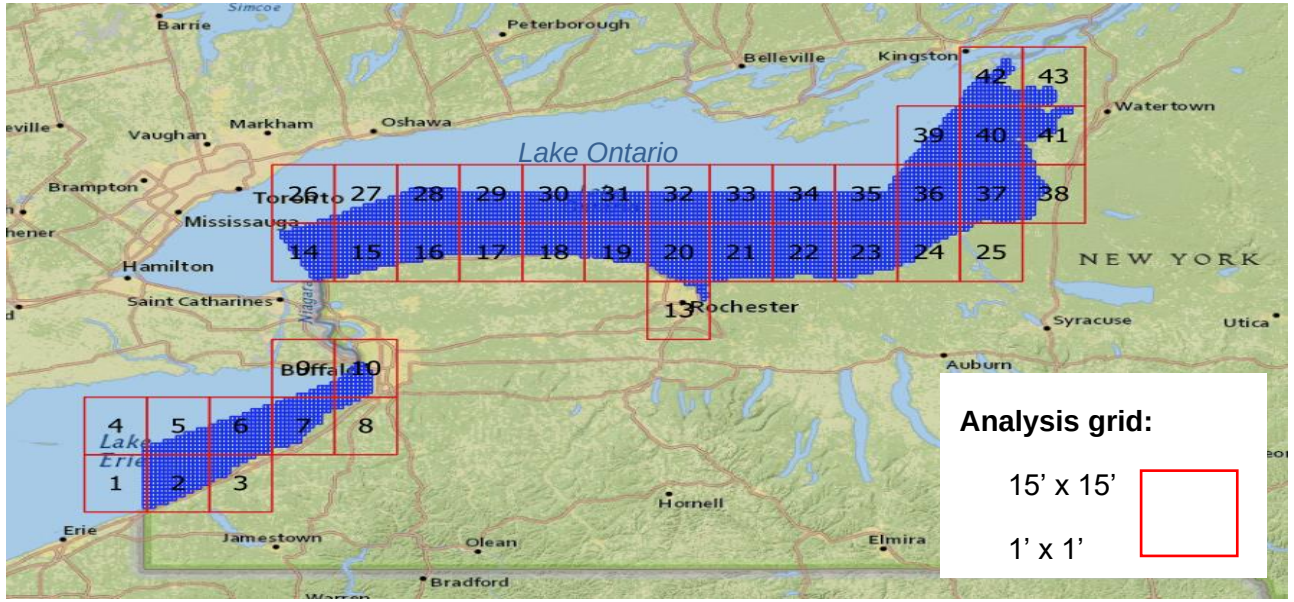
Aubryn Cooperman, Ph.D.
Wind Engineer

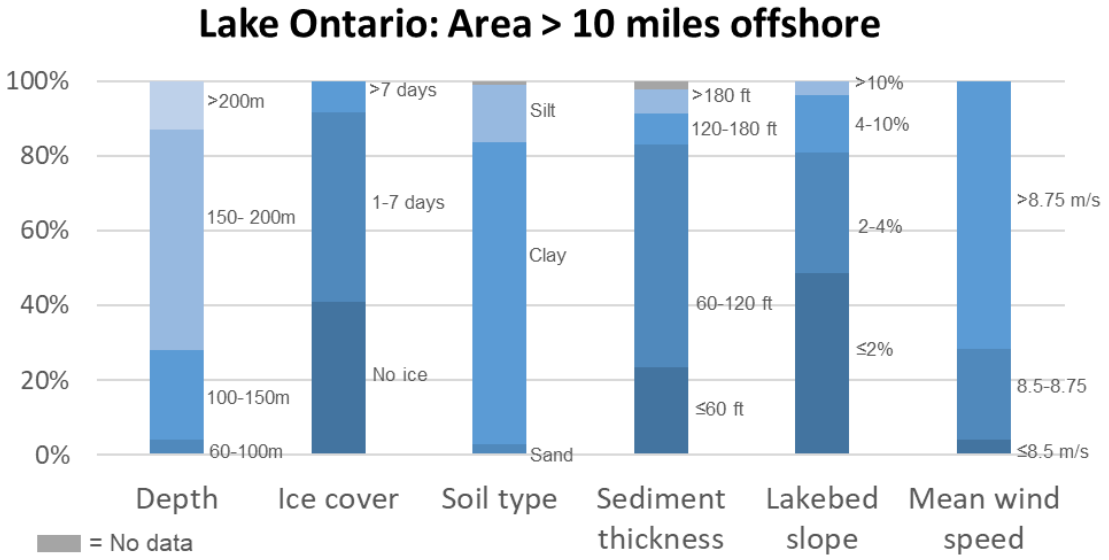
Stein Housner, M.S.
Wind Engineer

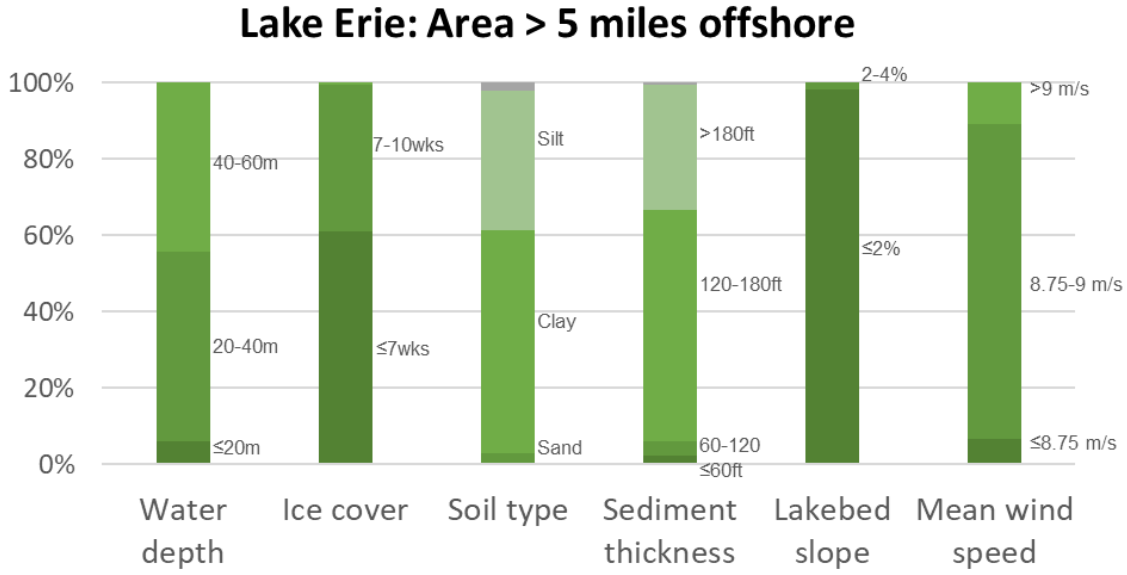
Patrick Duffy, M.S.
Wind Cost Engineer

Physical Characteristics

Lake	Total Area	Area beyond 5 miles from shore	Area beyond 10 miles from shore
Erie	590 mi^2	270 mi^2 (~2 GW)	70 mi^2 (~0.5 GW)
Ontario	3,500 mi^2	2,350 mi^2 (~18 GW)	1,450 mi^2 (~11 GW)

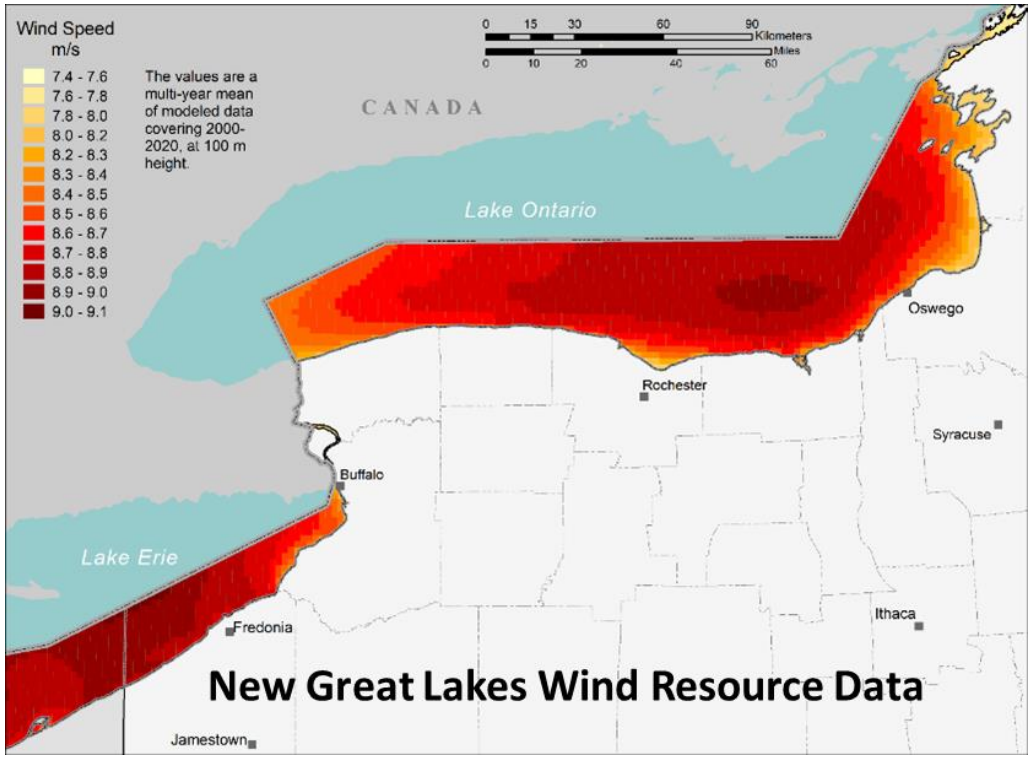


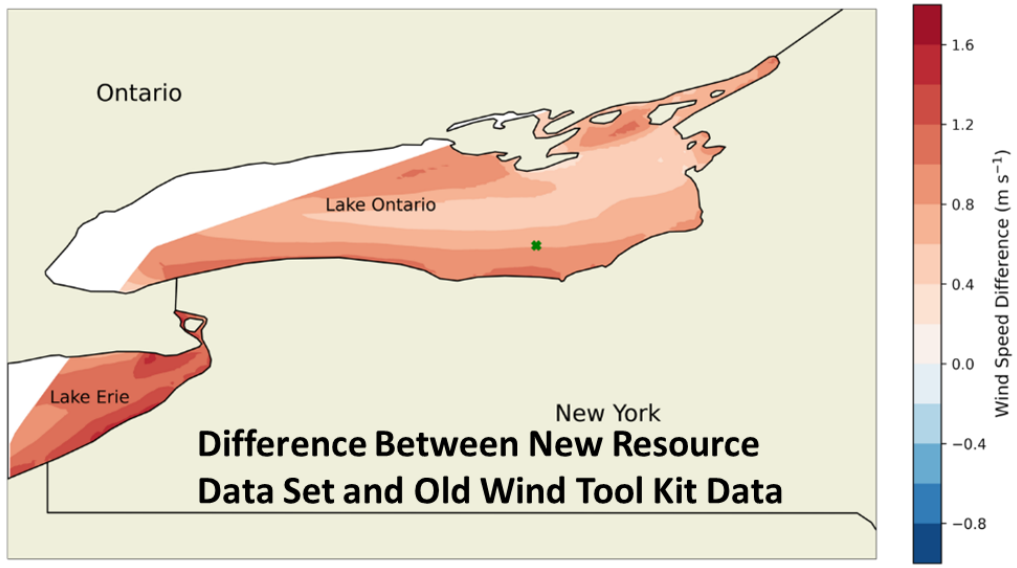




New Wind Resource

- NREL is updating the Great Lakes resource data, replacing WIND Toolkit from 2015
- New data uses recent advances in the Weather Research and Forecasting (WRF) numerical weather prediction model
- Updated data cover 21-year period instead of 7 years, and indicate higher wind speeds compared to the WIND Toolkit (lower figure)
- The eastern part of Lake Ontario has the highest annual average wind speeds at 8.5-9.0 m/s
- Increases in wind speed over Lake Erie range from 0.8-1.6 m/s, and about 0.2-1.0 m/s in Lake Ontario
- Data for the Great Lakes are publicly available (See: NREL 2021)





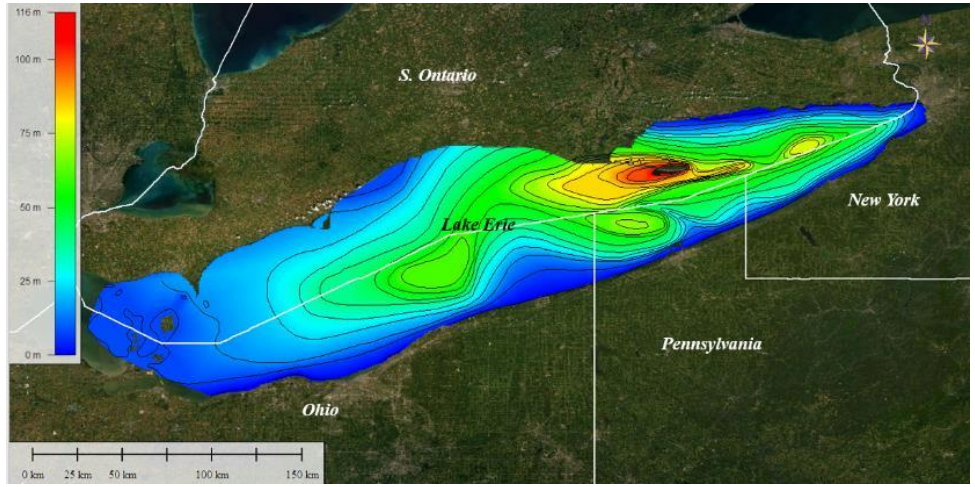
Depth to Bedrock – Close to Surface

Lake Erie Depth to Bedrock (NY Waters)

> Less than 250 ft (76.2 m)

> Average ~100 ft (30.5 m)

Morgan, N. A., B. J. Todd, and C.F. M. Lewis. 2020. *Interpreted seismic reflection profiles, sediment thickness and bedrock topography in Lake Erie, Ontario, Canada and Michigan, Ohio, Pennsylvania and New York, U.S.A.* Open File 8733, Geological Survey of Canada, 26. https://doi.org/10.4095/326715.



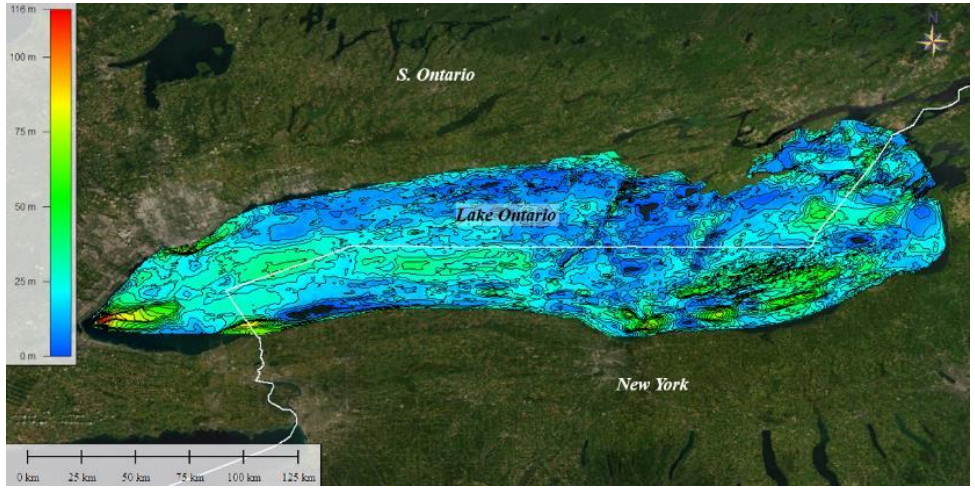
Lake Ontario Depth to Bedrock (NY Waters)

> Less than 295 ft (90 m)

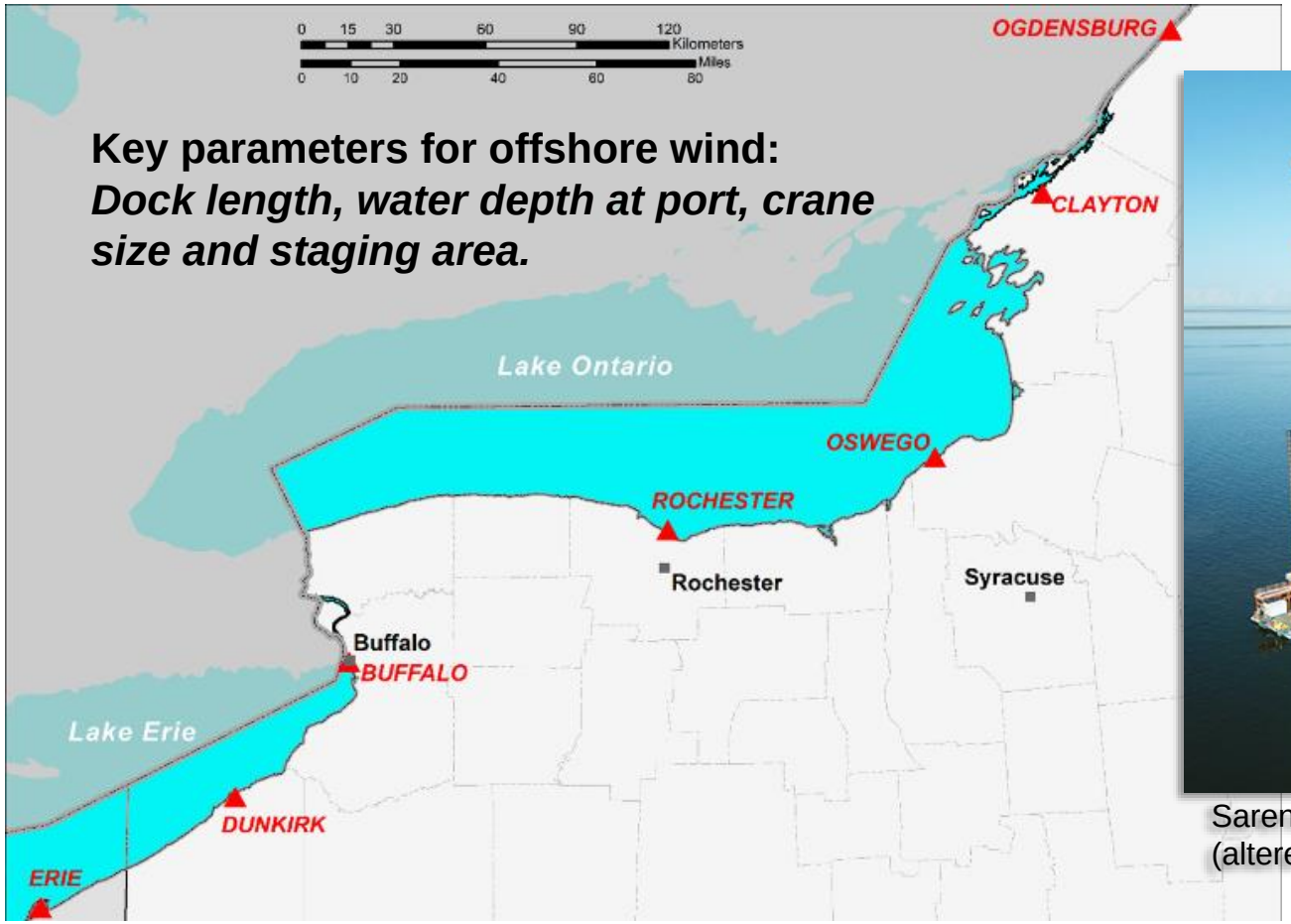
> Average ~74.8 ft (22.8 m)

Hutchinson, D. R., C.F. M. Lewis, and G. E. Hund. 1993. "Regional Stratigraphic Framework of Surficial Sediments and Bedrock Beneath Lake Ontario." *Geographie physique et Quaternaire* 47 (3): 337-352. http://doi.org/10.7202/032962ar.

National Geophysical Data Center. 1999. "Bathymetry of Lake Ontario." *Data set.* Edited by NOAA. National Geophysical Data Center. https://doi.org/10.7289/V56H4FBH.



Ports and Infrastructure



Sarens Soccer Pitch Barge (altered barge)

Vessel Limits Define Turbine Size

- The locks on the St. Lawrence Seaway limit the size of vessel that can be brought into the Great Lakes.
- Traditional Wind Turbine Installation vessels are not feasible due to width limitations.
- Barges are being considered to install the turbines.

Sources:

(Assessment of Vessel Requirements for the U.S. Off., 2013)

(Learn About the Seaway | Great Lakes St. Lawrence Seaway Development Corporation, n.d.)

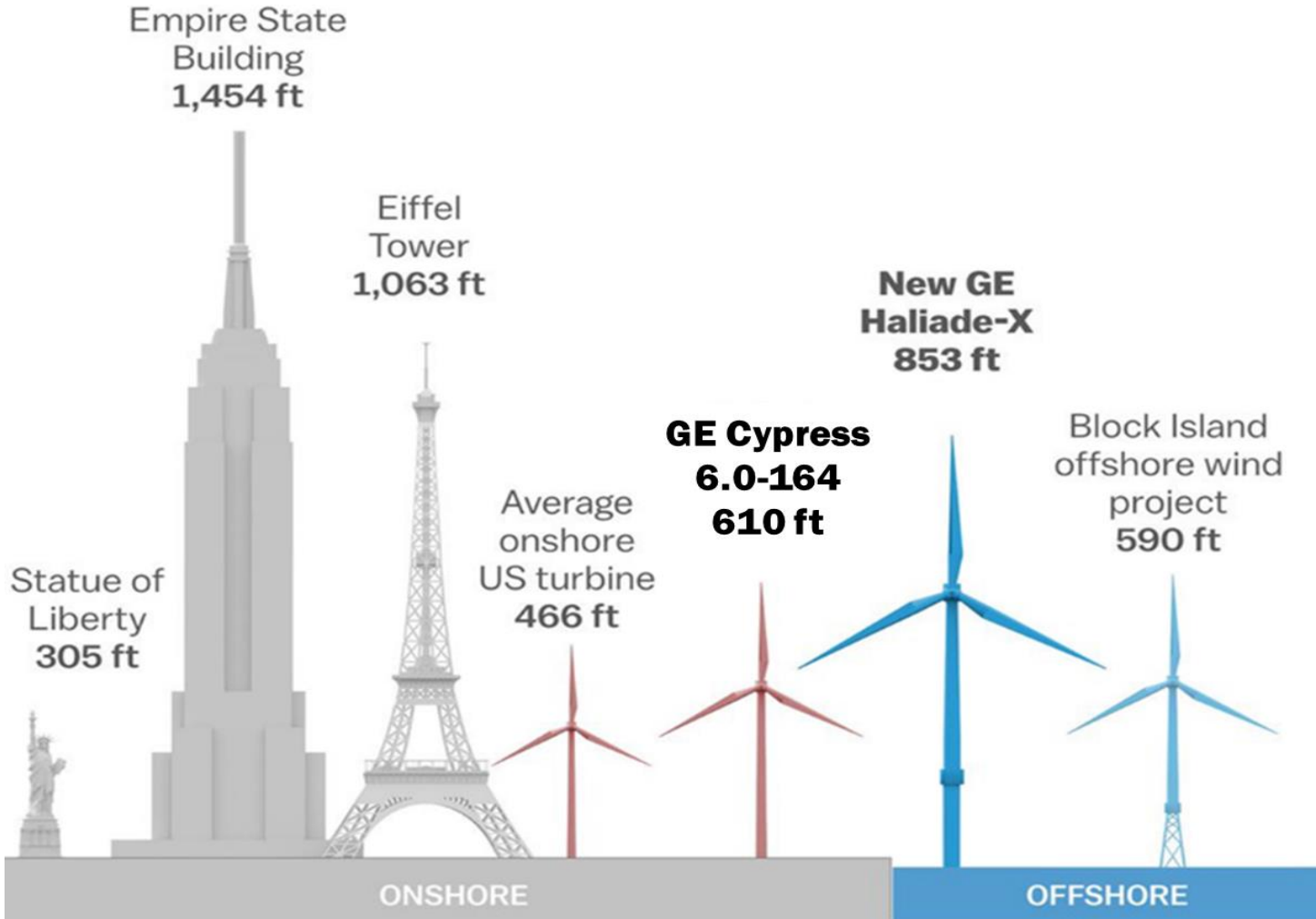
Turbine Selection

- Representative turbine: GE Cypress 6.0-164
  - Specific Power 284 W/m^2
  - Rotor Diameter 164 m
  - Turbine rating 6.0 MW
  - Hub heights available up to 112 m
- Selection of a land-based model due to transportation constraints in the Great Lakes and commercial availability aligned with timeframe of Great Lakes projects
- Supply chain for 6.0 MW scale land-based turbines may be more sustainable
- Class I or II machines are considered viable due to high mean wind speeds in the Great Lakes – many other options exist.

GE Cypress Platform Prototype

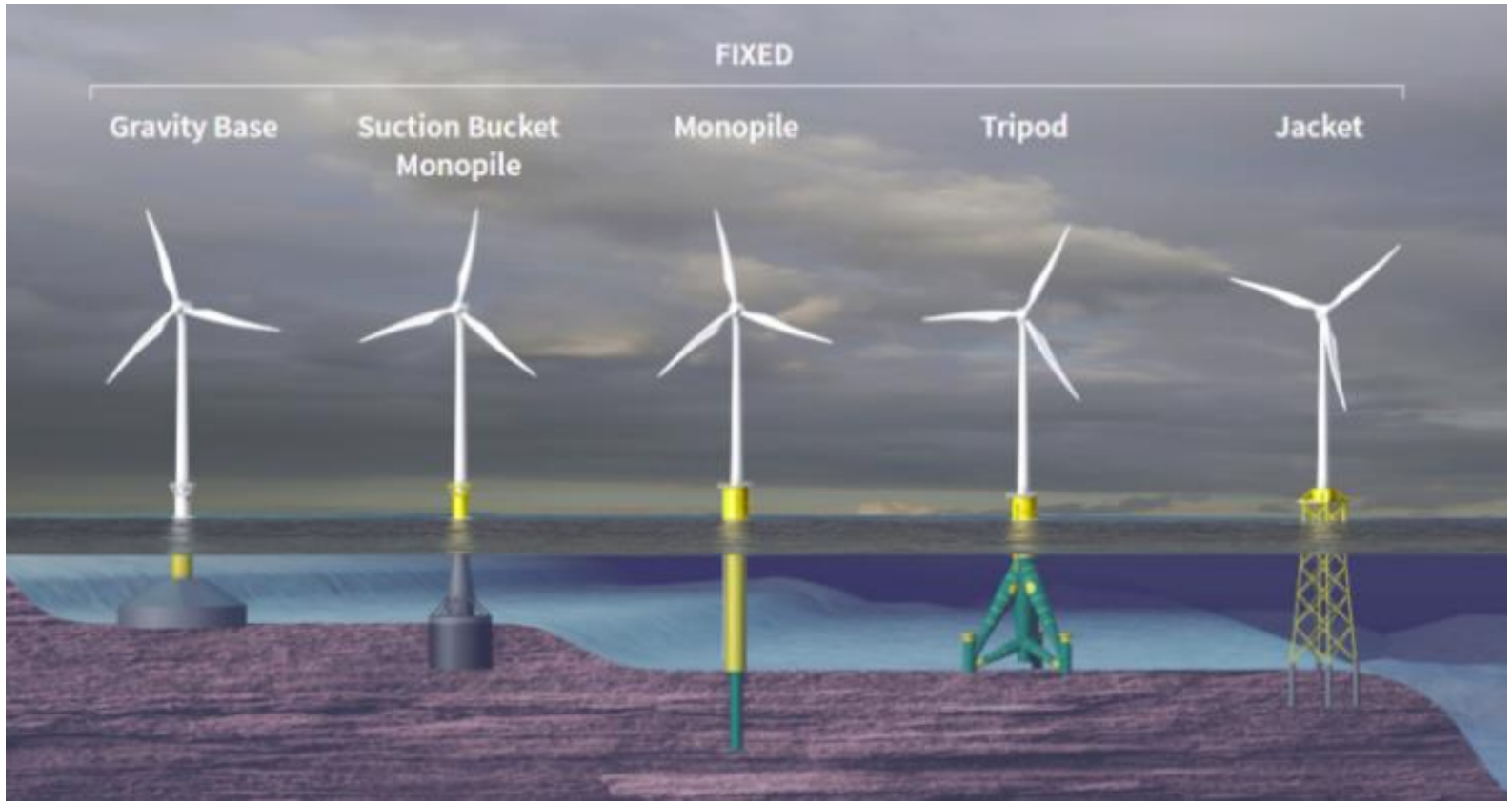
Comparison of Turbine Sizes

- Great Lakes wind turbines will be smaller than the 12 to 15-MW Class ocean-based wind turbines
- Comparable to Block Island Wind Turbines
- FAA limitations may restrict maximum height to 610 ft
- One GE Cypress 6.0-164 wind turbine can produce over 20 GWh per year – enough to power about 2,800 NY homes.



Fixed-Bottom Substructure Types: Lake Erie

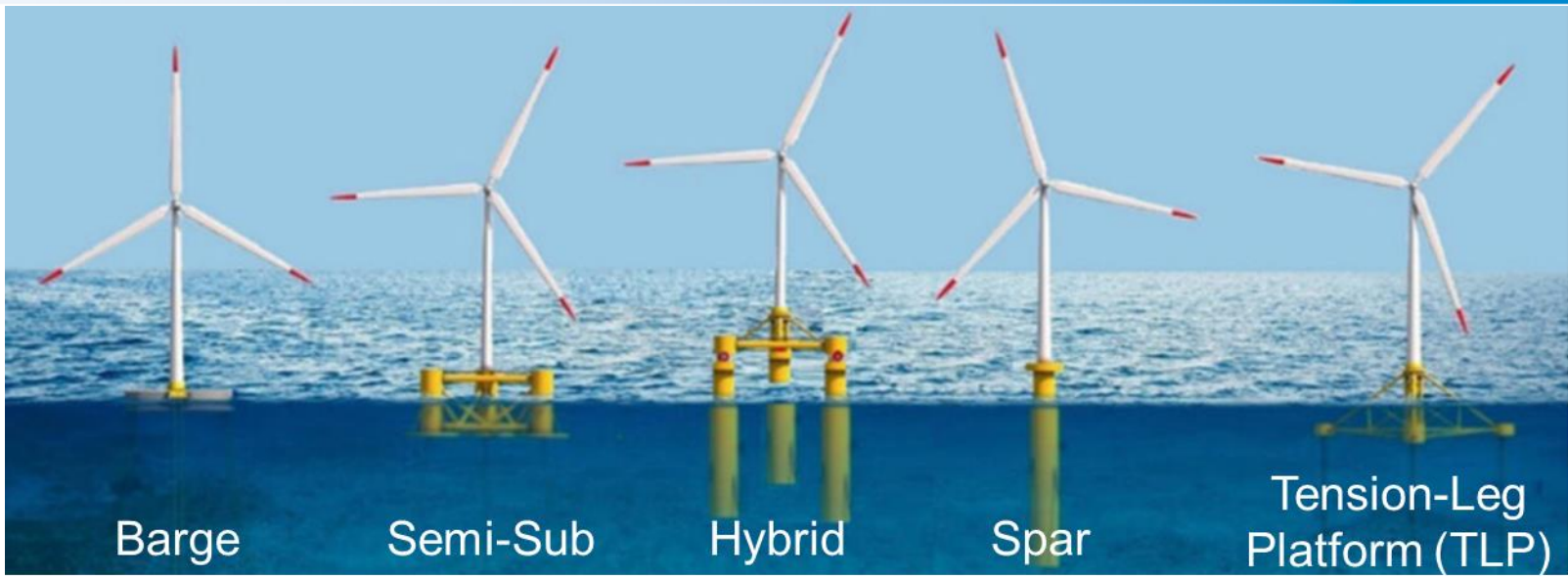
- **Considerations for support structure feasibility**
  - Installation method
  - Seabed compatibility
  - Ice structure interaction
  - Local manufacturability
  - Cost
  - Technology readiness
- **Key Drivers for Lake Erie**
  - Low profile at waterline
  - Shallow lakebed penetration due to bedrock
  - Port adaptability



e.g. LEED Co is using Mono-Buckets in Lake Erie

Floating Substructure Types: Lake Ontario

- **Floating substructures have not yet been deployed in ice-covered waters**
- **Considerations for support structure feasibility**
  - Installation method
  - Seabed compatibility
  - Ice structure interaction
  - Local manufacturability
  - Cost
  - Technology readiness
- **Key Drivers for Lake Ontario**
  - Low profiles at waterline
  - Port adaptability



Cost Modeling and Cost Reduction Pathways

Scenario development

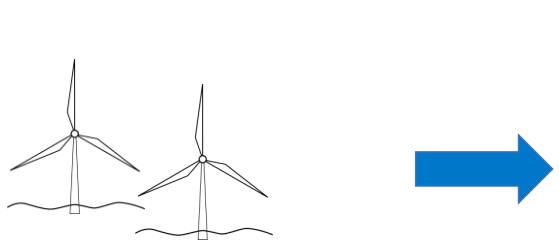
- Fixed and floating scenarios
- Capacities and technologies based on commercial operation date

Model customization

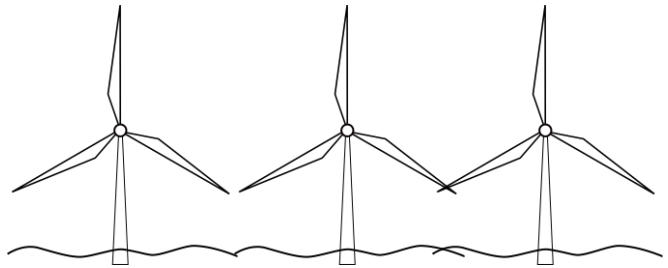
- Updating generic assumptions in ORCA and ORBIT for the Great Lakes
- Ports, vessels, grid, turbine rating, capacity factors, ice protection

Cost and sensitivity study

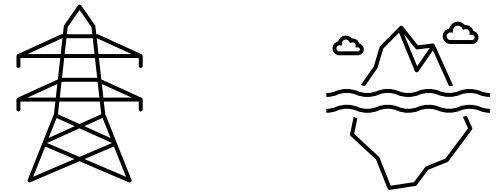
- ORBIT: Installation timelines and costs
- ORCA: LCOE heat maps, cost projections, detailed cost breakdowns

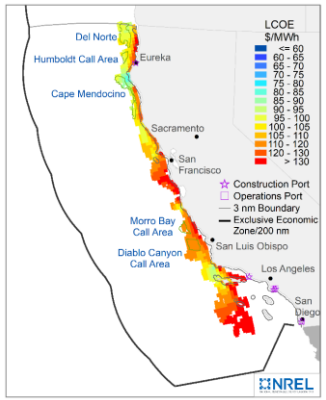


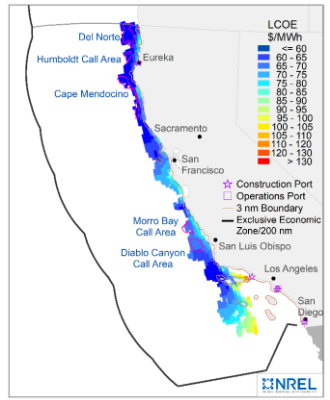
Near-term COD



Long-term COD







Jobs and Economic Development

- Estimating the **job and economic impacts** using NREL's Jobs and Economic Development Impact (JEDI) model
  - Results will include the impacts of development, manufacturing, installation, and operations for the state of New York
- Assessing the **workforce and economic development potential** from port utilization to support wind development in Lake Erie and Ontario
- **Identifying existing workforce programs** at vocational schools, community colleges, and universities which could train and educate a Great Lakes wind workforce

Thank you

For more information, please contact:

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Great Lakes Wind Feasibility Study

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Great Lakes Wind Feasibility Study

- **The Advisian Team is working on three aspects of the NYSERDA Great Lakes Wind Feasibility Study**
  I. State and Federal Permitting Study
  II. Geophysical and Geohazards Study
  III. Relative Risk, Minimization/Mitigation, and Benefits Study

Great Lakes Wind Feasibility Study: Risks/Benefits

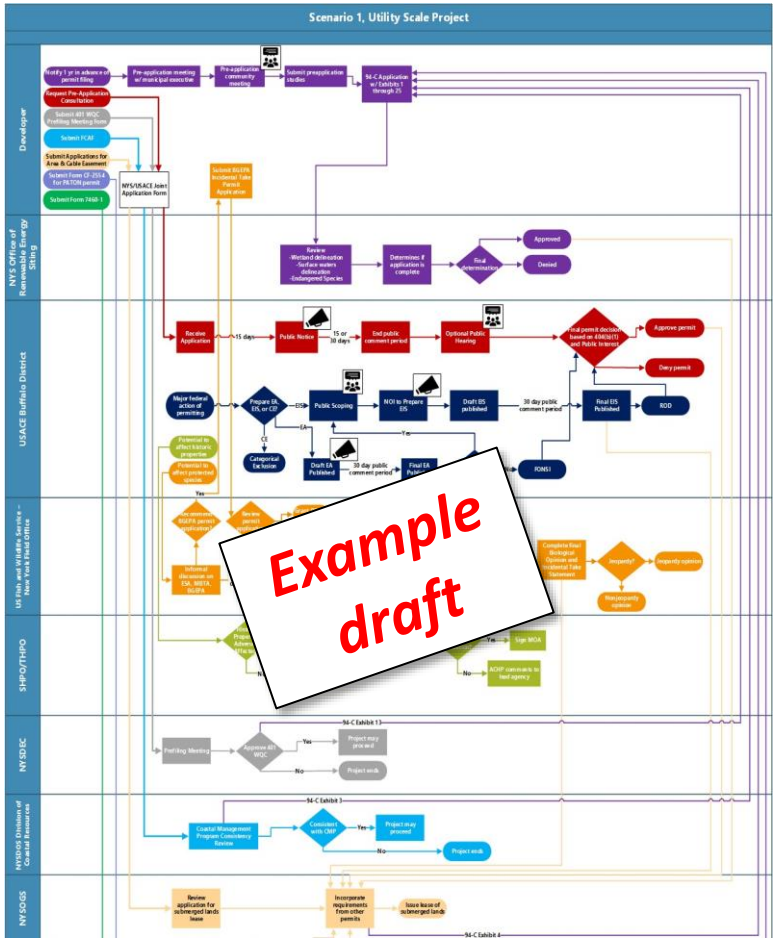
- > Unique Aspects of GL Wind
  - Submerged Lands Act
  - Near international boundary w/Canada
  - Very few prior freshwater wind farms
- > 14 Major Federal and State Permits, Consultations, or Authorizations
  - Wide range of issues addressed
  - Permits required for construction, turbines, cable installation
  - Required permits/approvals vary based on wind farm size (e.g., SEQRA vs. 94-c) and lead NEPA agency (i.e., there are multiple paths)
- > Case studies including freshwater wind farms in Europe

Permit or Regulatory Requirement	Covered Activities
National Environmental Policy Act Review	Major federal action such as granting a federal permit
Clean Water Act Section 404/Rivers and Harbors Act Section 10 Permit	Excavation or placement of dredged or fill in waters of the U.S.
Clean Water Act Section 401 Certification	Federal action that discharges to navigable waters of the U.S.
National Historic Preservation Act Section 106 Consultation	Impacts to historical or cultural resources
U.S. Coast Guard Private Aid to Navigation Permit	Obstructions or hazards to navigation
Federal Aviation Administration Obstruction Evaluation	Hazards to air navigation
National Oceanic and Atmospheric Administration National Marine Sanctuaries Section 304(d) Consultation	To be determined upon sanctuary designation
New York State 94-C Regulations	Major renewable energy project siting and permitting
New York State Environmental Quality Review Act Review	Discretionary state agency activities not covered by 94-C
Coastal Zone Management Act Consistency Review	Federal activities within New York State's coastal zone
New York State Dredge and Fill Permit	Excavation or placement of dredged or fill in New York State waters
New York State Grants of Lands Underwater	Structures located on state submerged lands
New York State Coastal Erosion Hazard Areas (CEHA) Permit	Activities in designated CEHA areas
New York State Incidental Take Permit	Take of New York State listed species

Great Lakes Wind Feasibility Study: Permitting

> Developed cross-functional process flow charts for the overall permitting process

- Two scenarios developed
- Shows activities of the developer and all federal and state regulators
- Handoffs between agencies and actors (i.e., integration points)
- Opportunities for public comment and public announcements
- Visualizes triggers, decisions points, and information flows between processes



Great Lakes Wind Feasibility Study: Risks/Benefits

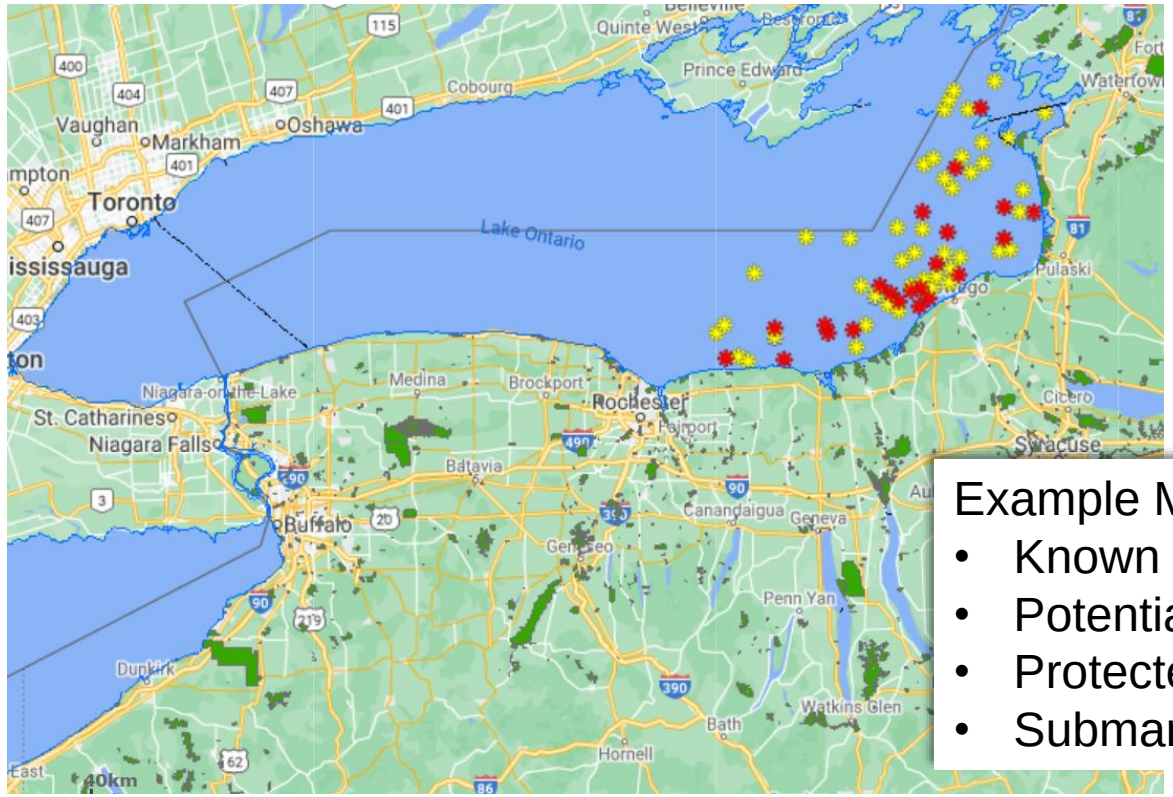
In progress - Relative Risks, Minimization/Mitigation, Benefits Study

Construction Stressors	Post-Construction Stressors
Noise/Particle Motion without Pile-Driving	Noise/Particle Motion
Noise/Particle Motion with Pile-Driving	Scour
Increased Vessel Traffic	EMF, Vibration, Heat
Bottom Disturbance	Permanent Structure
Habitat Alteration	Collision/Attraction/Displacement
Collision/Attraction/Displacement	

Contacted Agencies, Academics, Officials
US Fish and Wildlife Service
NY Department of Environmental Conservation
Ontario Ministries of Environment, Conservation, and Parks
US Geological Survey
Audubon
Black Swamp Bird Observatory
BirdCast
The Nature Conservancy
American Bird Conservancy
University of Maryland
University of Delaware
University of Michigan
Point Blue Conservation
Black Swamp Bird Observatory

Great Lakes Wind Feasibility Study: Risks/Benefits

In progress - Relative Risks, Minimization/Mitigation, Benefits Study



Example Map:

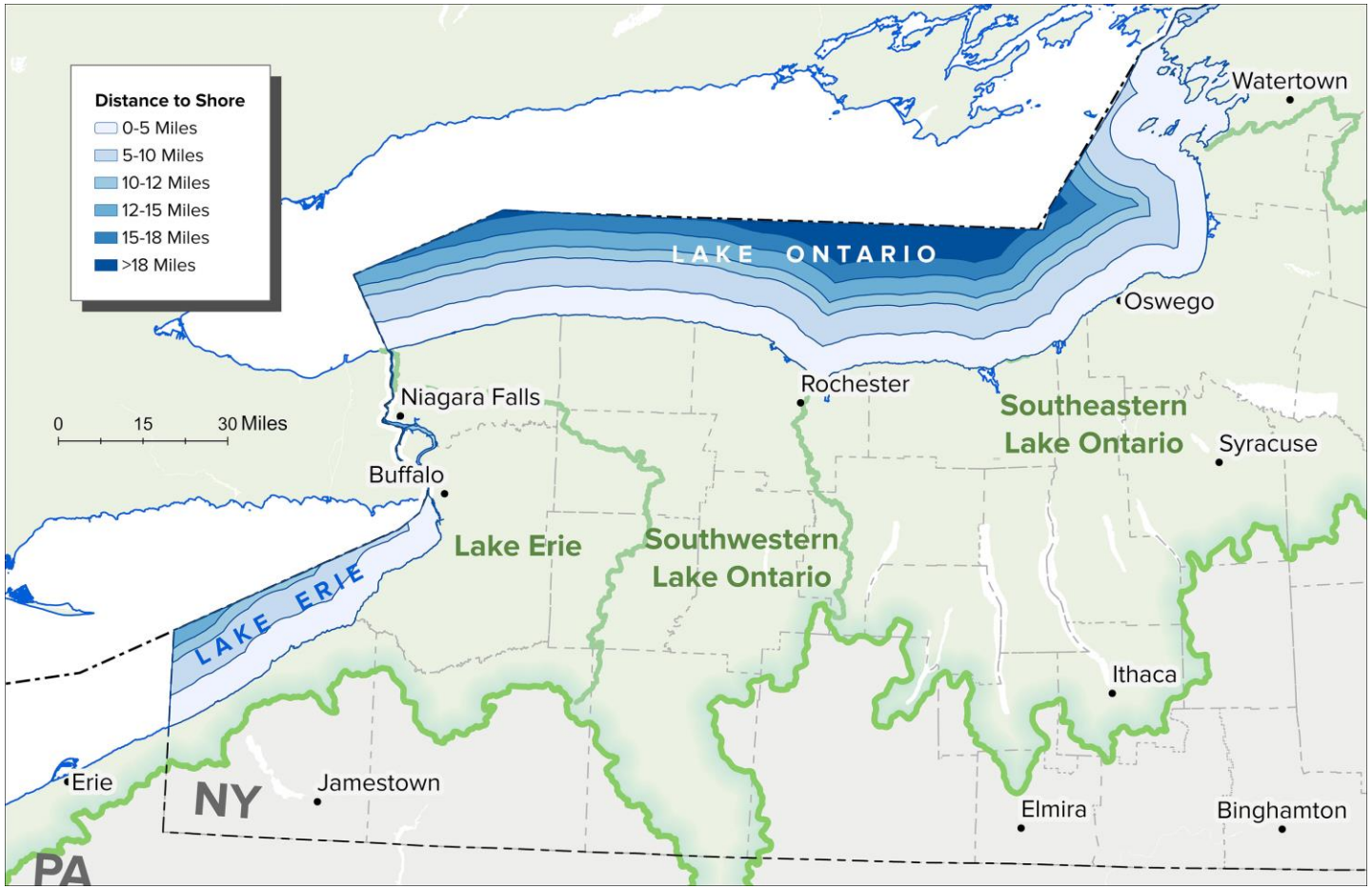
- Known Wrecks
- Potential Wreck
- Protected Areas
- Submarine Cables

Receptor Groups
Shorebirds
Waterfowl
Migrating birds
Bats
Wetlands
Dunes
Fishing Areas
Areas of Concern
Important Environmental Areas
Wrecks
Shipping

Visibility and Related Impacts

Ongoing and Future Analysis

- Based on the composite data and parameters provided by NYSERDA and NREL
- Visual impact along the coastline will be determined by using a baseline wind turbine/substation design and common, GIS-based line-of-sight and over-the-horizon geometric analyses
- Establish zones of visibility for the nominal size/height of the structures selected



Thank you

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Interconnection Feasibility

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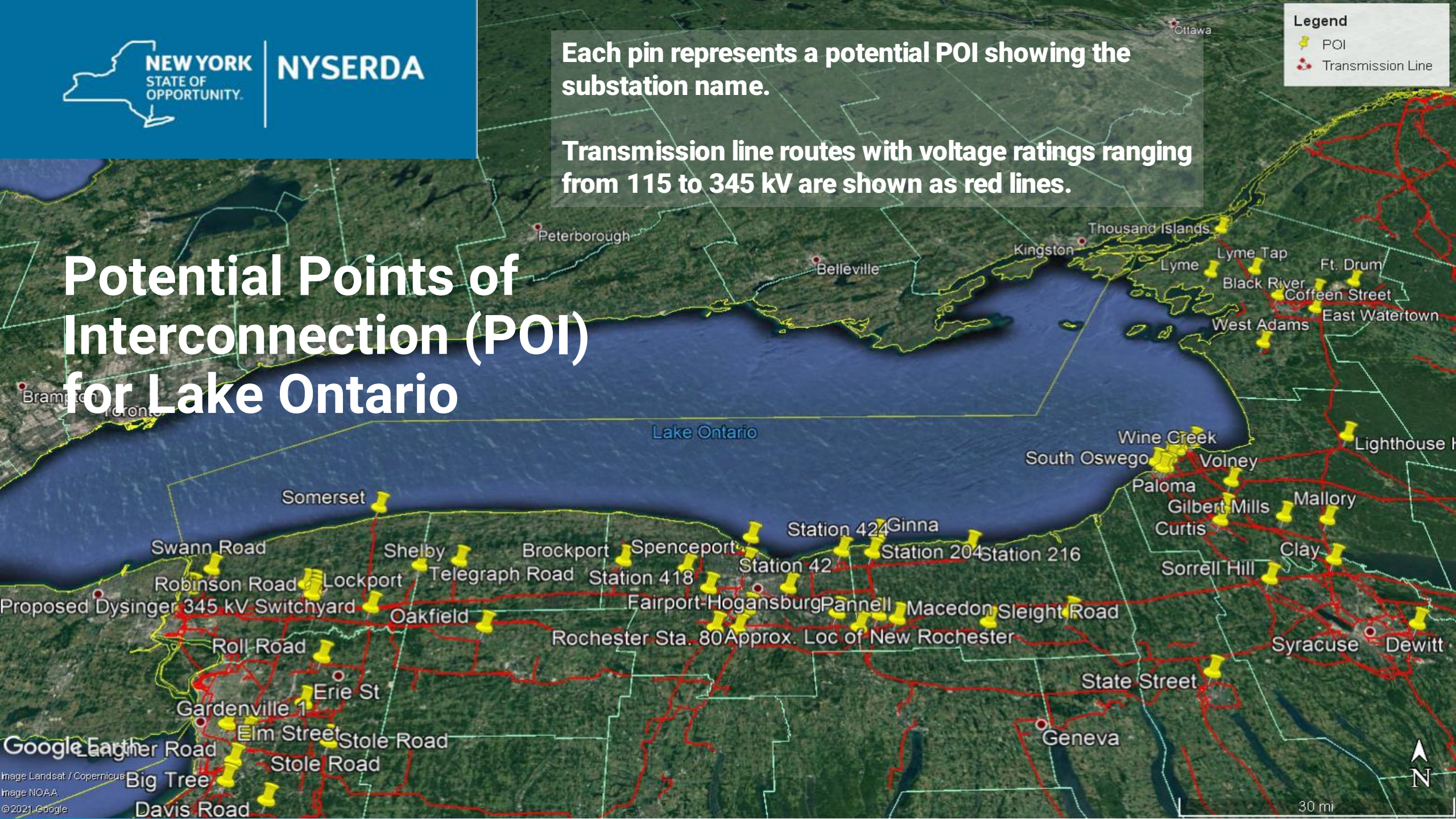
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NYSERDA
Each pin represents a potential POI showing the substation name.
Transmission line routes with voltage ratings ranging from 115 to 345 kV are shown as red lines.
Potential Points of Interconnection (POI) for Lake Ontario
Legend
POI
Transmission Line
Ottawa
Peterborough
Belleville
Kingston
Thousand Islands
Lyme
Lyme Tap
Ft. Drum
Black River
Coffeen Street
East Watertown
West Adams
Lake Ontario
Wine Creek
South Oswego
Volney
Lighthouse H
Paloma
Gilbert Mills
Mallory
Curtis
Clay
Sorrell Hill
Somerset
Swann Road
Shelby
Brockport
Spenceport
Station 424
Ginna
Station 204
Station 216
Station 42
Station 418
Telegraph Road
Robinson Road
Lockport
Proposed Dysinger 345 kV Switchyard
Oakfield
Fairport
Hogansburg
Pannell
Macedon
Sleight Road
Rochester Sta. 80
Approx. Loc of New Rochester
Roll Road
Syracuse
Dewitt
Erie St
State Street
Gardenville 1
Elm Street
Stole Road
Geneva
Stole Road
Big Tree
Davis Road
Google Earth
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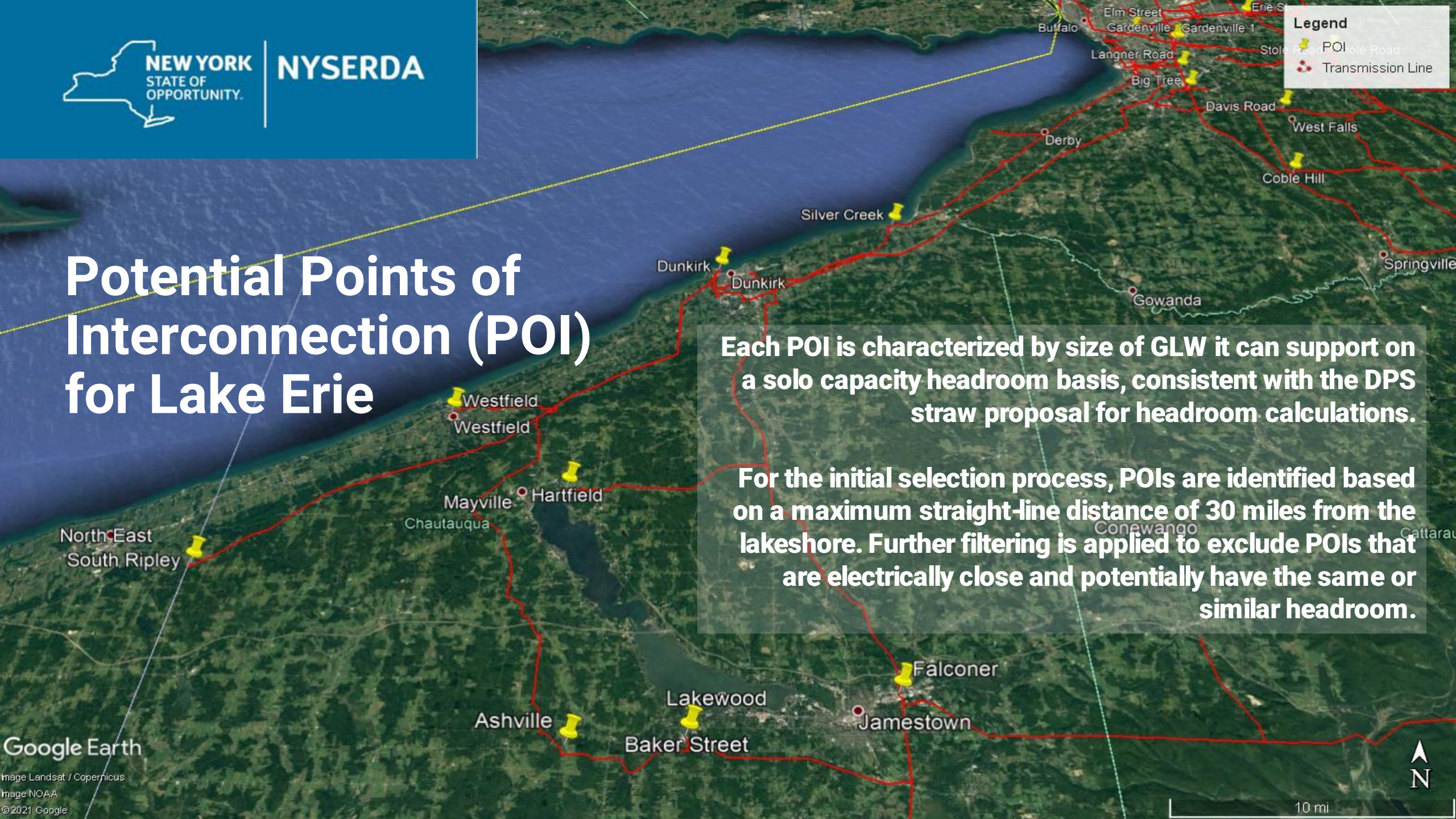
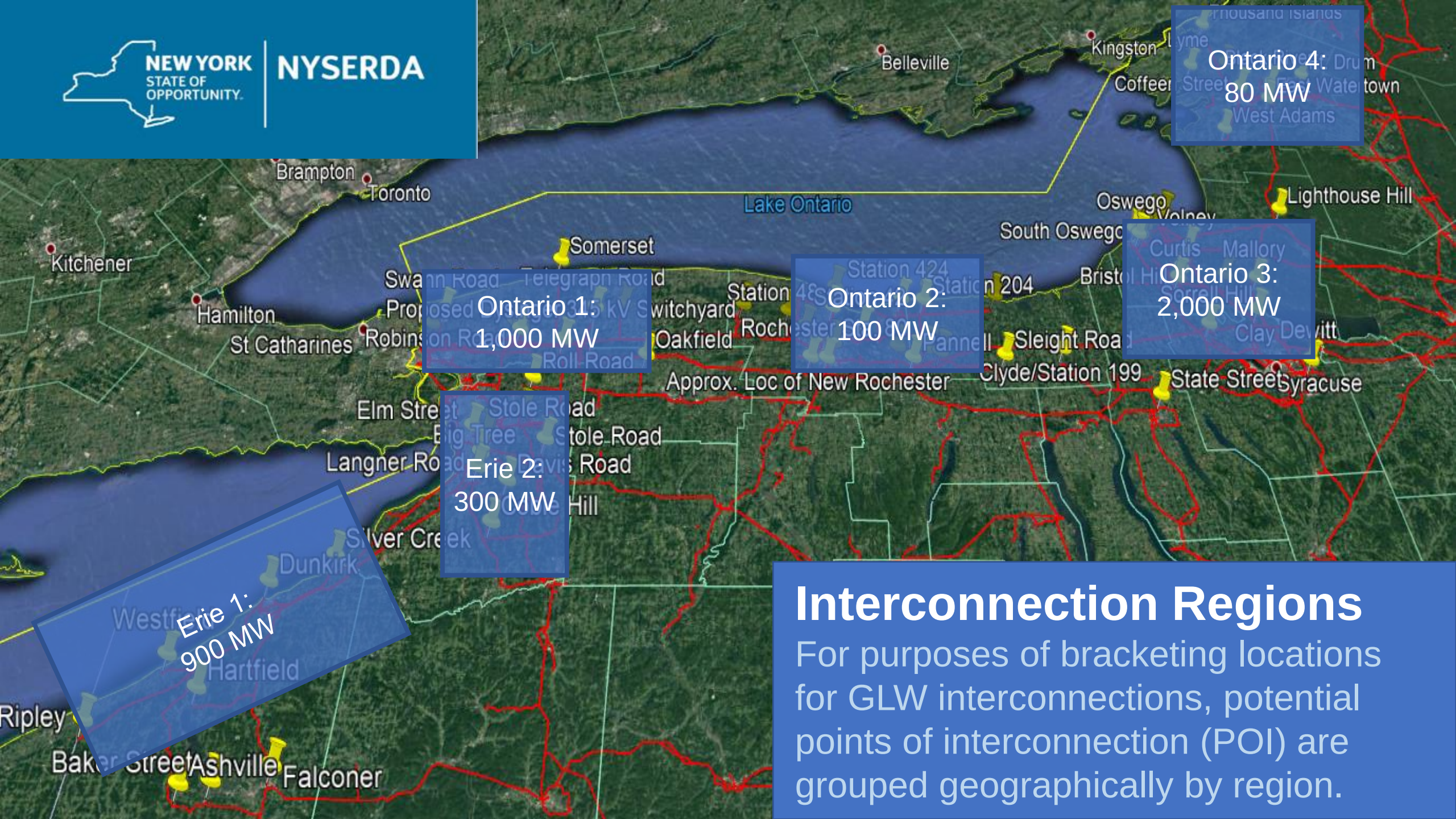
Potential Points of Interconnection (POI) for Lake Erie



Each POI is characterized by size of GLW it can support on a solo capacity headroom basis, consistent with the DPS straw proposal for headroom calculations.

For the initial selection process, POIs are identified based on a maximum straight-line distance of 30 miles from the lakeshore. Further filtering is applied to exclude POIs that are electrically close and potentially have the same or similar headroom.


NEW YORK
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Ontario 4:
80 MW
Ontario 1:
1,000 MW
Ontario 2:
100 MW
Ontario 3:
2,000 MW
Erie 2:
300 MW
Erie 1:
900 MW
Lake Ontario
Brampton
Toronto
Kitchener
Hamilton
St Catharines
Somerset
Oakfield
Approx. Loc of New Rochester
Oswego
Lighthouse Hill
Sleight Road
Clyde/Station 199
State Street
Syracuse
Dunkirk
Hartfield
Ripley
Ashville
Falconer
Belleville
Kingston
Interconnection Regions
For purposes of bracketing locations for GLW interconnections, potential points of interconnection (POI) are grouped geographically by region.

Status Update

- Selected power flow models: NYISO FERC 715 cases for 2025 and 2030, new model developed to represent 2030 with 70% renewable energy
- Identified initial set of Points of Interconnection (POIs) using defined criteria
- Calculated capacity headroom for each POI
- Grouped POIs by geographic region. Identified capacity headroom on a regional basis
- PENDING: Capacity headroom for total combined interconnections from both Lake Ontario and Lake Erie

Thank you

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Public Input From Public Feedback Session

Great Lakes Wind Feasibility Study

Topic Types from June 9, 2021

> Role of Wind in Energy Transition

> Policy and Planning

> Potential Future Siting Considerations

> Environmental Impacts

> Socioeconomic Impacts

Registration Numbers	**151 registrants** **110 attendees**
Commenters	**25 verbal** **62 written**

Great Lakes Wind Feasibility Study

Public Input From Public Feedback Session and Written Comments

June 2021

Role of Wind in Energy Transition	• Include context on the necessity of renewable energy transition in mitigating future climate impacts, including to the Great Lakes • Provide context on the role of Great Lakes Wind in achieving overall CLCPA commitments, including assessment of need for upstate wind capacity • Compare wind energy with other potential renewable energy sources
Policy and Planning	• Be transparent on data sources and methodologies in the Study to ensure the public understands the science and facts that will be utilized in any future decision-making • Provide information on professionals internal and external to state government working on the Study • Conduct additional public outreach • Consider support for and opposition to Great Lakes Wind in the region • Consider lessons learned from Block Island Wind Farm
Potential Future Siting Considerations	• Establish a standard for "responsible" siting of wind in the Great Lakes • Articulate rationale for any differences in approach between ocean wind and Great Lakes wind • Respond to concerns about Public Trust Doctrine and Rivers and Harbors Act of 1899 • Consider the utilization of different wind technologies (e.g. suction, floating)

Great Lakes Wind Feasibility Study

Public Input From Public Feedback Session and Written Comments

June 2021

Environmental Impacts	• Assess wind impacts on wildlife, soil sediment, local ecosystems, sensitive habitat, drinking water, and public health • Assess the likelihood of contamination from wind turbines or manufacturing • Include plan for decommissioning turbines in an environmentally sensitive way • Assess cultural resources
Socioeconomic Impacts	• Analyze impacts on lakeshore tourism (e.g., businesses running sportfishing and boating recreational activities) and fisheres • Analyze jobs impacts, including assessment of impacted industries, wages and career growth potential, increased regional investment, domestic supply chains, and export opportunities • Analyze ratepayer impacts from transition to wind energy • Analyze the potential for Community Benefits Agreement • Evaluate programs necessary for training and expanding the domestic workforce with an emphasis on ensuring opportunities for dislocated workers, as well as access and career pathways for both disproportionately impacted communities and BIPOC communities

Next Steps

Great Lakes Wind Feasibility Study Remaining Timeline

Draft Study
Fall 2021

- Continued research and Study production
- Internal NYSERDA review
- Public Webinar #4 (October)

Final Study
Early 2022

- Filling with PSC to satisfy order
- Public release
- Additional public webinars (as needed)

Public Service Commission 2022

- Decision on feasibility of GLW
- Related public comment periods per regulation (if needed)

Next Steps

Great Lakes Wind Feasibility Study Engagement

> **Multiple opportunities to stay engaged!**

> **Webinar #4: October 2021**– Presentation of the draft Study by NYSERDA and the Study researchers

> **Sign-up for email updates** and get the latest on study progress at the NYSERDA Great Lakes Wind website **nyserda.ny.gov/Great-Lakes-Wind-Feasibility-Study**

> Email the Great Lakes Wind Team at **greatlakeswind@nyserda.ny.gov**

Thank you

For more information, please contact:

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Visit the project website at:
nyserda.ny.gov/Great-Lakes-Wind-Feasibility-Study

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