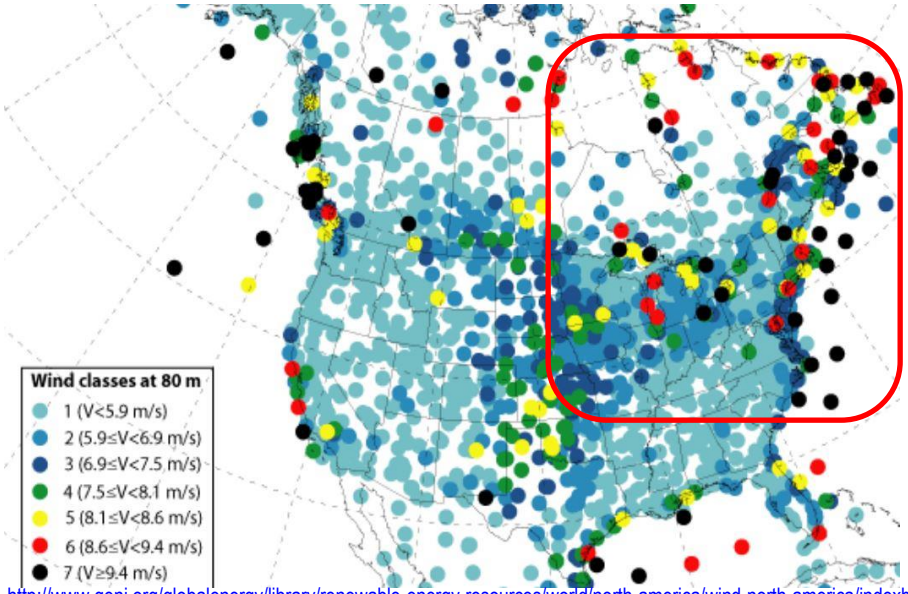
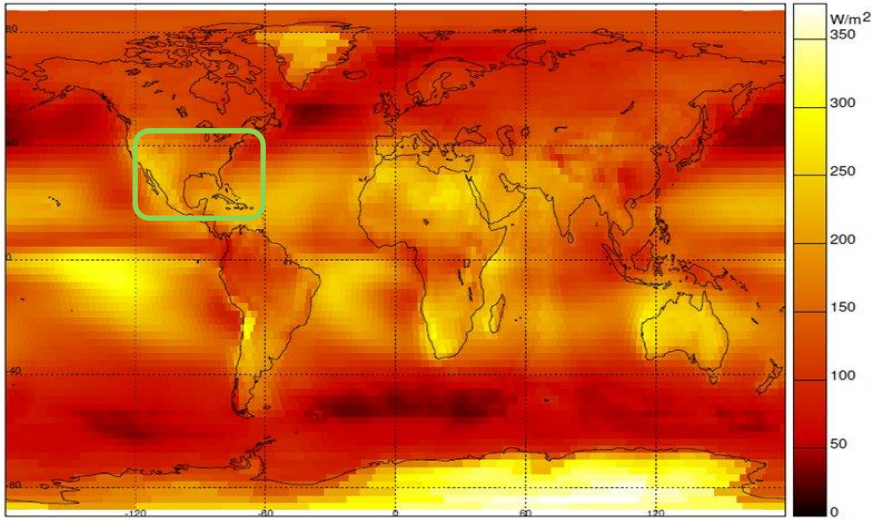
World's Largest Pumped Storage System Opportunity

Opportunity Summary

https://www.tripadvisor.com/Tourism-g48261-Niagara_Falls_New_York-Vacations.html



http://www.geni.org/globalenergy/library/renewable-energy-resources/world/north-america/wind-north-america/indexbig.shtml



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https://www.dlr.de/pa/en/desktopdefault.aspx/tabid-4621/7605_read-11414/

MOTIVATIONS: Growth in Pumped Hydro Storage Systems

USA goals are:
- 100% clean electricity by 2035
- Economy-wide decarbonization by 2050

Solar power is intermittent
Wind power is intermittent
Tidal power is intermittent

In addition to growing renewable energy generation and transmission, tremendous growth in energy storage is needed by 2035, according to NREL:
- 120–350 gigawatts (GW) diurnal (daily) storage
- 100-680 gigawatts (GW) seasonal storage

https://www.energy.gov/eere/articles/nrel-study-identifies-opportunities-and-challenges-achieving-us-transformational-goal

Diurnal storage by:
1) Pumped Hydro
2) Batteries
3) Other

Seasonal storage by:
1) Pumped Hydro
2) Hydrogen
3) Other

STATUS: Pumped Hydro Storage Systems & Technology

Pumped Hydro Energy Storage technology Is over a century old and is proven at the highest Technology Readiness Level, TRL 9.

Pumped Hydro Energy Storage accounts for over 94% of installed global energy storage capacity, far ahead of batteries or hydrogen energy storage.

https://www.hydropower.org/factsheets/pumped-storage

Biggest challenges for future growth are land submergence & environmental concerns for new reservoirs & dams.

OPPORTUNITY: World's largest Pumped Hydro Storage System

America is blessed with the opportunity to create the World's Largest Pumped Hydro Storage System…
without needing a new reservoir!

- Pump water from Lake Ontario to Lake Erie
- 400 gigawatts (GW) power and 2740 GWh daily energy storage, to meet over half of 2035 US energy storage needs for 100% clean electricity
- Water levels stay within seasonal variations, with 360 billion cu.ft storage only needing 1.75 ft change in Lake Ontario and 1.3 ft change in Lake Erie

Develop Win-Win solutions for all stakeholders

Low risk combined with *many* value-adding benefit mechanisms:

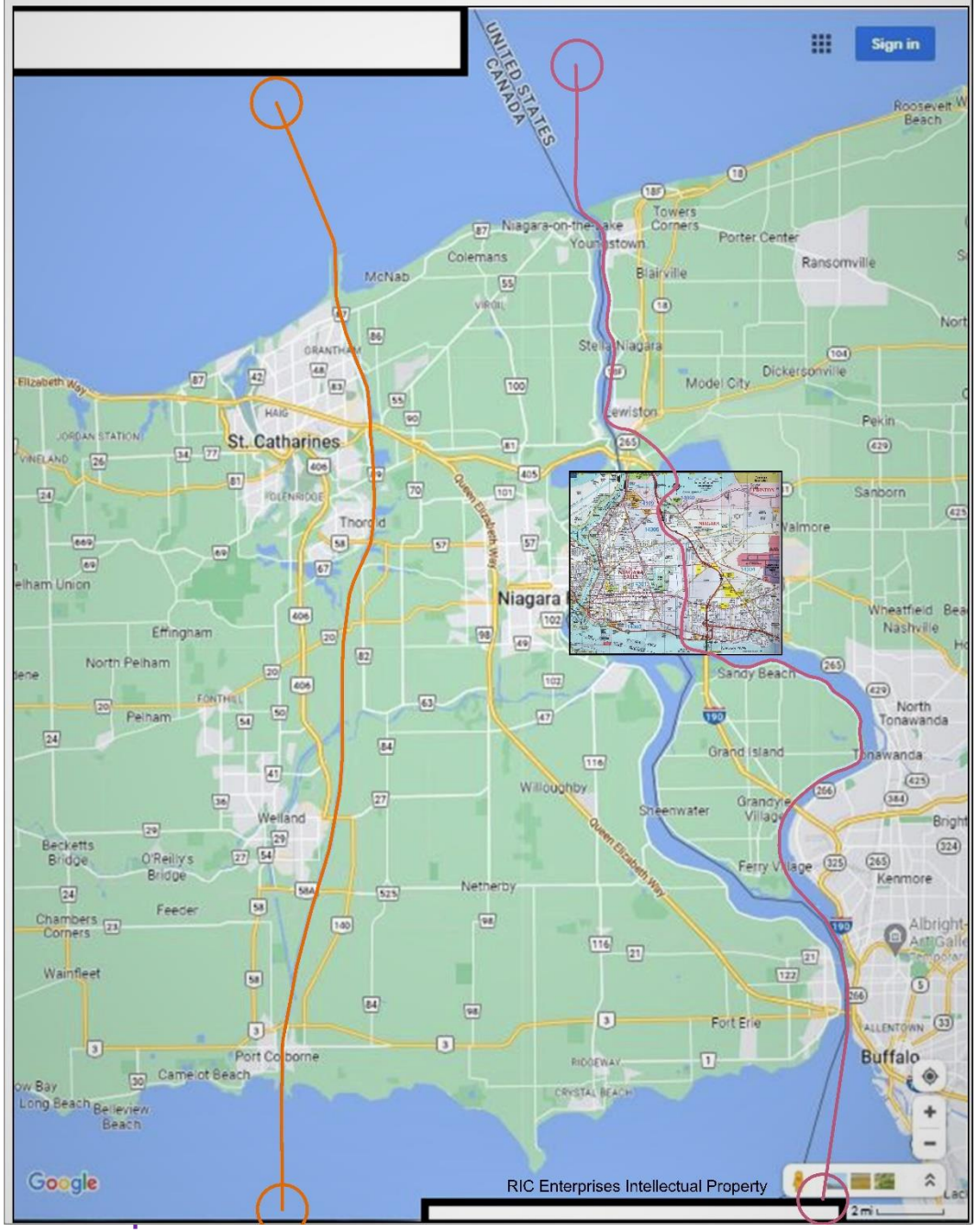
- Seize storage leadership from China, with system 100 times larger than theirs
- Boost the economy … ~ a hundred thousand good jobs over a decade timeframe
- Boost Niagara Falls tourism with patented flow control + tourism enhancements
- Managed water levels reduce weather disaster impacts (storms, seiches, ice jams…) for *all* states with Great Lakes shorelines

NIAGARA PUMPED STORAGE SYSTEM

NOMINAL ULTRA-LARGE PENSTOCK PIPE ROUTINGS

Implement appropriate design features to assure human safety and to minimize harm to fish and wildlife, as well as to minimize environmental & erosion risks.

PUMPED STORAGE SYSTEM WITH WATERFALL CONTROL SUBSYSTEM
Dual Nominal US & Canada Ultra-Large Penstock Pipe Routings



NIAGARA PUMPED STORAGE SYSTEM – NEAR-TERM AVENUES FORWARD

- A Columbia University student team is conducting a comprehensive preliminary study, under the umbrella of the DOE sponsored Hydropower Collegiate Competition.
- Initial engagements are planned with community stakeholders & media.
- RIC Enterprises is engaging with government and industry and non-government entities on R&D collaboration, IP agreements, technology & project collaboration, etc.
- Collaborative development of a Comprehensive Roadmap to Implementation, for the ultimate benefit to the USA, Canada, humankind and our global environment.
- Additional avenues to be defined and implemented …

Thank you !!