

Presentation Summary for ESA Meeting Paper:

Evaluation of a Pumped Storage Facility Operating Between Lake Erie and Lake Ontario

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This paper evaluates the largest potential pumped storage opportunity anywhere in North America: the Lake Erie/Lake Ontario System. The proposed Isthmus of Niagara project (“Niagara Pumped Storage”) does not require that any dry land be flooded (except for minor canal surface area) to implement, and so would arguably have much less environmental impact than a comparable project based on new reservoirs. Niagara pumped storage is in essence an energy storage scheme that is capable of providing enough storage capacity to harmonize the available power from wind, tidal, and solar sources with power demand in a large portion of the US and Canada. Although the storage capacity at Niagara could be devoted to economic dispatch of nuclear and run-of-river hydro power, this potential use for pumped storage between Lake Erie and Lake Ontario would fail to utilize the unique potential for energy storage over much longer periods than any other pumped storage facility in the world. The average 99.4 meter difference of elevation between Lake Erie and Lake Ontario combined with their large surface area would provide 1300 gigawatt-hours of stored energy (at 70% overall efficiency) if the level in Lake Ontario is allowed to vary by 30 cm during a charge/discharge cycle (less than the typical seasonal variation of Lake Ontario’s level, which is about 45 cm). We define project characteristics for a 10 GW pumped storage facility. Although it would be a massive engineering project to realize the storage potential of these lakes, the benefits for not having to purchase the land, create the reservoirs, and flood dry land for the pumped storage project are very large advantages of the scheme. The proposed facility would be uniquely able to deal with peak demand or low wind periods lasting for more than a week. This paper also describes the natural synergism of Niagara pumped storage with an HVDC supergrid.

Bio of the Presenting Author

Roger Faulkner is the founder of Rethink Technologies, Inc, (www.rethink-technologies.com) and a polymer scientist who studied at Akron University. His Ph.D. research was on one of his inventions, reaction wave polymerization, and most of his 30 year career since then has had to do with pursuing and developing this and other inventions, not all in the area of polymer science. He has a strong interest in enabling technologies for renewable energy, including development of a long distance multi-terminal HVDC grid based on “electric pipelines” (which will be mentioned briefly in his presentation, because the Niagara pumped storage project requires a major regional transmission upgrade to be practical), and the topic of the present paper, using the Great Lakes to provide the massive energy storage capacity needed to make wind power practical for making a large contribution to our North American energy economy. He has had a strong interest in energy policy issues for many years, and was a full party and public intervenor in the Wisconsin PSC’s Advance Plan 6 hearings in 1991, where he first introduced the concept of HVDC pipelines in testimony he presented with Professor Willis (Bill) Long of UW-Madison, a leading expert in HVDC power transmission.