TC Energy Pumped Storage Project at Meaford

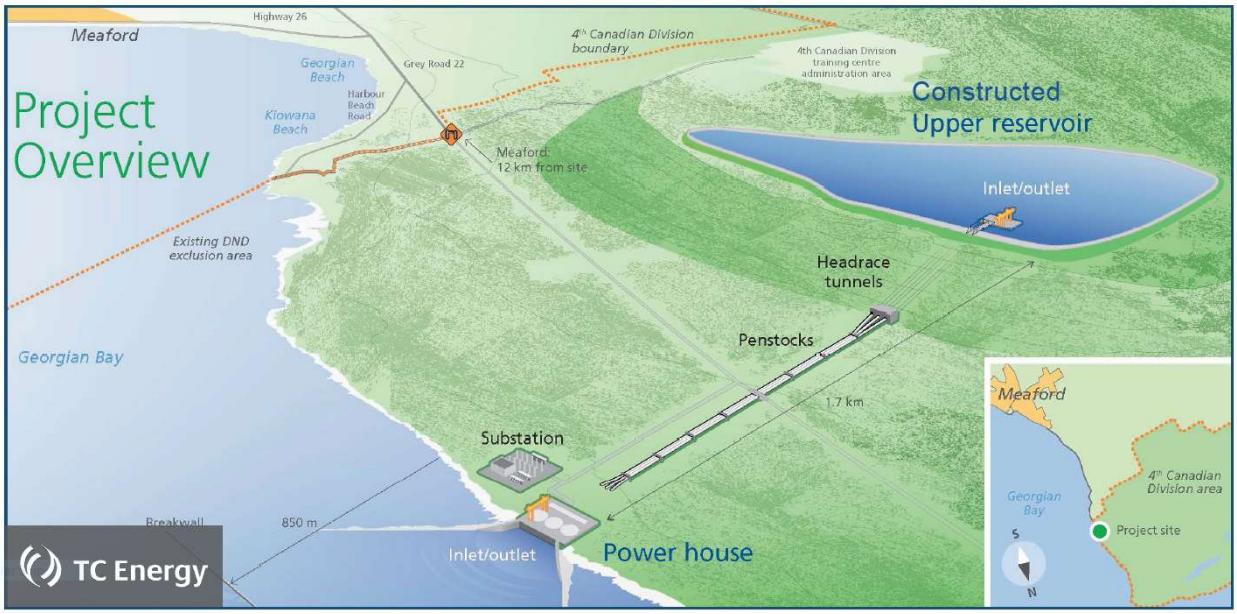
February 9, 2020

Proposed Project

TC Energy (TCE) is the new name for TransCanada Corp. and is the majority shareholder of TransCanada Pipelines.

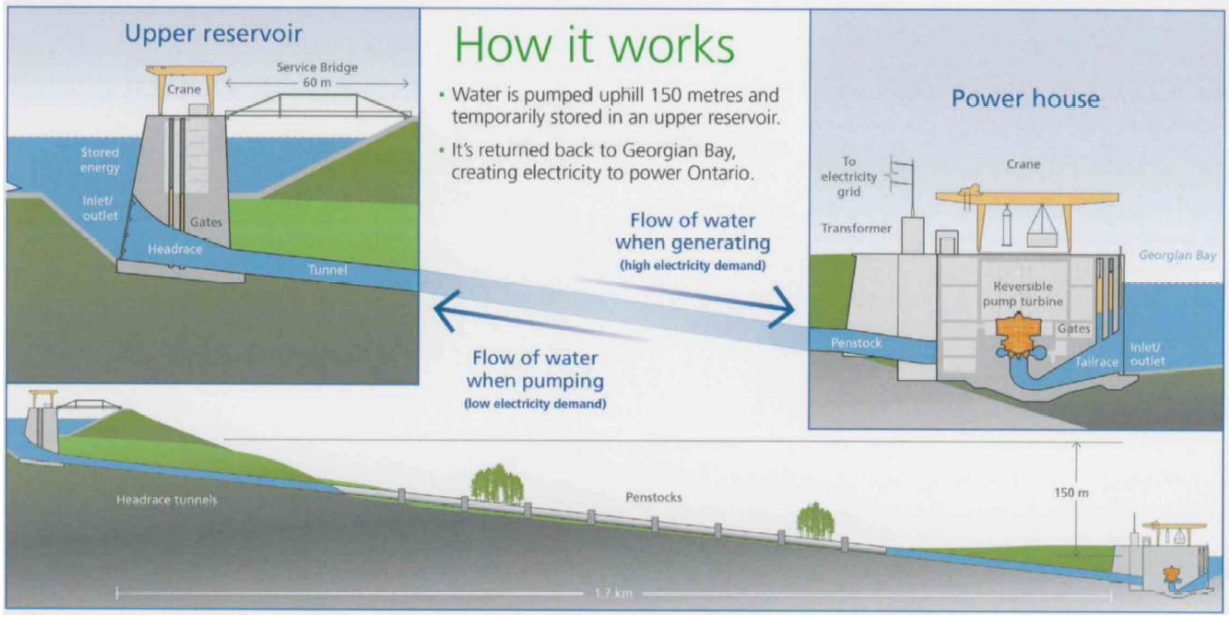
They propose to construct a very large pump storage facility just north of Meaford on land owned by the Department of National Defense (DND). The project is at the pre-design stage and TCE and DND are holding public consultations on the proposal.

The site was selected because it provides 150 m of vertical elevation above the lake and is within 100 km of a power grid that can handle the level of power the project would produce.



How it Works

As per the diagrams, water would be pumped out of Georgian Bay into the reservoir above at low off-peak hydro rates, when most of Ontario's energy needs are being supplied by low-carbon energy sources such as nuclear and wind energy. It would then be released down the steep slope to generate power at peak demand times, when we rely more heavily on natural gas-fired hydro power plants. The current site was selected because it provides 150 m of vertical elevation above the lake and is within 100 km of a power grid that can handle the level of power the project is projected to produce.



Key Statistics

- Output: 1,000 MW
- Stored energy: 8,000 MWh (1,000MW per hour for 8 hours)
- Flow rate in both directions (up and down) is around 1,000 cubic meters per second (cms) - equivalent to ~42% of the average flow rate over the Canadian side of Niagara Falls (Horseshoe Falls).
- Efficiency: ~72% – i.e. for every 100 KW used to pump the water into the reservoir, 72 KW are generated when the water is released.

Viability

Despite this project being only ~72% efficient, the price differential between the off-peak and peak hydro supply rates creates significant revenue. In addition, the grid balancing capabilities of the 8,000 MW stored energy will furnish additional revenues. Much of the grid balancing need in Ontario is created by wind-power, which is obviously variable. Most of the energy consumed by the TCE project will come from nuclear generation.

GBA Action to date

Although the project is proposed for a site on the west coast of the Bay, GBA is examining this project because we have several concerns about its environmental impacts on Georgian Bay, notably fish mortality, water turbidity, water temperature increases, and habitat destruction. These impacts will affect the entire Bay, and we are concerned about the precedent it will set.

At this stage GBA is gathering information on the proposal from sources including:

- TCE at a meeting in October, who provided brochures and other material describing the projects and setting out the benefits.
- A local group called Save Georgian Bay that is opposed to the project. In particular, GBA has been communicating with group member Bruce Rodgers, an environmental consultant who was long-time GBA supporter Karl Schiefer's (see: https://georgianbay.ca/karl-schiefer-scientist-1944-2019/) business partner for 30 years.
- A public meeting in December hosted by TCE and DND at which ~400 mainly local residents turned up, almost all of them vigorously opposed to the project. Further material was provided by TCE and DND and many pertinent questions were asked.
- A meeting in January with Graeme Burt of ERM, who are the environmental and social impacts consultants to TCE for the project.
- Discussions with Northland Power who are proposing a similar, but smaller, closed loop project in eastern Ontario.

Benefits

The main benefits of this project are:

1. At peak demand, gas-fired power stations are currently brought online. This project would reduce that output by 1,000 MW per hour for up to 8 hours, which would significantly reduce CO2 emissions.

2. By capturing excess power that would otherwise be wasted and releasing it when needed at peak times the project would enhance the efficiency, flexibility, reliability and security of the Ontario electricity supply system. It would also be able to provide back-up power during grid disruptions and better integrate other power generation facilities in the province. Collectively this grid balancing would reduce costs of electricity for Ontario consumers by ~$250 million per year.

Negative Impacts

With regard to all negative environmental impacts related to this project, GBA recommends that TCE be held to the highest standard, and that the best available technology is applied in order to maximize mitigation and reduce all impacts to the minimum that can be achieved. The main negative impacts that may arise are:

1. The intake would entrain (kill) 1-10 million fish a year. A similar project at Ludington on Lake Michigan started by entraining 150 million fish a year. That has since been reduced through mitigation and overall reductions in Lake Michigan fish populations, but is still unacceptably high, because the shoreline intake/offtake structure does not permit the application of the optimum technology to maximize mitigation.

TC Energy believe that adding additional mitigation would reduce it to 1 million for their project, but, in this context, the following is relevant:

a. Environmental assessments are needed to identify the current nearshore fish habitat and population at this site. It is known that the shoreline and nearshore provide ideal spawning habitat (wave swept cobble with pristine overlying waters) for Whitefish, Carp and Lake Trout. It is not known if other species utilize these waters, or the extent to which the noted species spawn in this area.

b. From the 1970s and on, large intakes have generally been located far offshore in deep water, away from biologically productive areas. They also have engineered structures at the end to diffuse the velocity of the intake stream. As a result, fish entrainment is substantially reduced. The new build at Darlington was approved by DFO in 2019 and establishes a benchmark for acceptable mitigation. Darlington have not been permitted to build the intake at the shoreline, or mitigate with nets or screens. It is likely to cost around $500 million to address a flow rate of 200 cms and bring down the velocity of the water on intake and offtake below 20 meters per second (ms). It currently represents the highest standard and best available technology to mitigate entrainment. TCE should be required to structure their intake/offtake accordingly.

c. The extent to which the pipe should be extended offshore should be dependent upon an environmental assessment of the fish population and habitat moving out into Georgian Bay from the plant, so that the pipe reaches an area where the entrainment impact will be minimized. No such environmental studies have yet been done. It should be noted that the cost of such a pipe might be a factor, since, at 1,000 cms, it would need to cater for a flow that is ~5-7 times that of similar nuclear power station pipes, such as Darlington.

d. Additional considerations for requiring TCE to utilize an offshore pipe structure, as above, are:
    i. If there is a substantial near shore fish habitat/population it may not be possible to mitigate the effects from a shore-based intake that draws 1,000 cms from entraining fish over a large area, eliminating their spawning habitat and dividing the nearshore ecosystem on either side of the plant; and
    ii. At Ludington and the Pickering nuclear plant, which both have shore-based intakes, they attempt to mitigate with nets, but still kill unacceptably large numbers of fish every year.

2. The outflow would disturb significant quantities of lakebed sediment (clay in this area) and bring sediment down from the reservoir that would be dispersed over a very large area of Georgian Bay. Given that DND has used this site as a training facility and firing range for decades, there could be high concentrations of pollutants such as heavy metals in the nearshore sediment. There are also elevated levels of organic chemicals in the sediment along this part of the Georgian Bay coast. Collectively these potential impacts on water quality, from sediment disturbed and dispersed over a wide area, are of concern.

3. The outflow would warm the water over a wide area and disrupt water currents in Georgian Bay. All of these effects would significantly impact fish habitat, particularly for those species that move along the shore in the area near the proposed project.
4. There are 11 species at risk onshore at this location whose habitat would be destroyed or compromised both from the construction activity and the permanent flooding of 375 acres on the Niagara Escarpment to create the reservoir. The butternut, an endangered tree, also grows on the site.
5. The hydro line needed to transport the power to Collingwood to connect to the grid would be constructed on existing power corridors (with minimal damage) and some new sections (likely causing some ecosystem damage and habitat destruction). Alternatively, a large underwater cable might be laid that would disrupt lakebed sediment.

Additional Information

Save Georgian Bay
This group: https://www.savegeorgianbay.ca/ has a petition going:
https://www.change.org/p/federal-save-georgian-bay-fe02a3a7-9e1f-438d-91a7-258324ae1fdd
which has almost 21,000 signatures as of today. They have assembled relevant engineering, environmental consultancy and biologist skills to back up their opposition to this project.

A closed loop alternative
It might be possible to locate a pumped storage project for western Ontario at a disused mine/tailing pond (or quarries with differential elevations) as Northland Power has done – see:
https://marmoraandlake.ca/pumped-storage
This would yield a closed loop system with minimal environmental damage.

Other technologies for Power Storage
The technology for pump storage is moving to lithium ion batteries. See:
https://about.bnef.com/blog/energy-storage-investments-boom-battery-costs-halve-next-decade/
Another technology uses hydrogen fuel cells. Surplus electricity splits water into hydrogen and oxygen, captures the two gases and then burns them later to generate heat and water (steam). See: https://en.wikipedia.org/wiki/Fuel_cell or any of the many references.

Saugeen Ojibway Nation (SON)
TCE have entered into discussions with SON. This is likely to improve their negotiating position with government.

TCE Website
For information posted by TCE about the project, see
https://www.tcenergy.com/operations/power/pumped-storage-project/ and the recent TCE brochure.