EASTERN POWER PROJECT – *ECONOMICS AND IMPACTS*

If built, we believe the proposed Eastern Power "Hydrogen Ready Power Plant" Project will result in higher costs to consumers and business than other options, discourage investment in Ontario and increase Ontario's GHG emissions. Therefore, the project should not be approved.

Economics and Impacts

The proposed plant is a 600 MW capacity combined cycle facility, firing natural gas but with an option to convert to hydrogen at some point in the future. There are many arguments against building such a facility.

1) A natural gas fired gas-turbine combined cycle plant is not the best choice for electricity generation today, even if firing hydrogen in the future. Ontario has gone to significant cost and effort to reduce the GHG emissions intensity associated with generating electricity by 87% since 2005[1]. Since emissions accumulate in the atmosphere resulting in warming, it is vitally important that we continue to reduce emissions and keep them low in order to stay within our carbon budget. Ontario has the opportunity to both increase generation from renewable sources and to import additional generation from Quebec, which can be done at a lower cost than the proposed gas fired plant.

2) Ontario has received interest from a number of new industries looking to locate in an area that can offer very low GHG emission electricity. These companies recognize the value of offering their customers a product with low associated manufacturing emissions (i.e. low Scope 2 emissions), and they do not want to locate into a jurisdiction that is forecasting higher future emissions. In 2021 Ontario's percentage of electricity generated from natural gas was 27% higher than in previous years (2018-2020)[2]. If built, this project will increase generation from fossil fuels even further and lock Ontario into these higher rates for decades to come, thereby

[1] https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-ontario.html#:~:text=The%20greenhouse%20gas%20intensity%20of,of%20CO2e%2FkWh.

[2] https://www.ieso.ca/en/Corporate-IESO/Media/Year-End-Data and https://www.ieso.ca/en/Corporate-IESO/Media/Year-End-Data/2019

discouraging investment in Ontario from companies concerned about GHG emissions.

3) As detailed in our report, ***How Green is Blue and Green Hydrogen***[3] on a life cycle basis, so called grey and blue hydrogen result in more GHG emissions than methane when burned. From both an economic and an environmental perspective, it will never make sense to burn grey or blue hydrogen in preference to natural gas (primarily methane).Only green hydrogen produced by the electrolysis of water using renewable energy produces fewer emissions than methane. However, whilst we can meet our low GHG emission electricity in a number of ways, some industries such as steel manufacturing can only reduce their emissions by the use of green hydrogen, and therefore must be given priority when green hydrogen is available. In addition, green hydrogen is not a potential source of green electricity, but is rather just an energy storage medium. A 2021 study by Queens University prepared for the **Bowman Centre for Sustainable Energy**, titled ***A Techno-Economic Feasibility Analysis of Hydrogen Storage in Salt Caverns***[4] demonstrated both the technical and economic feasibility of generating green hydrogen when excess green electricity is available, storing the hydrogen in underground salt caverns and then selling it directly to nearby (Sarnia area) industry or converting the hydrogen back into green electricity when required. If priority is given to utilizing limited green hydrogen resources to reduce emissions in hard to transform industries like steel or cement making it may be beneficial to utilize other methods of energy storage such as pumped storage or behind the dam storage at large hydraulic facilities.

4) A combined cycle plant is not the best option in the future for converting hydrogen to electricity on a dispatchable basis. According to the U.S. Department of Energy Fuel Cell Technologies Office[5] "***Fuel cells are the most energy efficient devices for extracting power from fuels. Capable of running on a variety of fuels, including hydrogen, natural gas, and biogas, fuel cells can provide clean power for applications ranging from less than a watt to multiple megawatts***." Not only are fuel cells more efficient when running at load, but they do not require long periods (typically ~8 hrs) of inefficient operation when starting from cold or suffer from poor efficiency when operated at low loads as often required when operating under Independent Electricity System Operator (IESO) direction. In addition, a combined

[3] https://www.bowmancentre.com/_files/ugd/372347_25c28e34308142ca8fb0d4536a0c3579.pdf
[4] Available at https://www.bowmancentre.com/
[5] https://www.energy.gov/sites/prod/files/2015/11/f27/fcto_fuel_cells_fact_sheet.pdf

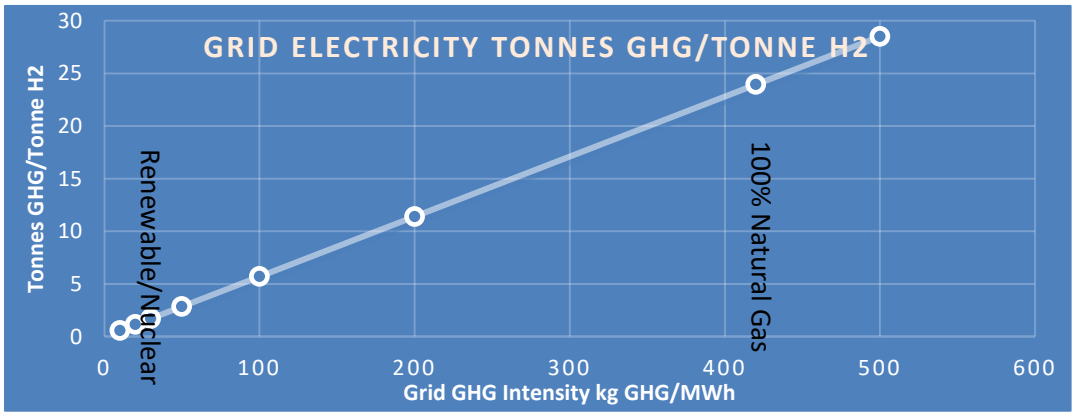
cycle GT facility has a number of other disadvantages, such as: high NOx emissions, higher staffing needs, start up noise issues, etc.

5) Using natural gas or a blend of natural gas and hydrogen will result in increased Scope 1 GHG emissions. These emissions, in addition to their contribution to anthropogenic climate change, will attract carbon price related costs. These costs further impair the economics of the proposed project over the economic life of the project. This adds to project exposure to increasing fuel prices, a vulnerability that is not applicable to renewable energy with energy storage projects.

6) Levelized Cost of Electricity (LCOE) for renewable (wind/solar + battery) is competitive with fossil fueled peaker and dispatched power plants[6][7]. Why commit to build a new high GHG emitting plant when renewables are competitive and not vulnerable to future natural gas price increases and carbon taxes?

7) Where will the hydrogen come from for the proposed project and what will the carbon intensity of the hydrogen be given this project will increase grid intensity.

8) The carbon intensity of green hydrogen produced using grid electricity is highly sensitive to grid carbon intensity. The attached graph shows that hydrogen generated using marginal power provided by natural gas would have a carbon intensity as high as grey hydrogen, 20 to 25 tonnes of CO_2 per tonne of hydrogen (Scope 1 and Scope 2 for grey hydrogen).



[6] (493) #RethinkingEnergy #TheGreatStranding — A New Energy Report by RethinkX - YouTube (https://www.youtube.com/watch?v=YJ-HlykM1LU)

[7] Levelized Costs of New Generation Resources in the Annual Energy Outlook 2022 (eia.gov) (https://www.eia.gov/outlooks/aeo/pdf/electricity_generation.pdf

Summary

The project as proposed will cost more to build, result in higher GHG emissions for the life of the project, cause potential investors to look elsewhere to locate new facilities reducing both investment dollars and jobs and consume more hydrogen to generate electricity (lower efficiency) than would be required if fuel cells were utilized.

While giving some appearance to being a reasonable transition technology towards a net zero carbon future, this project ties us to continued natural gas consumption and a lower efficiency conversion to electricity should green hydrogen become available and sufficiently abundant to make it economic for conversion to electricity. This project does not meet the goal of addressing global warming while encouraging sustainable economic growth nor is it the most economic when considering LCOE over the economic or commercial life of the proposed project.

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