

## Executive Summary

This report is the result of a mandate given by GNL Québec to the Chaire en éco-conseil to answer the research question: “How can a company that will be a major Canadian final emitter find credible ways to become carbon neutral in the current global context. What solutions can be implemented and what should be the order of priority?”. The research was carried out between December 2018 and August 2019.

Carbon neutrality is an accounting method that subtracts from a greenhouse gas emissions inventory an equal number of removals or offsets achieved by an emitter or third parties, beyond natural processes, in order to reach a net balance of zero. To be credible, the calculation must be based on a detailed inventory carried out according to a standardized method and verified by an independent and reliable third party. The working scope used for the study involved only emissions from the Énergie Saguenay liquefaction terminal. Emissions are expected to total 421,000 tonnes of CO<sub>2</sub> equivalent, representing 420,000 tonnes of CO<sub>2</sub> and 1,000 tonnes of CO<sub>2</sub> equivalent related to fugitive methane emissions.

A review of the scientific literature has shown that the means exist worldwide to achieve the Paris Agreement targets by 2030, through actions to reduce greenhouse gas emissions and measures to absorb, store and use CO<sub>2</sub>. Subsequent efforts will have to be made to ensure that all anthropogenic activities become carbon neutral by 2050 in order to maintain the overall temperature increase below the threshold of 1.5°C above pre-industrial levels by 2100. These methods can be applied in agriculture, construction, energy, forestry, industry, transport and other sectors. Hundreds of methodologies exist to quantify these reductions and trade them on carbon markets.

Following discussions with GNL Québec, four priority sectors were identified to achieve a carbon-neutral footprint for the Énergie Saguenay liquefaction terminal.

1. Afforestation presents little potential, and only after 2040, due to the time required for trees to store the CO<sub>2</sub> emitted by the plant and the limited private lands available to establish offset plantings.
2. The capture, purification and use of CO<sub>2</sub> emissions offers the greatest potential and could alone lead to carbon neutrality, but it would require the development of an innovative eco-industrial park to recover both the CO<sub>2</sub> and the industrial heat generated by the liquefaction terminal. This would require modifying the liquefaction facility and finding partners to utilize these resources using an eco-industrial approach. This sector has the potential to contribute to carbon neutrality by 2030.
3. The purchase of renewable natural gas (RNG) produced from forest residues also presents good potential to offset the plant’s emissions. However, the technological readiness of pyrolysis, the distances to be covered to move the residues close to the Gazoduq pipeline, and the competition for other uses of forest residues and for the purchase of RNG by Énergir for distribution in Quebec, to the extent that this resource is required to meet Quebec’s targets, make this potential very uncertain. This method is unlikely to contribute to carbon neutrality before 2030.
4. The purchase of offset credits on carbon markets will be necessary for Énergie Saguenay to achieve a carbon neutral footprint. These credits can be

purchased on the SPEDE regulated market or on voluntary markets. There are enough credible serialized credits currently available on voluntary markets to ensure carbon neutrality at least for the period 2025-2030, and it is likely that, as other measures are deployed, it will be possible to supplement the balance of Énergie Saguenay's emissions through annual offset credit purchases for the duration of its operations.

The report outlines economic considerations to enable GNL Québec to develop an implementation strategy. It puts various factors into perspective based on research findings, and the legislative and regulatory obstacles that will have to be taken into account.

Consequently, the Chaire recommends that GNL Québec:

- Maintains its carbon neutrality objective for the Énergie Saguenay liquefaction terminal project;
- Pays special attention to potential technologies to prevent fugitive emissions from its operations;
- Examines opportunities for purifying and marketing the CO<sub>2</sub> that will be generated by the Énergie Saguenay terminal;
- Investigates the feasibility of capturing and recovering the residual heat from its process;
- Engages with government, municipal, industrial and institutional partners in plans for an innovative eco-industrial park to utilize its CO<sub>2</sub> and heat discharges;
- Engages with government, municipal, industrial and institutional partners in the establishment of RNG production from forest residues;
- Calls on interested stakeholders to participate in a multi-criteria analysis to set priorities for the purchase of offset credits;
- Engages with the government of Québec and other carbon market players to revise SPEDE rules in order to facilitate the development of offset projects across the Québec territory.