



**GOVERNMENT OF NEWFOUNDLAND AND LABRADOR  
Office of Climate Change and Energy Efficiency  
(GNL – CCEE)**

**OIL REFINING – NEWFOUNDLAND AND LABRADOR  
GHG REDUCTION OPPORTUNITIES & COMPETITIVE IMPLICATIONS**

**PUBLIC SUMMARY REPORT**

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## PUBLIC SUMMARY

The North Atlantic Refining Limited (NARL) facility is responsible for just over one fifth of greenhouse gas (GHG) emissions from the Newfoundland and Labrador (NL) provincial large industry sector. It is the only petroleum refinery in the province but one of 19 (as of mid-2013) conventional refineries in Canada, and is a member of the Canadian Fuels Association. This study focused on the potential for GHG reductions in the oil refining sector (NARL) in NL within the context that the refinery is operating in a highly competitive industry and international market.

The study undertook an abatement technology review for the refinery in its current process unit configuration, a parallel economic cost assessment, and a review of potential GHG policy options and their likely impact in relation to the expected policy associated with developing federal oil and gas regulations. In order to complete this study, confidential, proprietary and commercially sensitive information was required, and a non-disclosure agreement was signed with NARL. This agreement precludes the publication of the analysis or any implications that could impact on the competitiveness of the refinery.

As input to the abatement technology review, an overall annual baseline was derived for the weighted average of the winter and the summer fuel gas and fuel oil balance. The technology review identified a shortlist of project groups with potential to reduce GHG emissions, with several project groups applicable across a number of refinery process units. Most of the identified projects would need to be implemented during planned shutdown periods. Some GHG reductions can be achieved at negative cost where fuel savings outweigh capital costs associated with equipment, installation and commissioning. Other reductions come at net neutral costs, whilst others are cost prohibitive.

The policy analysis examined the qualitative and quantitative implications of different types of benchmarking of emissions intensity together with different policy options for compliance. The analysis evaluates two options for benchmarking the sector: a benchmark based on each facility's historic emissions intensity and a benchmark based on the emissions intensity per Solomon Associates' Complexity Weighted Barrel (CWB). Requiring NARL to reduce its emissions from a historic baseline would mitigate compliance costs, as the baseline would account for NARL's higher fuel oil consumption.

Additionally, the Government of Canada has indicated it is prepared to forego implementation of its regulations for a particular industry in a particular province in favour of provincial regulation if an Equivalency Agreement (EA) under the *Canadian Environmental Protection Act (CEPA)* can be agreed to with that province. An EA requires that projected provincial regulatory outcomes be equal or better than projected *CEPA* outcomes. The benefit of an EA is that provincial regulation that accounts for local circumstances would replace federal regulations designed for national application. There is therefore the potential for the Government of Newfoundland and Labrador to pursue an "equivalency" agreement with the Government of Canada with respect to NARL in which it aims to achieve the same level of GHG reductions as the federal requirements using a provincial policy approach that is tailored to local circumstances. The analysis shows that all options considered for provincial equivalency have lower compliance costs in comparison to the federal policy. This indicates that a provincial policy could potentially be designed to achieve better outcomes for the NARL refinery.

NARL has participated in this technical study, providing a significant amount of data. As noted above, given commercial sensitivities, and the fact that the refining sector in Newfoundland and Labrador comprises only a single entity, the analytical findings of this report are confidential and cannot be released. However, some higher level conclusions based on publicly available data can be released and are highlighted below:

- i) The NARL Refinery currently contributes between one fifth and one quarter of the total GHG emissions from the large industrial sector in Newfoundland and Labrador. Nationally, the NARL emissions are approximately 6.1% of the overall 18 million tonnes (MT) of carbon dioxide equivalent (CO<sub>2</sub>e) GHG emissions from the traditional Canadian oil refining sector (2011 data excluding bitumen upgraders). The corresponding NARL crude oil capacity as a percentage of the capacity of the Canadian traditional oil refining sector (2011 data) is approximately 5.6%.
- ii) The primary source of GHG emissions is from fuel burnt in the NARL refinery fired heaters and boilers, comprising refinery gas and fuel oil. Without access to natural gas as a fuel source, the refinery relies on fuel oil which has a higher emission factor than natural gas. The fuel oil produced by the refinery itself as a product of processing sour crude feedstock is too high in sulfur to be burnt on site due to the prevailing environmental limits on Criteria Air Contaminants, particularly sulfur dioxide emissions. NARL therefore has to purchase low sulfur fuel oil. Any marginal savings in fuel consumption will therefore lead to a saving in CO<sub>2</sub>e emissions as well as a direct financial saving in purchased fuel oil costs.
- iii) The refinery utilises electricity purchased from the provincial electricity grid, and there is no onsite electricity generating capacity. The electricity is primarily used for driving pumps and compressors. However, because the provincial grid is already largely hydroelectric and is expected to be 98% hydroelectric by 2017, no specific GHG opportunities have been identified in this area.
- iv) With respect to the Nelson Complexity index, the NARL refinery complexity is considered to be close to average complexity for North American refineries and refineries within the 34-country Organization of Economic Cooperation and Development (OECD). This index is a relative measure of the construction costs of a refinery based on its crude and upgrading capacity. It compares the costs of various refinery units to the cost of a crude distillation unit.
- v) With respect to energy intensity, the NARL refinery is considered to be close to average intensity for Canadian refineries. However, its simple emission intensity is higher because the refinery does not have access to natural gas. This puts NARL at a disadvantage in terms of emissions intensity even though it is close to average in terms of energy intensity.
- vi) AMEC conducted a technology review of abatement opportunities for NARL. The technology review identified project group opportunities for mitigating emissions. Some project groups are applicable to several refinery Process Units and others applicable to specific Process Units only.

- vii) The production risks and the engineering timescales required to implement the abatement project opportunities would require a phased planning approach around major refinery turnarounds so as not to have major impact on refinery availability.
- viii) The federal oil and gas regulations envision calling for a reduction in GHG intensity, but emissions intensity can be defined in different ways. One option for a benchmark for petroleum refining is to use simple emissions intensity per barrel of crude input in a historic period (e.g., the approach used in Alberta's Specified Gas Emitters Regulation). Another option for the refinery sector is to pursue the approach proposed by the Canadian Fuels Association and already used in European and Californian GHG regulations, which calls for refineries to achieve the emissions intensity per complexity-weighted barrel (CWB) of the best (e.g. the best 10%) European or OECD refineries.
- ix) NARL's costs and net costs of complying with the policy are likely to be dependent on which benchmark is selected. Net compliance costs would be a function of NARL's investments in low-emissions technologies, its utilization of flexibility mechanisms (e.g., contributing to a technology fund, purchasing offsets and emissions performance credits) and the level of reinvestment of a technology fund back into NARL.
- x) Newfoundland Labrador has the option to pursue a provincial policy that achieves an "equivalent" reduction in GHG emissions as the federal oil and gas regulations. The advantage of pursuing equivalency is the province has greater discretion on mechanisms that qualify for compliance.
- xi) Finally, it must be noted that NARL is uniquely sensitive within the refining sector to climate policy because it does not have access to natural gas. Fuel switching to natural gas from fuel oil is often an important abatement opportunity for refineries across North America.

The report concluded with four recommendations:

- i) The technology review and GHG abatement projects identified along with estimated costs and implementation assumptions should be reviewed by NARL to determine if they are likely to be feasible within a 5-10 year workplan. Estimated costs should be subject to further refinement before any projects are considered.
- ii) Because NARL's emissions intensity appears to be higher than the average Canadian refinery, the choice of a historic benchmark would be preferable from a cost perspective to a CWB benchmark. A CWB benchmark would likely impose greater compliance costs on NARL.
- iii) Compliance costs for NARL can be mitigated by using a technology fund, in which the revenue is used to invest in abatement opportunities in NARL.
- iv) Any policy framework should account for the fact that NARL does not have access to natural gas.