

Ammonia Production Greenhouse Gas Emissions Benchmarking



2023



FERTILIZER CANADA

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Summary

With support from Natural Resources Canada, WSP prepared a study that assessed the greenhouse gas emissions intensity from the production of ammonia at Canadian facilities and benchmarked our performance against global manufacturers. The study found Canadian ammonia is produced with an overall Net Emissions intensity that is the lowest of all countries/regions examined, and 30 to 63 per cent lower than other countries that Canada imports nitrogen fertilizer from. The nine Canadian ammonia facilities were assessed for emission sources in the production process to determine the emissions generated and what proportion of those emissions are currently captured for beneficial uses.

Canada produces nitrogen with the lowest net emissions intensity. We have an opportunity to be a world leader, but climate policies and regulations could make Canada noncompetitive, driving investment to other jurisdictions and creating carbon leakage.

Key Findings

- Canadian ammonia is produced with an overall Net Emissions intensity that is the lowest of all countries examined. Canada's ammonia is 31 per cent lower than Russia, and 52–63 per cent lower than China, with the range depending on whether the fuel source is coal or natural gas.
- Canada's nine facilities produce 4.9 million tonnes of ammonia annually. These facilities range from 30 to 67 years old, with most located in Alberta and one each in Saskatchewan, Manitoba, and Ontario.
- Process emissions represent 64 per cent of total generated emissions across the sector, which are fixed by the chemical process and cannot be reduced. Of the total process emissions, 61 per cent are recovered for use in the production of urea, for resale to specialty gas distributors, and/ or carbon capture and storage, with one facility recovering 89 per cent of their process emissions.
- Without limiting production, facilities will need to change or update equipment and/or increase CO₂ recovery to reduce emissions, which will require a significant investment in time and capital.
- The average net emissions intensity for the sector is 1.1 tonnes CO₂e/tonnes NH₃, with the average generated emissions at 1.9 and the average recovered emissions at 0.7 tonnes CO₂e/tonnes NH₃.

Recommendations

Nitrogen fertilizer is a vital input for farmers that increases yields and helps protect food security. Canada's nitrogen is produced with less GHG emissions intensity than competing countries. To protect Canada's competitiveness and domestic production, and help farmers get our sustainably produced nitrogen fertilizer we need a regulatory environment that encourages and incentivizes private and public investment.

As a globally traded commodity Canada's policies and regulations must protect competitiveness against our biggest competitors like Russia and China who don't face the same

environmental regulations. Canadian fertilizer manufacturing is an energy-intensive, trade exposed industry that competes in a global marketplace, so it is vital that policies and regulations protect competitiveness and consider incentives from other competing jurisdictions. Canada must carefully consider impacts to the sector to ensure production does not move to jurisdictions with more favourable policies. For example, in the U.S. the section 45Q tax credit provides \$60 to \$85 USD/tonne CO₂ captured. Canada does not have a comparable incentive.

Methodology

WSP with the assistance of Fertilizer Canada obtained data from Canadian facilities covering the period of 2018–2022. The data used was the actual production data reported by the facilities, not the production capacity of the facility. International data was collected from the International Fertilizer Association and other public documents such as reports from producers.

Emissions calculations followed the Environment and Climate Change Canada (ECCC) Greenhouse Gas Reporting Program (GHGRP) quantification methods. Any gaps in the GHGRP were supplemented with calculations using the Western Climate Initiative methods (WCI). The same calculations were

applied to all facilities with regional differences in electricity grid intensity accounted for by using provincial emission factors.

Canadian Industry Partnership for Energy Conservation (CIPEC) created a benchmarking report for Canadian ammonia producers for 2000–2002, which found a slightly lower emissions intensity than our report which is expected to be the difference in methodology rather than an increase in emissions intensity at the facilities. A direct comparison could not be completed as the methodology for the CIPEC report was not transparent. Also, CIPEC did not include emissions from electricity.



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