LCBA LOW CARBON BUSINESS ACTION CANADA

This project is funded by the European Union

Challenge Synopsis:

Canada's Oil Sands Innovation Alliance (COSIA) members are committed to accelerating the improvement in environmental performance in the Canadian oil sands through collaborative action and innovation. Natural gas decarbonization as an opportunity area in which to explore for technologies that will materially reduce oil sands greenhouse gas (GHG) emissions.

Challenge Statement:

COSIA's member companies are looking for a new transformative technology that will partially or completely remove the carbon content of natural gas. The emissions associated with producing the decarbonized gas, plus the emissions from combusting the decarbonized gas, must be less than the emissions from combusting natural gas.

Context:

A common bitumen production process involves the injection of steam into the bitumen reservoir. The steam heats the bitumen 'in situ', meaning in place, reducing the viscosity of the bitumen such that it can be pumped to surface facilities for further processing.

In situ oil sands operations consume large quantities of natural gas to produce steam. A typical 33,000 bpd (barrels per day) facility would operate six steam boilers requiring 1600 GJ/h (lower heating value) of natural gas. Combustion air is supplied at 55^{o}C, using natural or forced draft. Combustion flue gas contains 7-8% CO_2. Material and energy flow diagrams for a standard 33,000 bpd in-situ facility are provided in the Appendix below.

COSIA is investigating a number of carbon capture technologies, including post-combustion CO_2 capture, pre-combustion CO_2 capture and oxy-combustion. High capital and operating costs have hindered the deployment of these technologies.

An alternative capture technology is to remove the carbon from natural gas before combustion, through thermal or electrical means. The former is the basis of carbon black manufacturing while the latter includes using plasma to decarbonize the gas. In both cases, the carbon is removed as solids, which is sequestration ready, while the remaining gas has a higher hydrogen content.

The energy used to decarbonize the gas plus the subsequent combustion efficiency change must be included in the GHG emission accounting. This metric could be measured per unit steam generated. The avoidance cost of decarbonizing natural gas would be compared against existing carbon capture approaches (i.e. pre- and post-combustion and oxy-combustion).

Evaluation metrics include GHG emission intensity and CO_2 avoidance cost. GHG intensity will include any change in combustion efficiency that may result from the decarbonized gas. The second metric will account for the costs required to achieve GHG reduction including CO_2 or carbon sequestration.

Response Criteria:

- Reduce the GHG emission intensity of the altered gas in steam generation including the energy used in decarbonizing the gas.
- Remove the carbon and transform it into a form that is sequestration ready (e.g. such as carbon black).
- Not be natural gas gasification or reforming to make syngas.

The Opportunity:

- Potential to pitch your technology (if selected) to an alliance which represents 9 of the biggest oil sands producers in Canada. These companies account for over 90% of the oil sands product in Canada.
- Meet new customers and enter new markets with your product.

About COSIA:

COSIA accelerates the pace of environmental performance improvement in Canada's oil sands through collaborative action and innovation. We bring together innovators and leading thinkers from industry, government, academia, and the wider public to identify and advance new transformative technologies. Challenges are one way we articulate an actionable innovation need, bringing global innovation capacity to bear on global environmental challenges.

***Only non-confidential information should be included in your response ***

APPENDIX:

See material and energy flow diagrams.