Application of Flue Gas Recovery to Reduce Emissions Intensity

1 BACKGROUND

Combustion of hydrocarbons and coal are amongst the largest supply sources of energy globally. Industry and society have benefitted from the low-cost, readily available and reliable access to these sources of energy. However, this has come at the expense of rising CO_2, methane and other harmful gases produced in the combustion process, contributing significantly to elevated levels of global Greenhouse Gas (GHG) emissions over the past several decades.

Global emitters have recently identified Carbon Capture and Underground Sequestration (CCUS) as the most viable option for achieving meaningful reductions in CO_2 emissions. There are a number of challenges to CCUS:

1. Very high cost to capture and separate CO_2 from flue gases
2. Difficult to identify and access reservoirs with the proper geologic characteristics to support CO_2 sequestration
3. Federal and local approvals to use feasible reservoirs is not easy to obtain due to potential environmental hazards
4. Distance between large emitters and potential CO_2 injection sites for underground storage can be high, increasing transportation costs
5. Dedicated CO_2 pipeline infrastructure may need to be built to facilitate transportation between emitters and storage sites

Consequently, in Canada, CCUS is an initiative being driven by the largest emitters, with billions of dollars being committed in the long-term to build the necessary CO_2 capture, transportation and injection infrastructure. Ultimately, this process will be a hub model, with a centralized CO_2 pipeline network and several connected CO_2 emitter sites and injection facilities.

One key challenge of the centralized CO_2 gathering and injection model, especially in Canada, is it is less accessible, and thus more expensive, for emitters further from the gathering infrastructure. Additionally, the high associated costs mean smaller emitters potentially do not have the financial resources to participate in either the hub model or to set up a standalone CCUS.

The challenge for smaller post-combustion CO_2 emitters are numerous:

1. While supply of hydrocarbons as an energy source is stable, energy delivery from renewable sources such as solar and wind could be intermittentin certain geographies.
2. It is difficult to reduce energy intensity, as measured as CO_2 per unit of energy, for some of the more energy efficient emitters.
3. Given the high cost for standalone CCUS, it is difficult for some emitters to identify ways to economically reduce absolute emissions.
4. Emitters that are not in jurisdictions with non-hydrocarbon sources of energy supply (such as hydro or nuclear), do not have the option to pursue electrification of assets as an option for absolute CO_2 emissions reduction without investing in expensive captive infrastructure.

With this view, that combustion processes are likely required for the foreseeable future to provide society the necessary supply of low-cost and reliable energy, there is opportunity to look for ways to enhance energy efficiency further to improve CO_2 intensity metrics and reduce the GHG footprint.

2 Current Solutions

As discussed previously, CCUS is a primary solution for capturing post-combustion flue gases, albeit the above noted challenges.

There also exist a number of off-the-shelf solutions to capture CO_2 from flue gas, though there needs to be a concurrent use for the CO_2 segregated to achieve effective reduction in emissions.

3 Pain Points

Post-combustion CO_2 emitters are challenged from the perspective of having few other cost-effective options available to provide necessary energy to end users.

There are also costs and encumbrances associated with participating in a Hub model along with peers to achieve a collaborative CCUS arrangement.

In addition, locational restrictions and federal and provincial regulations also have to be considered for any kind of solution implementation.

4 Desired Outcome

We are seeking options for small to mid-scale post-combustion flue gas emitters to enhance energy efficiency and reduce CO_2 intensity.

The ideal solution will capture flue gas and utilize a combination of heat recovery and / or CO_2 sequestration on a small scale and low cost to allow smaller emitters to participate economically with the social drive to achieve net zero emissions.

We are seeking solutions that are at a minimum Technology Readiness Level (TRL) of 6 as per the grid provided below:

Specific requirements for this Challenge include:

- Technology must be validated in existing applications
- Solution must be easily integrated with existing infrastructure (power plants, compressor stations, and other combustion processes generating flue gas)
- Any intellectual property & technology must be in public domain, owned by the submitter or the submitter should be sufficiently licensed to use the same

The Solution offered must be able to exhibit one or all of the following:

- Incremental resource generation for the same energy input (incremental power generation, waste heat utilization for a new process, new revenue stream from a process benefiting from waste heat or power generation)
- Process that is able to capture CO_2 for sequestration on a smaller and more economic scale than CCUS

5 Platform Story

Concerned about climate change and the devastating environmental and subsequently economic impact it is having on Canada, a group of entrepreneurial Canadians decided to pool in their qualifications, experiences and resources to launch get2net0.

Get2net0 recognizes the incredible amount of effort required for Canada and Canadians to achieve their Net-Zero aspirations and recognizes the opportunity for Canada to emerge as a global leader and role model in showing the way to other nations. In turn get2net0 will expand its outreach globally.

To support this effort get2net0 is launching a simplistic yet effective portal which to begin with allows enterprises or “Challenge Sponsors” to throw challenges on any topic related to achieving reduced or capturing greenhouse gas emissions, including but not limited to, early-stage planning, developing roadmaps, technology solutions, logistics solutions, process or chemistry. Challenges can also be on the topic of adaptation to and prevention of catastrophic events which have now become common place. Once a challenge is posted, individuals and teams from around the globe compete to provide the best solutions. For the solution providers whether they be students working in teams, think-tank participants, start-ups or off-the-shelf solution providers, these Challenges will provide opportunities to showcase their capabilities and in return be rewarded for their ingenuity.

In celebration of the launch of this one-of-a-kind platform, get2net0 is Sponsoring 3 diverse Challenges in covering the sectors of Energy, Agriculture and Technology, all with the purpose of finding Solutions that will help mitigate the Greenhouse Gas (GHG) footprint in those respective sectors.

6 Reward and Recognition offered

Monetary: Reward for the top Solution submission will be C$5,000 with the 2nd place Solution receiving C$2,500. Top 2 submissions will be considered for further discussions.

Recognition: With the consent of the Solution Submitters, the winning Solutions will be featured in online forums and the success shared with the Get2Net0 network. In addition, as mutually agreed on, introduction to professional networks, business development assistance and access to public and private funding could be provided.

7 Challenge Rules & Regulations including Intellectual Property

In providing your Solution you agree to the Challenge Participation Rules

8 Guide to Providing a complete Solution and the scoring Rubrics