

Mobilizing the world's minds and resources to improve environmental performance.



Enrichment of Combustion Air

SOLUTION DESCRIPTION: Technology able to produce combustion air enriched in oxygen	INNOVATION OPPORTUNITY CHAMPION: COSIA's GHG EPA is sponsoring this Innovation Opportunity. Our aspiration is to produce our oil with lower greenhouse gas emissions than other sources of oil.
UPDATED: March 2022 All project proposals are evaluated and actioned as they are received.	
<p>For more information on this COSIA Innovation Opportunity please visit</p> <p>www.cosia.ca/innovation-opportunities/greenhouse-gases</p>	

SUBMIT YOUR IDEA [HERE](#)

Canada's Oil Sands Innovation Alliance (COSIA) accelerates the pace of environmental performance improvement in Canada's oil sands through collaborative action and innovation. COSIA Members represent more than 90 per cent of oil sands production. We bring together innovators and leading thinkers from industry, government, academia and the wider public to identify and advance new transformative technologies. Innovation Opportunities are one way we articulate an actionable innovation need, bringing global innovation capacity to bear on global environmental challenges.



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WHAT TO SUBMIT TO COSIA

COSIA requires sufficient non-confidential, non-proprietary information to properly evaluate the technology.

Some items that will be especially important to present in your submission are:

- Concept and basic unit operations
- Technical justification for the approach (e.g. laboratory batch or continuous experiments; pilot or demo plants; process modeling; literature precedent)
- Describe quantities and qualities of utilities and consumables that are required
- Energy inputs – quantity and type(s)
- Capital and operating cost estimates if available based on described capacity targets
- 3rd party verified comparison of your proposed technology against an MEA baseline. 3rd party verifiers should be reputable, independent engineering companies if possible
- Basis of cost estimation, including estimation scope, contingency, etc.
- IP status of your proposed technology
- What operating environment restrictions might your technology face:
 - Explosive atmospheres
 - Severe weather
 - Power fluctuations

FUNDING, FINANCIALS, AND INTELLECTUAL PROPERTY

COSIA Members are committed to identifying emerging technologies, while protecting the Intellectual Property (IP) rights of the owner of the technology.

HOW TO SUBMIT TO COSIA

Submit a summary of your solution using COSIA's Environmental Technology Assessment Portal (ETAP) Process, available at:

<https://cosia.ca/focus-areas/e-tap>

Please note: ETAP is a staged submission process. The initial submission requires only a brief description and limited technical information. Upon review by COSIA, additional information may be requested. Instructions for submission are provided on the ETAP site.

All information provided is non-confidential. COSIA will respond to all submissions.

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DETAILED SOLUTION DESCRIPTION

The COSIA GHG Environmental Priority Area Steering Committee invites proposals for the supply of technology to produce combustion air enriched in oxygen. This is a forward-looking request and proposals that can make a compelling case for investment in early-stage technology are of interest.

The successful technology will:

- Enrich the oxygen content of air to at least 25% O₂ by volume, or as high as 40%.
- Compatible with natural and forced draft heaters and boilers
- Operating temperature range -40 to +30 °C
- Humidity tolerance 20-100%

BACKGROUND

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 facility would operate six steam boilers requiring 1600 GJ/h (LHV) of natural gas. Combustion air is supplied at 55°C, using natural or forced draft. Combustion flue gas contains 7-8% CO₂.

Material and energy flow diagrams for a standard 33,000 BPD in-situ facility are provided below.

The primary objective of enriching the combustion air O₂ content is to improve the combustion efficiency of boilers and heaters. The secondary objective is to reduce the capital cost of CO₂ capture. Oxy-combustion has been investigated and piloted recently. The combustion exhaust gas is primarily CO₂, ideal for CO₂ capture. However, high combustion temperatures require exotic metallurgy and the Air Separation Unit (ASU) has high capital and operating expenses. High combustion temperatures can also lead to high NO_x emissions.

COSIA envisions a 'sweet spot', where small inexpensive increases in the oxygen concentration of combustion air could improve the boiler efficiency and directionally reduce the cost to capture flue gas CO₂, without the need for exotic metallurgies and expensive air separation units.

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APPROACHES NOT OF INTEREST

The following approaches are not of interest:

- Non constant gas compositions
- Non constant flow rate

ADDITIONAL INFORMATION

COSIA has several tools you can use, including sample Reference Facilities. These tools will help you analyze and quantify the benefits of your technologies prior to submitting them to our [Environmental Technology Assessment Portal \(ETAP\)](#). You can find these tools on the Green House Gases Innovation Opportunity page at [Greenhouse Gases Innovation Opportunities | Canada's Oil Sands Innovation Alliance - COSIA](#).

For this specific Innovation Opportunity, please review the tools noted below:

SAGD Reference Facility

- Base Case, mechanical lift, Warm Lime Softening CPF **pg 43/60**
- Base Case WLS/OTSG Energy Flow **pg 45/60**

Mine Reference Facility

- High Grade PFT (Mass and) Energy Flow **pg 23/26**
- High Grade NFT (Mass and) Energy Flow **pg 25/26**