

# COSIA CHALLENGE

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



## Quantification of Area Fugitive Emissions

<p><b>SOLUTION DESCRIPTION:</b></p> <p>Transformative, cost-effective technologies to accurately and precisely quantify area fugitive greenhouse gas emissions from oil sands tailings ponds and mine faces.</p>	<p><b>CHALLENGE SPONSOR:</b></p> <p>COSIA's <b>GHG EPA</b> is sponsoring this challenge.</p> <p>Our aspiration is to <b>produce our oil with lower greenhouse gas emissions than other sources of oil.</b></p> <p><i>COSIA has four Environmental Priority Areas (EPAs): Water, Land, Tailings, and Greenhouse Gases (GHGs).</i></p>
<p><b>CREATED:</b> October 18, 2016</p> <p>All projects are evaluated and actioned as they are received.</p>	
<p>For more information on this COSIA Challenge please visit <a href="http://www.cosia.ca/challenges">http://www.cosia.ca/challenges</a></p>	

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. Challenges 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 and funding the development of the technologies to the point of commercialization, while protecting the Intellectual Property (IP) rights of the owner of the technology.

Successful proposals can receive funding from COSIA members to develop and demonstrate the technology in an oil sands application. Multiple technologies may be funded, at the discretion of the Members.

## HOW TO SUBMIT TO COSIA

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

<http://www.cosia.ca/initiatives/etap/idea-submission-form>

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.*



## #0017: Quantification of Area Fugitive Emissions

### DETAILED SOLUTION DESCRIPTION

COSIA is seeking cost effective technology that is also precise and accurate to measure area fugitive emissions of methane and carbon dioxide and/or volatile organic compounds from a tailings pond and mine pit. The tailings pond emissions may not be uniform and the composition may vary from area to area within the tailings pond. The mine emissions are similar to the tailings pond with an added complexity of the terrain, seasonal and diurnal effects on emissions.

The technology for quantifying area fugitive emissions from tailings pond and mine faces will:

- Provide high levels of certainty in emissions over the total area of oil sands tailings ponds and mine faces throughout the year
- Calculate the flux rates reliably that are collected in real time, continuously, and with full spatial coverage
- Have automated upload, compiling, and real-time data calculation ability providing current flux rates
- Nice to have option - Provide on-demand area fugitive GHG report generation with minimal QA/QC input
- The technology must be cost effective and not labor intensive.
- The ability to validate/audit (occasionally) by another leading technology (e.g. laser, satellite)

### BACKGROUND

COSIA members that are developing or operating a mine are actively pursuing improved methods of quantifying area fugitive emissions from both oil sands tailings ponds and the mine face.

Area fugitive emission rates from tailings ponds and mine faces are difficult to quantify and are currently measured using flux chamber technology conducted once per year. Emissions are estimated through extrapolation of measurement results in both space and time, and do not account for seasonal and operational variability thus leading to high levels of variability in results.

Area fugitive emissions can be measured using a range of different sensor technologies, either on the surface (ground, water), from the air, or from space; each having their advantages and disadvantages. While COSIA members are currently advancing existing technologies for improved quantification, these methods can be costly, may carry safety concerns, and are logistically or operationally challenging. As such, there is increased interest by oil sands companies in understanding the technology landscape for low cost and safe monitoring that provide high levels of certainty from wide area sources; specifically, Methane (CH<sub>4</sub>) and Carbon Dioxide (CO<sub>2</sub>), and ideally Volatile Organic Compounds (VOCs) and Total Residual Sulphur (TRS). This challenge offers two distinct separate objectives, a focus on GHG or VOC emissions.

### APPROACHES PREVIOUSLY OR CURRENTLY BEING EVALUATED

The following approaches are well known to COSIA members and are not of interest with respect to this particular Challenge:

- Eddy Covariance
- OP-FTIR and Radial plume mapping and/or dispersion models
- Advanced LIDAR (including DIAL)
- Unmanned Aerial Vehicles
- Satellite monitoring and modeling for flux estimation
- Aerial Survey for Methane Measurement by Shell LightTouch

### ADDITIONAL INFORMATION

COSIA members are actively involved with satellite based monitoring system, ground based remote sensing technologies such as OP-FTIR, OP\_TDL, UAV and several types of dispersion modeling techniques,

The following links provide an overview of oil sands mining and extraction:

## #0017: Quantification of Area Fugitive Emissions

<http://www.oilsandsmagazine.com/oil-sands-surface-mining-open-pit-mining-techniques-overview>

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The following link provides a description of Tailings Ponds in general:

<http://www.canadasoilsands.ca/en/explore-topics/tailings-ponds>

The existing area fugitive quantification technology approach accepted by the Government of Alberta, flux chamber, is described here:

<http://aep.alberta.ca/climate-change/guidelines-legislation/specified-gas-emitters-regulation/documents/AreaFugitiveEmissionsOilSandsMines-2014.pdf>

The following link provides information on COSIA's Mine Reference Facility, which includes energy and material flow diagrams for a reference oil sands mine:

<http://www.cosia.ca/uploads/documents/id39/Tetra%20Tech%20Development%20of%20a%20Static%20Oil%20Sands%20Mine%20Ref.pdf>