

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



Electromagnetic Simulation Tools

SOLUTION DESCRIPTION: Software coupling of trusted EM simulation tool to a trusted reservoir simulator.	INNOVATION OPPORTUNITY CHAMPION: COSIA's members have identified 'Electromagnetic (EM) Simulation Tools innovation priority', which if realized, would help accelerate adoption of EM reservoir heating and dramatically reduce the amount of water needed and emissions per barrel of oil produced.
CREATED: (April, 2022) All project proposals are evaluated and actioned as they are received.	
For more information on this COSIA Innovation Opportunity please visit www.cosia.ca/innovation-opportunities/greenhouse-gases	

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.



ELECTROMAGNETIC SIMULATION TOOLS

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 operations
- Technical justification for the approach
- Basis of cost estimation, including estimation scope, contingency, etc.
- IP status of your proposed technology

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.

PROBLEM STATEMENT

Thermal geo-mechanical integrated EM models don't exist for use in an oil sands reservoir engineering.

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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BACKGROUND

- There is a need to accurately predict the power consumption, NCG pressure maintenance and solvent requirements related to the utilization of EM heating in subsurface environments.
- Full field asset development plans carry a significant forecasting uncertainty due to the complexity of combined electromagnetic and hydrodynamic numerical models, immaturity of the simulation tools.
- Poor understanding of physical phenomena related to EM heating of porous media presents a major risk for application of EM-assisted thermal recovery.
- Complexity of integrating solvent process dynamics with EM heating will require shifting the paradigm for reservoir management and forecasting.
- Commercially available reservoir simulators do not perform calculations using the same methodology as EM simulators (finite difference vs finite element)
- There are several routinely used reservoir simulators and many commercial EM tools
 - Task requires coupling 2 different simulation methodologies – reservoir simulation is commonly finite element whereas EM simulation is commonly finite difference
 - There are no independently available ‘go-to’ tool available for integrating these simulation tools
- There is a need to connect the two bodies of work so that they can work together to supply producers with an independent method to perform their own analysis outside of service providers
- There are multiple reputable Ph.D. theses on this topic, but none have been developed into a useful tool, including:
 - Conduction and Dielectric Relaxation Mechanisms in Oil Sands Influencing Electrical Heating – Abraham, Tinu 2016
 - Combined Electromagnetic Heating and Solvent Injection for Heavy Oil Recovery – Hu, Lanxiao 2018
 - Mathematical Modeling of Heavy Oil Recovery Using Electromagnetic Heating Combined with Solvent Injection - Sadeghi, Asghar 2019 BACKGROUND

ELECTROMAGNETIC SIMULATION TOOLS

EXPECTED RESULTS (THE ASK)

Seeking a qualified tech provider who is willing to act on the PHD theses and make them digestible

- Need the coupling tools, to join trusted reservoir simulators (CMG STARS, INTERSECT, etc) to a trusted EM tool
- This tool must be intuitive and user friendly (include a GUI)

CURRENT OR CONTEMPLATED PROJECTS

ConocoPhillips Surrmont EM Heating Technology Pilot 2024