

CCP PROJECT FACTSHEET

OXY-FUEL – ONCE-THROUGH STEAM GENERATORS (OTSG) PILOT TEST

OVERVIEW

The CO₂ Capture Project (CCP), joined by Cenovus Energy, Climate Change Emissions Management Corporation (CCEMC), Devon Canada, MEG Energy, Praxair and Statoil, is piloting oxy-fuel combustion technology to reduce CO₂ emissions from once-through steam generators (OTSG). OTSG boilers are the primary source of CO₂ emissions from in-situ production of heavy oil.

The demonstration is part of the CCP's work to develop next generation technologies that will make CO₂ Capture and Storage a practical and cost effective option for reducing CO₂ emissions from fossil fuels.

THE PROJECT

Goals

The main goals of the project are:

- To evaluate the integration of oxy-fuel combustion and CO₂ capture technology into the operation of a OTSG boiler to enable CO₂ sequestration
- Provide design and cost estimates for a commercial-scale OTSG boiler with CO₂ capture, and compression

Oxy-fuel combustion in OTSG is expected to have several advantages over post-combustion capture with amines, including:

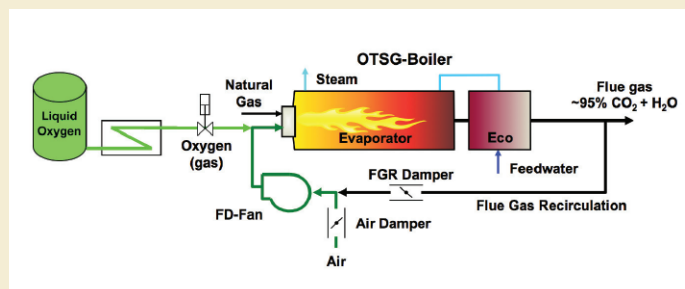
- Ability to capture up to 99% of the CO₂ emissions
- Lower levelized capture costs
- Lower total energy and operation and maintenance costs
- Significant reductions in emissions of air contaminants, oxides of nitrogen
- Recovery of water from the gas, thus reducing or eliminating the need for boiler make-up water
- No requirements for amine or ammonia solvents, which may pose operational and environmental challenges
- The potential for improved boiler as there is no nitrogen present in the combustion process.



Oxy-Fuel Combustion to Reduce OTSG Emissions

Once-through steam generators (OTSGs) burn large amounts of natural gas, and are the primary source of GHG emissions from the in-situ production of bitumen from Canada's Athabasca oil sands. OTSGs are used in steam-assisted gravity drainage (SAGD) operations; these types of operation will be the primary source of growth in heavy oil activities for the foreseeable future, as upwards of 85% of bitumen resources in Canada can only be extracted through in-situ production methods. This is an important area of development which could help significantly reduce the greenhouse gas emissions of these operations.

The CCP identified oxy-fuel combustion as a leading candidate for OTSG boilers. Oxy-fuel technology uses nearly pure oxygen instead of air for combustion. By eliminating nitrogen, a gas with concentrated CO₂ is produced, which requires minimal clean-up prior to compression and transport to long-term geological storage.



Three Phase Project:

The project is being carried out in three phases; the first has been completed:

Phase I – Design basis for pilot and commercial-scale OTSGs (Complete)

Phase I, at an approximate cost of CAD\$1 million, was completed in 2010 and optimized the design and costs of both a pilot-scale and commercial scale boiler. This phase included the establishment of the design basis for a commercial scale boiler system as well as a test sized boiler.

The results of this phase indicate that the costs of capturing CO₂ with oxy-firing will be in the range of CAD\$125-150 per tonne CO₂ avoided, which is significantly less than post-combustion capture technologies for this application.

Phase II – Pilot test of oxy-fuel combustion on test boiler (2011-13)

Phase II of the project, at an approximate cost of CAD\$5 million, will pilot oxy-fuel combustion on a 50 MMBTU/hr OTSG unit at Cenovus Energy's Christina Lake in-situ site. This phase will modify and operate a OSTG for oxy-fuel combustion, without capture and compression, for several weeks to demonstrate feasibility and provide essential data to design a full scale system. The oxygen for the test will be provided by trucking liquid oxygen from an existing air separation plant.

In 2010, the project participants were awarded a \$2.5 million grant from the Alberta CCEMC to partially offset the costs of the pilot programme.

Phase III – Addition of purification, compression and sequestration to pilot

Phase III would convert the oxy-fuel test completed in Phase II into a long term pilot by adding permanent oxygen supply and a CO₂ Processing Unit. Cost estimates and test plans developed in Phase I along with a successful Phase II will be used when making a decision whether to proceed with Phase III.

Project Participants

The project participants include the CO₂ Capture Project, Devon Canada, Cenovus Energy, Statoil ASA, MEG Energy, Praxair, Inc, and the CCMEC. Cenovus Energy is hosting the test at their Christina Lake in-situ site, and Praxair is the prime technology provider. Suncor is the project manager.



ABOUT THE CO₂ CAPTURE PROJECT

The CO₂ Capture Project (CCP) is an award-winning partnership of several major energy companies working to advance the technologies that will underpin the deployment of industrial-scale CO₂ capture and storage. To find out more visit www.co2captureproject.com

