

Base Protocol Plan – Enhanced Oil Recovery Base Protocol

PART I: IDENTIFICATION OF THE PROTOCOL DEVELOPER

1.1 Title of Base Protocol

Enhanced Oil Recovery Base Protocol (adapted from the *Quantification Protocol for Enhanced Oil Recovery*, October 2007, Version 1. Alberta Environment; Specified Gas Emitters Regulation)

1.2 Lead Protocol Developer

1.3 Initiating Entity

DRAFT

PART II: BASE PROTOCOL APPLICABILITY AND DEVELOPMENT APPROACH

2.1 Description of the Project Type

This project type pertains to the capture and storage of greenhouse gases (GHG) from oil and gas or other industrial processes. Emissions from the oil and gas industries – including processing and extraction - are included in Canada's inventory of GHG emissions.¹ This protocol applies specifically to enhanced oil recovery projects and is not applicable to other forms of CO₂ geosequestration.

This protocol quantifies emission reductions created by the capture, processing, transport, injection, recirculation and geological storage of gases from oil and gas production processes or other industrial processes. This protocol applies to enhanced oil recovery projects where the injected gases are emitted from industrial sources into the atmosphere under baseline conditions. This protocol does not intend nor attempt to address the issue of how offset credits are earned or granted. Potential users of this protocol are entities that operate within and around the oil and gas industry.

Enhanced oil recovery projects that began injecting CO₂ into oil reservoirs prior to January 1, 2000 will not be eligible under this protocol. Credits will only be granted for emission reductions that occur after January 1, 2008.² Only projects that begin enhanced oil recovery using CO₂ in an oil reservoir where no enhanced oil recovery using CO₂ existed previously, or expands the capacity³ of an existing enhanced oil recovery system that begin operation after January 1, 2000 are eligible under this protocol.

2.2 Description of any project-specific technology

Enhanced oil recovery refers to oil recovery processes that extract over and above what is obtained using the natural pressure of the reservoir. For the purposes of this protocol, this enhancement is obtained by increasing the pressure in the reservoir through the injection of carbon dioxide and/or acid gas. These gases must subsequently be geologically sequestered.

This protocol applies to those projects where the injected gases are from industrial sources and would otherwise have been emitted to atmosphere, including CO₂ produced as a by-product of natural gas or oil production.

Enhanced oil recovery projects utilize a range of technologies to achieve their goals. In particular, GHG capture⁴, injection and transportation technologies are used. A number of technology providers are able to supply each of these technologies.

2.3 Greenhouse gases that will be reduced

- Carbon dioxide (CO₂)

¹ Section 3.3.2 Oil and Natural Gas (CRF Category 1.B.2) and Section 3.2.1 Energy Industries (CRF Category 1.A.1) National Inventory Report, 1990-2005: Greenhouse Gas Sources and Sinks in Canada. Environment Canada, April 2007. In addition, the National Inventory Report states, in regard to CO₂ sequestration, that '...current inventory procedures are designed to estimate the net CO₂ emitted to the atmosphere...'

² Section III. Registration of Offset Projects. Turning the Corner: Canada's Offset System for Greenhouse Gases.

³ The term 'expanded capacity' means an increase in the theoretical rate that an existing enhanced oil recovery project can inject and store GHGs. For instance, pipeline capacity may be increased, another industrial source of GHGs may be added, etc.

⁴ Carbon dioxide capture may be accomplished through solvent absorption, physical absorption, membrane separation and cryogenic fractionation, among other methods.

- Methane (CH₄)
- Nitrous oxide (N₂O)

2.4 Description of how real reductions will be achieved

Eligible projects under this protocol will capture and sequester GHG emissions, primarily carbon dioxide, produced as a by-product of natural gas, oil or other industrial production processes that would otherwise have been vented to the atmosphere. The amount of GHGs released during transport, compression and storage of the GHGs are substantially less than the amount of GHG being sequestered; therefore, net, real reductions will occur. Projects may be supplied by more than one source of GHG.

In enhanced oil recovery schemes, waste gases are generally captured from point sources that emit significant volumes of CO₂, such as fossil fuel processing facilities or industries that emit large volumes of CO₂. In some cases, these point sources contain a high concentration of GHGs; in others, the waste gas is processed to increase the concentration of CO₂ in the waste gas.

There are a number of technologies that can be used to treat waste gas streams and increase the concentration of CO₂, including adsorption and the application of liquid solvents. In some cases, advanced techniques may be used to increase the concentration of GHGs, particularly CO₂ in the waste stream. These techniques include removing the carbon from fossil fuels or other feed stocks prior to combustion or processing and combusting fossil fuels in oxygen rather than air.

After capture, the CO₂ must be transported to an oil field, where it is used to increase the ability for oil to be extracted⁵; hence, enhancing oil recovery. Transport of CO₂ is generally achieved via pipeline, although other techniques may be available. Typically, a significant volume of the injected CO₂ returns with the produced oil, which is re-injected into the reservoir to ensure that no CO₂ is emitted to the atmosphere once injected into the reservoir.

These oil reservoirs are also the ultimate storage sites for the CO₂, which feature a number of physical characteristics such as highly impermeable cap rock that prevents the CO₂ from escaping into the atmosphere. Injecting CO₂ into deep geological formations at carefully selected sites can store it underground for long periods of time; it is considered likely that 99% or more of the injected CO₂ will be retained for 1,000 years.⁶

EOR projects will not require a testing period prior to full implementation of the project. This is due to the fact that EOR projects are subject to significant regulation and therefore must be approved by highly competent regulators. In addition, any CO₂ that is not stored under the project condition will not be eligible for crediting. Therefore, no testing period for EOR projects are required under this protocol.

⁵ Generally speaking, the injection of CO₂ into an oil reservoir increases the ability to extract oil by increasing the pressure of the reservoir and by reducing the viscosity of the oil, among other effects.

⁶ IPCC Special Report on Carbon Dioxide Capture and Storage (2005) http://www.ipcc.ch/pdf/special-reports/srccs/srccs_wholereport.pdf

2.5 Base Protocol Flexibility

- A range of established and emerging technologies exist that can be employed in EOR projects, including CO₂ capture, transportation and injection technologies. Technologies that achieve the same end can be used, provided appropriate SS's are considered.
- The base protocol may be applied to projects that employ gases from Source Type A, Source Type B, or both.⁷
- Not all parameters are applicable to all EOR systems. Those sources and sinks (SS's) that are not applicable will be excluded as their input variables will be zeros. This principle is applicable to those projects that undertake metering that intrinsically accounts for fugitive emissions. As such, the project developer can exclude sources and sinks that are not applicable to their project with reasonable justification; and
- This protocol may be applied to projects where an existing injection program is being expanded to include additional capacity. In the case of a project expansion, the proponent may consider the additional capacity as a new project. Alternatively, the project developer may include the previous operations as the operating condition under the baseline. As such, the SS's considered under the baseline condition may be amended to include SS's as defined for the project conditions that are applicable under the baseline condition.

2.6 Federal, Provincial/Territorial Legal Requirements & Climate Change Incentives

List of potentially relevant legal requirements:

Federal:

- *Turning the Corner: Regulatory Framework for Industrial Greenhouse Gas Emissions* (Note: To date, these stated requirements have yet to be enshrined in legislation)

Provincial/Territorial:

Alberta

- *Climate Change and Emissions Management Act*, R.S.A. 2003, c. C-16.7 & *Specified Gas Emitters Regulation*, Alta. Reg. 139/2007

British Columbia

- *Greenhouse Gas Reduction (Cap and Trade) Act*, S.B.C. 2008, c. 32. (Note: this Act was given Royal assent on May 29, 2008, but is not yet in force).

⁷ Source Type A: The CO₂ portion of gas captured and processed as part of the normal operating practice for the facility. This source type is anticipated to apply to solution gas capture and processing in the oil and gas production industries.

Source Type B: CO₂ from gas capture and processing are not normally undertaken but are used for EOR. Source Type B is anticipated to apply to industrial processes outside of the fossil fuel production industry.

Manitoba

- *Climate Change and Emissions Reductions Act*, C.C.S.M. c. C135

Nova Scotia

- *Environmental Goals and Sustainable Prosperity Act*, S.N.S. 2007, c. 7

List of potentially relevant incentives:

Federal:

There are no relevant Federal incentives.

Provincial/Territorial:

- On July 8, 2008 the Alberta Government announced a \$2-billion fund to advance carbon capture and storage projects.
- New Brunswick launched a \$34-million Climate Change Action Fund in October 2007 to support projects to reduce GHG emissions.

2.7 Building on existing protocols or proprietary information

Registered name of protocol:	<i>Quantification Protocol for Enhanced Oil Recovery</i>
System for which protocol was developed:	Specified Gas Emitters Regulation, Alberta Environment
Date protocol was completed and approved:	October 2007, Version 1
Developer of the protocol:	Alberta Environment ⁸

Explanation of how the existing protocol will be adapted

The *Quantification Protocol for Enhanced Oil Recovery* ('*Alberta Protocol*') will be adapted through a collaborative process involving members of the Geosequestration Working Group, facilitated by the Industry Provincial Offset Group (IPOG) and best-practice guidance based on the Methane Management protocols listed in Annex J of the *Draft Guide for Protocol Developers*.

Explanation of the nature of the proprietary information and how it might be used in the Base Protocol

The protocol is based upon the publicly available *Quantification Protocol for Enhanced Oil Recovery*, Specified Gas Emitters Regulation, Alberta Environment.

⁸ The *Quantification Protocol for Enhanced Oil Recovery* is an abridged, re-formatted and amended version of the *CO2-EOR Offset Quantification Protocol*, September 2006, which was prepared by EnergyINet Inc. and the Alberta Research Council.

PART III: DECLARATION/CONSENT/SIGNATURE

The undersigned acknowledges that the undersigned has read, understood and that the undersigned agrees to abide by all the terms, conditions, instructions, and notices set out in the Guide for Protocol Development.

The undersigned acknowledges that the review of, and comments regarding, this base protocol plan or portions thereof does not ensure that the base protocol plan or portions thereof will be used in an Offset System Quantification Protocol by Canada's Offset System for Greenhouse Gases.

The undersigned is legally authorized to use any and all proprietary (or protected) information found in and submitted with the base protocol plan.

The undersigned is duly authorized to sign this application.

The undersigned declares that the base protocol plan submitted for Canada's Offset System for Greenhouse Gases and the information provided on, with or pursuant to this application is true, accurate and complete.

The undersigned consents to the public disclosure, in any manner including, without limitation, posting on Offset System website, of all the information in the base protocol plan and the information submitted with the base protocol plan.

Signature:

By protocol developer (individual, or an organization's or a corporation's duly authorized representative, date, name, title)

Name

By: _____
(print name)

Title: _____

Signature: _____

Signed this ____ day of _____, 2008