



# Quantification Protocol for Solution Gas Conservation for the Alberta Offset System

2<sup>nd</sup> Round Stakeholder Review  
October 29, 2009

# Overview

- Description of project type
- Process overview
- Protocol applicability
- Alberta Offset System eligibility criteria
- Description of Baseline and Project conditions
- Flexibility mechanisms
- Quantification methodology
- Example calculation

# Process Overview

- Initiating entities
  - Canadian Natural Resources Limited
  - Husky Energy
- Seed documents/key references
  - Clean Development Mechanism AM0009 v3, AM0037 v2.1
  - Alberta Environment Quantification Protocols for Landfill Gas Capture and Combustion v1 and Anaerobic Treatment of Wastewater Projects v1.
  - Information from initiating entities
  - Other documents from University of Alberta, Energy Resources and Conservation Board, Clean Air Strategic Alliance, etc.
- Technical Review
  - Expert Technical Review Meeting took place on March 19, 2009 with 16 people in attendance.
- Suggested changes to current draft
  - Typos
  - Flexibility mechanisms
  - Quantification procedures

# Description of Solution Gas Conservation

- Applies to the oil and bitumen extraction industry.
- Solution gas is the natural gas often released from solution during crude oil and bitumen extraction, consisting mainly of methane, a greenhouse gas.
- The conservation of solution gas is required if it meets criteria identified in Alberta Energy Resource Conservation Board's *Directive 60: Upstream Petroleum Industry Flaring, Incinerating and Venting*.
- The Gas to Oil Ratio is used to determine how Directive 60 applies to a given site.
- Conservation occurs by capturing the solution gas and injecting it into the natural gas system.

# Description of Solution Gas Conservation

- Solution gas is often vented directly to the atmosphere if its conservation is not required by *Directive 60*.
- This protocol quantifies reductions from projects that conserve solution gas that was previously vented and that are not required to conserve based on *Directive 60*.
- Under the baseline – solution gas (containing methane, a GHG) is released to the atmosphere. Under the project, this methane in the solution gas is instead destroyed (through end-users of pipeline natural gas or other equipment), resulting in a reduction of GHG emissions.

# Applicability criteria

- Prior to the project, solution gas was vented to the atmosphere;
- Must not be required by *Directive 60* or any other regulation;
- The quantification of reductions must be based on actual measurement (except as indicated in the protocol) and should take into account the possibility of fugitive emissions; and,
- The project must meet the requirements of the Alberta Offset System.

# Eligibility criteria

- Start Date: Conservation of solution gas must have begun no earlier than January 1, 2002.
- Credit Duration Period: Projects will be eligible to generate credits for 8 years, with a possible extension of 5 years.
  - Change in regulation
  - Typical duration of solution gas projects
- Real, Demonstrable and Quantifiable
- Not required by law: Only those projects that are not required by any applicable regulation (including *Directive 60*) at the time solution gas conservation begins will be eligible for crediting.

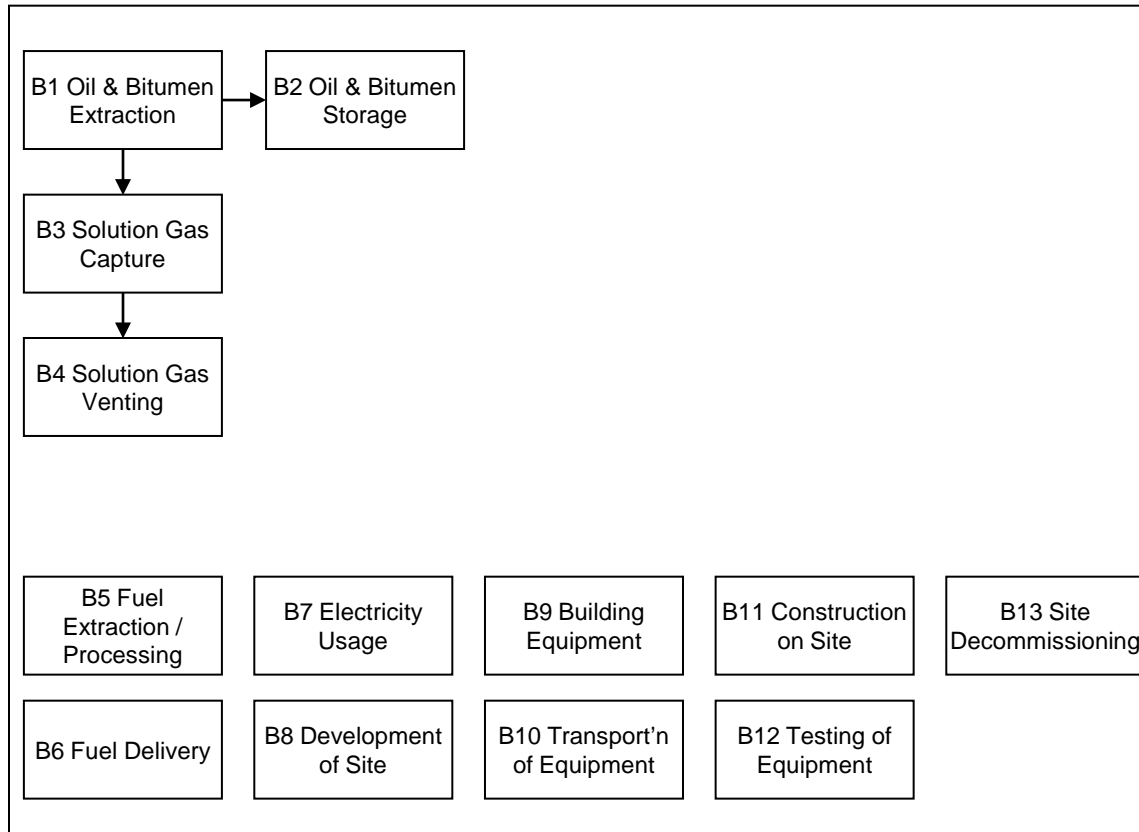
# Eligibility criteria

- Ownership: Will be established through oil and gas rights; in cases of joint ownership, the ownership of any credits will be addressed privately by the parties involved.
- Counted once: Facilities that emit greater than 100,000 tonnes of CO<sub>2</sub>e (i.e. regulated facilities) will not be eligible to generate credits using this protocol.
- The credits must be verified by a third-party and must have occurred in Alberta.

# Baseline condition

- Represents the operation of the facility under its original configuration, prior to the commencement of solution gas conservation – i.e. the venting of solution gas directly to the atmosphere.
- Quantifies emissions from the direct venting of solution gas
- Baseline is calculation-based, dynamic and will vary from facility to facility.
- Monitoring generally consists of:
  - Volume of solution gas that would otherwise have been vented
  - Concentration of methane in otherwise-vented solution gas

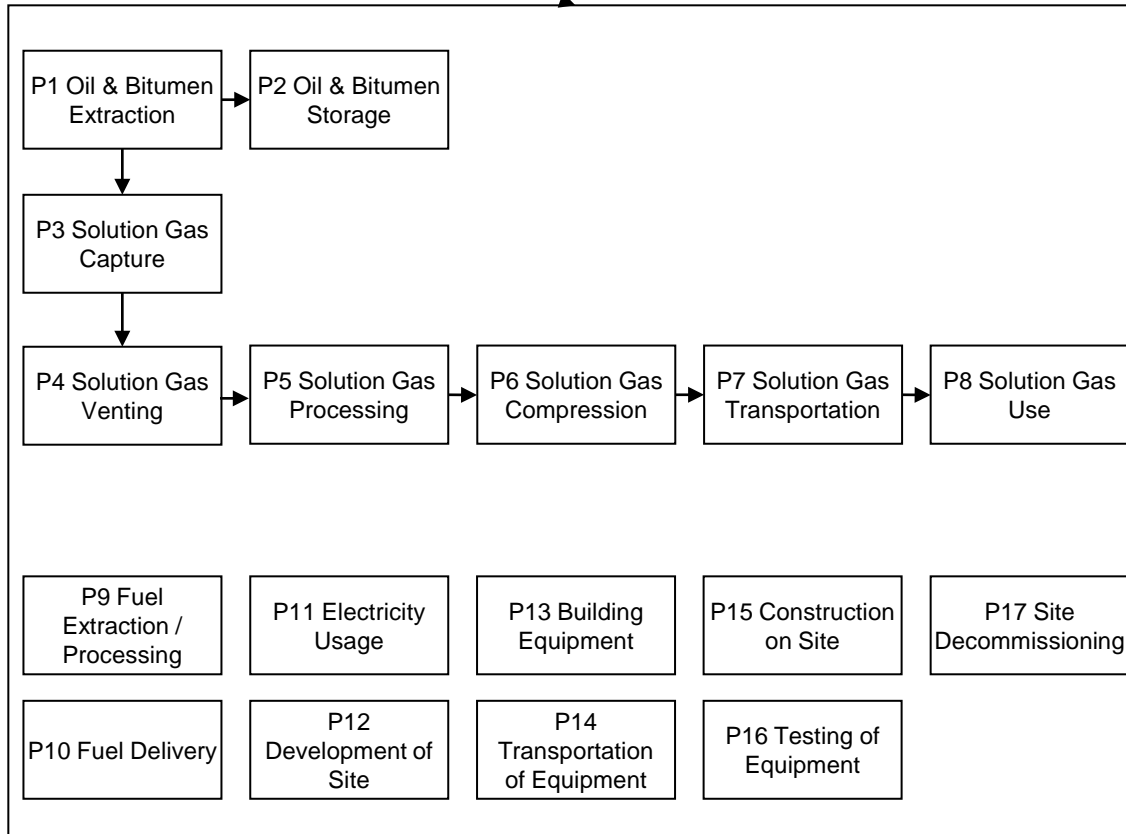
# Process Flow Diagram – Baseline



# Project condition

- Represents the operation of the facility once solution gas conservation has begun, where conservation is not required by *Directive 60*.
- Quantifies emissions from the use of conserved solution gas and other fossil fuels.
  - Combustion of solution gas and other fossil fuels (if applicable)
- Monitoring generally consists of:
  - Volume of solution gas conserved
  - Volume of solution gas used for compression, and processing, etc.
  - Concentration of methane in solution gas
  - Volume of other fossil fuels used (e.g. propane)

# Process Flow Diagram – Project



# Flexibility mechanisms

- Credit may be claimed due to the displacement of fossil fuels on an equivalent energy basis;
  - Natural gas or other fossil fuels
- Credits may be claimed for gas flared instead of vented under the baseline condition with appropriate modifications to SS B4;
- Aggregation of credits from multiple projects to facilitate offset commoditization is allowed;
- The quantification methodology contained may be simplified by including only SS P8 and SS B4 where it is conservative to do so.
  - Allows for simple and conservative quantification

# Quantification methodology

$$\text{Emissions Reduction} = \text{Emissions}_{\text{Baseline}} - \text{Emissions}_{\text{Project}}$$

$$\text{Emissions}_{\text{Baseline}} = E_{\text{Solution Gas Venting}} + E_{\text{Fuel Extraction / Processing}}$$

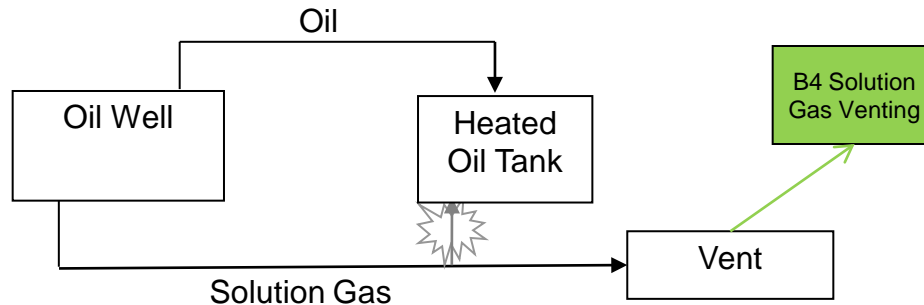
- Baseline:
  - Does not apply B5 Fuel Extraction/Processing to solution gas

$$\begin{aligned} \text{Emissions}_{\text{Project}} = & E_{\text{Oil \& Bitumen Extraction}} + E_{\text{Oil \& Bitumen Storage}} + E_{\text{Solution Gas Venting}} + \\ & E_{\text{Solution Gas Processing}} + E_{\text{Solution Gas Compression}} + E_{\text{Solution Gas Use}} + E_{\text{Fuel Extraction / Processing}} \end{aligned}$$

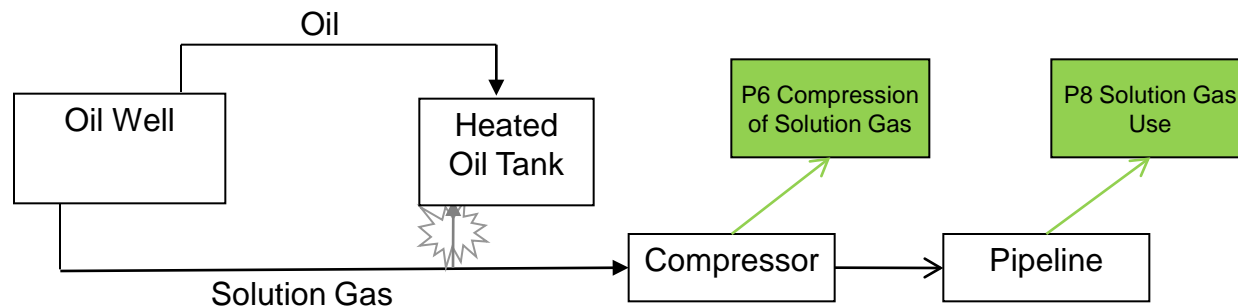
- Project:
  - Suggested change to quantification procedure; removal of P1 Oil & Bitumen Extraction and P2 Oil & Bitumen Storage
  - Includes emissions from the use of any other fossil fuels; does not apply P9 Fuel Extraction/Processing to solution gas

# Example Calculation

- Baseline condition: Solution gas is consumed to extract and store the oil & bitumen; the balance of the solution gas is vented.



- Project condition: Solution gas is consumed to extract and store the oil & bitumen; the remaining solution gas is used to operate a compressor and inject the gas into a natural gas pipeline.



# Example Calculation

- Baseline emissions: no fossil fuel use other than solution gas – therefore, B5 Fuel Extraction/Processing is excluded.

$$\text{Emissions}_{\text{Baseline}} = E_{\text{Solution Gas Venting}} + E_{\text{Fuel Extraction/Processing}}$$

- P1 Oil & Bitumen Extraction and P2 Oil & Bitumen Storage are equivalent to baseline, while project venting and solution gas processing are not applicable to this particular facility.

$$\begin{aligned} \text{Emissions}_{\text{Project}} = & E_{\text{Oil \& Bitumen Extraction}} + E_{\text{Oil \& Bitumen Storage}} + E_{\text{Solution Gas Venting}} + \\ & E_{\text{Solution Gas Processing}} + E_{\text{Solution Gas Compression}} + E_{\text{Solution Gas Use}} + E_{\text{Fuel Extraction / Processing}} \end{aligned}$$

# Example Calculation

- Therefore, baseline emissions are calculated as:

$$\text{Emissions}_{\text{Baseline}} = E_{\text{Solution Gas Venting}} = (V_{\text{compressor}} + V_{\text{pipeline}}) * [\text{CH}_4] * 21$$

- And project emissions are calculated as:

$$\text{Emissions}_{\text{Project}} = E_{\text{Solution Gas Use}} + E_{\text{Solution Gas Compression}}$$

$$\text{Emissions}_{\text{Project}} = V_{\text{pipeline}} * EF_{\text{CO}_2, \text{CH}_4, \text{N}_2\text{O}} + V_{\text{compressor}} * EF_{\text{CO}_2, \text{CH}_4, \text{N}_2\text{O}}$$

# Summary

- Solution gas is associated with oil and bitumen extraction activities
- *Directive 60* requires certain projects to conserve solution gas via injection of the gas into a pipeline;
- The protocol applies to those facilities where venting of solution gas occurs, and it's conservation is not required by *Directive 60* or any other regulation

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