



Pump Conversion to Reduce GHGs

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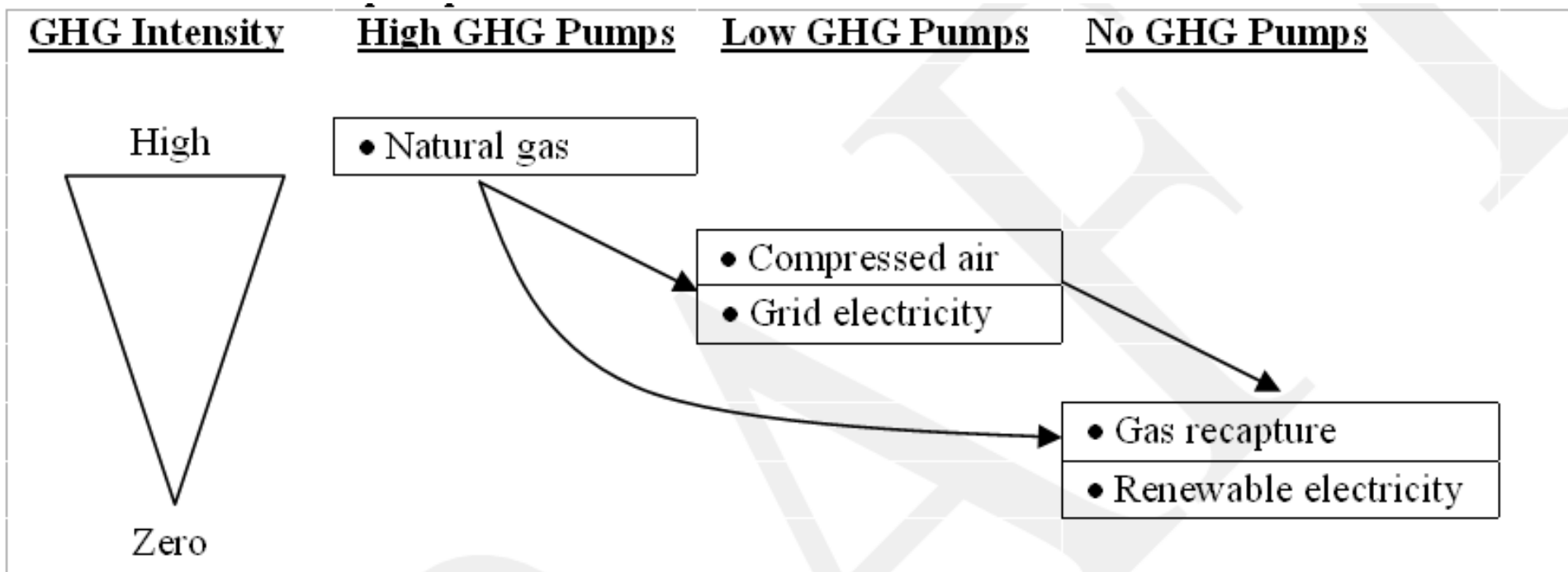
Contract Advisor

2nd Stakeholder Review | Edmonton, Alberta | October 28, 2009

Description of project type

- **Pump systems are commonly used in the oil and gas industry to displace fluids.**
- **In this protocol, the project developer will install, update or retrofit pumps and/or the power source for these pumps at a facility to reduce GHG emissions.**
- **Protocol is used to quantify emissions from GHG reduction using more efficient pumps.**
- **The opportunity for generating carbon offsets with this proposed protocol arises from the direct and indirect reduction of greenhouse gas emissions resulting from converting high GHG intensive pumps to low/no GHG intensive pumps.**

Description of project type



Process Overview (how protocol was developed, seed documents, technical review, etc.)

- **Step 1 Alberta Protocol Development Process Seed material/key references**
 - Reviewed existing protocols/methodologies
 - US EPA Gas Star Program
 - ISO 14064 Part 2
 - Industry experts
- **No directly related protocols available, good guidance documents found- many individual methodologies**
- **Developed proposed protocol**

Process Overview (how protocol was developed, seed documents, technical review, etc.)

- **Developed TPP and TSD in support of protocol**
- **Expert Technical Review**
 - **Step 7- Alberta Protocol Development Process**
 - Held on March 3rd, 2009
 - Internal/External reviewers-10
 - Industry- BP, EnCana, Petro-Canada
 - Government- ARC, Climate Change Central
 - Academia- University of Calgary
- **No sustained objections to move forward- Updated protocol with comments from review and feedback submitted later-March 13th. 2009**

Protocol Applicability (what applies, what doesn't)

Project developer must supply sufficient evidence to demonstrate:

- **Same liquid and level of service- Functional Equivalence**
- **Includes end-of-life replacements**
 - not facilities originally constructed to use low/no GHG intensive pump systems.

Option	Conversion Type	Is type A available?	Baseline calculated using* :
1	A→A	Yes	Does not qualify for offsets
2	A→B	Yes	Does not qualify for offsets
3	A→B	No	Does not qualify for offsets
4	A→C	No	B
5	A→C	Yes	A

- **Meet Alberta Offset System requirements.**

Project Condition

- **The project condition has been identified as the use of low/no GHG intensive pump systems at a facility after the conversion.**
- **PDFs (pump displacement factor) from manufacturers' technical specifications.**
- **This requires the project developer to meter either the electricity consumed or the fluid displaced.**
- **Low/no GHG intensive pump systems- powered natural gas, or on-grid or off-grid electricity.**
- **Project Emissions- electricity generation used to power pumps and fuel extraction and processing.**

Baseline Condition (and why chosen baseline scenario)

- **The baseline condition has been identified as the use of high GHG intensive pump systems at a facility prior to conversion to low/no GHG intensive pump systems.**
- **Metered quantities of either electricity or fluid displaced in the project condition are applied to pump-specific PDFs to estimate baseline emissions.**
- **High GHG intensive pump systems powered by natural gas, which is sourced from the fuel supply for the facility, or by on-grid or off-grid electricity.**
- **Baseline Emissions- electricity generation used to power pumps, vented natural gas, and fuel extraction and processing of fossil fuels.**

Flexibility mechanisms

- **Site specific emissions factors.**
- **Flexibility is given to the project developer to measure displaced fluids or electricity.**
- **Flexibility mechanism allows the project developer to increase the baseline volume and therefore baseline emission based on an Adjustment Factor for Optimization (AFO).**
- **Retroactive credits.**
- **Pump system conversion can take place at single or multiple sites. Flexibility in aggregating offsets from multiple projects.**

Proposed addition to flexibility mechanism # 2

“ Instead of metering the volumes of fluid displaced, the project proponent may also calculate them using vendor’s engineering specifications.”

- **Justification:**

- Practical and cost-effective approach to incent widespread conversion of small-scale emissions reductions.
- Chemical injection rate is constant and can be calculated by vendor’s engineering specifications.

AB Offset System criteria (how meets requirements)

- **Actions taken after January 1, 2002**
- **Occur on or after January 1, 2002**
- **Real, demonstrable, quantifiable (the reason for protocol)**
- **Not required by law (assessed on a case by case basis)**
- **Clear ownership**
- **Counted once for compliance purposes (registered in Alberta Offset System)**
- **Verified by a third party (to be hired by EnCana Corporation)**
- **Occurred in Alberta**

Barriers to Project Implementation and Co-benefits

Barrier type	Description
Financial Budgetary	<ul style="list-style-type: none"> • Scare resources to allocate funds for pump system conversion projects • Shutdown time during implementation resulting in revenue loss.
Technology Operation/ Maintenance / Technology Transfer	<ul style="list-style-type: none"> • Additional on-site personnel required for logistics of technology • Technology transfer delayed by unforeseen factors
Infrastructure/ Resource availability	<ul style="list-style-type: none"> • Unpredictability of renewable energy source availability may require a backup system.
Market Structure	<ul style="list-style-type: none"> • Uncertainty provincial/federal carbon market delay project execution; • Lack of available parts in local markets; • Unforeseen increase in demand may cause shortage/ delays in project
Institutional/Social/ Cultural/Political- Staffing	<ul style="list-style-type: none"> • Potential unwillingness to commit to changing current proven system; • Lack of field personnel willing to take responsibility of new system;

Co-benefits

- **Work safety, reduced VOCs, energy efficiency**

Review of existing projects

- **Solar pumps- general application all over Alberta**
 - 300 solar pumps in BC
 - 31 solar in Clearwater
- **Glycol electrification pumps-**
 - Suffield
- **Hydraulic Submersible Pumps (HSP)- dewatering**
 - Powered by wind or solar energy
- **Electric Submersible Pumps (ESP)**
 - Low production
 - Powered by wind or solar energy
- **Diesel to renewable energy conversions**
- **Others**

Baseline Quantification (Approach, SS included, functional equivalence etc.)

Upstream SS's During Project

B 1 Fluid
Production/
Processing

B 6
Fuel Extraction/
Processing

B 7
Fuel
Delivery

B 8
Electricity
Usage

Upstream SS's Before Project

B 2
Low/No GHG
Intensive Pump

B 9
Construction on
Site

B 10
Development of
Site

B 11
Building
Equipment

B 12
Transportation
of Equipment

B 13
Testing of
Equipment

On Site SS's During Project

B 3
Electricity
Consumption

B 4
Vented
Emissions

Downstream SS's After Project

B 14
Site
Decommissioning

Downstream SS's During Project

B 5
Downstream
Fluid Processing

Project Quantification (Approach, SS included, functional equivalence etc.)

Upstream SS's During Project

P 1 Fluid
Production/
Processing

P 6
Fuel Extraction/
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P 8
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On Site SS's During Project

P 3
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P 4
Vented
Emissions

Downstream SS's After Project

P 14
Site
Decommissioning

Downstream SS's During Project

P 5
Downstream
Fluid Processing

Emissions Reductions Quantification

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

$$\text{Emissions}_{\text{Baseline}} = \text{Emissions}_{\text{Fuel Extraction/Processing}} + \text{Emissions}_{\text{Electricity Consumption}} + \text{Emissions}_{\text{Vented Emissions}}$$

$$\text{Emissions}_{\text{Project}} = \text{Emissions}_{\text{Fuel Extraction/Processing}} + \text{Emissions}_{\text{Electricity Consumption}} + \text{Emissions}_{\text{Vented Emissions}}$$

Sample calculation (with potentials for reductions/removals if available)

	t CO₂e/year
Baseline Emissions	
Gas-assisted glycol pumps	
Vented Gas (1,737,000 m³/yr)	24,412
Fuel Extraction/Processing	330
Total Baseline Emissions	<u>24,741</u>
Project Emissions	
Electrical pumps	
Electricity Consumption	<u>209</u>
Emissions Reductions	<u>24,531</u>



Discussion

Thank you