



# INDEPENDENT EXPERT REPORT

<b>Module Title</b>	CO <sub>2</sub> CAPTURE FROM ACID GAS REMOVAL AT NATURAL GAS PROCESSING PLANTS
<b>Version</b>	V 1.0
<b>Sectoral Scope(s)</b>	Sectoral Scope 16: Carbon Capture and Storage
<b>Document Reviewed</b>	Module for CO <sub>2</sub> Capture from Acid Gas Removal at Natural Gas Processing Plants
<b>Date of Issue</b>	November 4, 2025
<b>Expert Assessor</b>	April Hillier
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## 1 INTRODUCTION

Verra is managing the development of VCS module *M0367 CO<sub>2</sub> Capture from Acid Gas Removal in Natural Gas Processing Plants*. Per Section 3.5 of the [VCS Methodology Development and Review Process, v5.0](#), module development requires a review by a group of independent experts to ensure the module aligns with current scientific knowledge, research, and best practices, assuring the technical rigor, accuracy, and consistency of the proposed content.

Based on their experience in upstream oil and gas, carbon capture and storage, and project development for the carbon market, Verra hired April Hillier to provide an expert assessment of the proposed module. The expert assessor’s assessment focused on the following:

- 1) Scientific rigor: Assessment of whether the proposed module reflects the most recent scientific knowledge of greenhouse gas (GHG) emissions in carbon capture and storage
- 2) Validity of technical assumptions

- 3) Appropriateness, relevance, accuracy, and/or conservativeness of:
  - a) equations for quantifying project emissions and leakage emissions
  - b) assumptions, calculations, and data sources
  - c) monitoring approach
- 4) Scope of module boundary relative to typical gas plant facilities, their capture facilities, and other module boundaries in the VCS methodology *VM0049 Carbon Capture and Storage* framework
- 5) Key risks or criticisms expected from the market for this activity type

## 2 ASSESSMENT APPROACH AND FINDINGS

The expert assessor reviews the draft methodology that was published for public consultation and provides feedback to Verra. Verra prepares responses to the expert assessor's findings and updates the methodology accordingly. The expert assessor reviews the responses and provides confirmation that the planned updates address the findings. See Section 6 for detailed expert assessment feedback.

## 3 ASSESSMENT CONCLUSION

The expert assessor completes the expert assessment of *M0367 CO<sub>2</sub> Capture from Acid Gas Removal in Natural Gas Processing Plants* and confirms that the draft module adheres to the criteria established.

## 4 EXPERT QUALIFICATIONS

\_\_April Hillier\_\_ has authored \_\_4\_\_ peer-reviewed scientific publications to date. A detailed list of \_\_\_\_\_ employment, education and qualifications, and research publications is available at: \_\_\_\_ <https://www.linkedin.com/in/april-hillier-6a002644/>

## 5 SIGNATURE

Signed for and on behalf of:

Name of entity: \_\_\_\_\_ *April Hillier Consulting* \_\_\_\_\_  
Signature: \_\_\_\_\_ *April Hillier* \_\_\_\_\_

Name of signatory: April Hillier

 Date: December 11, 2025

## 6 EXPERT FEEDBACK

Section # - Description of the Section			
#	Paragraph from Draft Methodology	Comment	Verra's Response and/or Update
1	Summary line 4, 5, 6	Consider revising <i>Storage that result in the diversion of carbon dioxide, separated from raw natural gas flows through acid gas removal and capture processes, towards permanent storage</i> . To more definitive language such as "that results in permanent storage" or "to be stored in an approved permanent geological storage container"	<p>This module covers the diversion of captured gas that would have been emitted.</p> <p>The storage module covers activities that result in permanent storage.</p>
2	Summary line 4, 5, 6	Alberta withdrew this protocol because it was deemed to be common practice (greater than 40% uptake) in 2013 <a href="#">Termination of Acid Gas Injection Protocol</a>	Yes, we are aware of that. This module is intended to apply globally to projects in jurisdictions where these activities are not common practice.
3	Summary line 14	Consider being explicit that credits are only awarded for removals and reductions NOT avoided emissions. Also consider allowing for avoided emissions in this case when it is avoided acid gas flaring or avoided sulphur recovery which could be baselined relative to historical operations and measured data	<p>This module calculates project emissions and leakage emissions and does not award credits. No action taken.</p> <p>Projects seeking credit for avoided emissions from flaring or sulfur recovery that would have taken place in the baseline, are welcome to use another methodology to account for the emissions impact of those activities. The use of multiple methodologies by a single project is afforded under the VCS Standard.</p>
4	Sources line 19	VMD0056 CO2 Capture from Air (Direct Air Capture This phrase should likely be deleted. The DAC module is not relevant in this project type	<p>Projects using VM0049 may combine multiple capture modules as needed to account for the activities of their projects.</p> <p>So, while the DAC module is not relevant to the activities covered by this module, it may be relevant to the project using VM0049.</p> <p>No action taken.</p>
5	Sources line 24	VMD0058 CO2 Storage in Saline Aquifers and Depleted Hydrocarbon Reservoirs Does this	This question is not relevant to this module.

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		module cover class II wells acid gas injection wells? Does the protocol mean to limit to depleted reservoirs and deep saline – those are formations I suppose versus well types? Clarity is needed, and I believe Class II is a suitable storage type that could be included.	
6	Definitions line 39-41	<i>Acid Gas</i> Is there an specific acceptable limit or range of CO2 composition? Is 98% CO2 still acid gas? How to handle the case when sulphur recovery (clauss and such) is employed and that stream is recovered instead of released to atmosphere and injected?	This module is applicable to activities that prevent the release of CO2 to the atmosphere. If no CO2 was being released in the baseline, then the project is not eligible.
7	Definitions line 48	<i>Existing natural gas processing plant.</i> Are greenfield natural gas plants built after September 2025 not eligible? If so why? Greenfield facilities should be eligible as well.	Eligibility was limited to existing processing plants as a conservative measure for the public consultation, while we assessed the potential for carbon lock-in related to supporting the activities covered by this module.  We have since extended the module to apply to both existing and greenfield facilities.
8	Definition line 49-51	<i>Natural gas processing plant</i> Is this inclusive of sulfur recovery or acid gas flaring? Recommend adding those unit operations to the baseline appreciating that it could impact the credit type avoided versus reductions and removals. However, the baseline for existing facilities with those operations could be arrived at using measured and historical data.	The processing plant could include those activities or not. We consider sulfur recovery covered under the emission sources that deal with conditioning processes.  Avoided emissions are not credited under this module
9	Applicability Conditions	Consider adding more commentary on the alternate fate of the CO2. What if the alternate fate is temporary storage to beverage companies? Should that be considered not applicable? Or if it is used in EOR is that applicable? It could be helpful to be explicit about exclusions Consider adding “And the CO2 would have been vented to the atmosphere in the absence of the project” to line 55 section 4	VM0049 is not applicable to projects that divert CO2 from other storage or utilization activities. While these limitations apply to all modules under the VM0049 framework, they are only listed in the methodology itself to avoid redundancy or misalignment across documents.  Added suggested text to relevant section.
10	Applicability Conditions (1) line 57-62	Consider adding some commentary about a look back period that is allowable for these existing facilities or refer to the Standard if it is already specified for clarity. 1b allows investment to avoid decommissioning but it will	We content that this possibility is covered under Applicability Condition 4.  The condition for using B1 (b) is that the project can demonstrate

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		be important to distinguish this from routine maintenance, potentially based on equipment life. These facilities have to sweeten the gas to make pipeline specs having an amine system is SOP. So the applicability in my mind is that they have a stream of CO2 that will not be venting or flaring or incinerating. For the refurbishment, if a new technology is installed it will impact the equivalence of baseline to project which has been assumed consider adding a flexibility mechanism to account for that or just have The baseline SSRS included and then projects can exclude if they can justify equivalent baseline to project.	that the remaining life of the plant (measured as the remaining life of the vital equipment in CDM Tool10) is zero before the project start date.
11	Applicability Conditions (2) line 63-66	Specifying capture type creates a risk to future proofing the method in the event that new capture technologies are developed. Consider revising applicability to the operation must have one and the complete description of the capture process must be disclosed. Or say the known ones are automatically fine and anything not on that list must be disclosed and evaluated for applicability.	We appreciate the suggestion.
12	Applicability Conditions (3) line 67-70	Why exclude one time use? Could be included if the emissions associated with one time use are equivalent project to baseline. No reason to exclude for GHG accounting reasons. What happens if	One time use capture media are excluded under VM0049. Question seems to be missing conclusion here.
13	Applicability Conditions (4) line 71-73	Consider adding greenfield facilities as excluded if that is the intention and only existing facilities are eligible. Recommend including both greenfield and brownfield.	The module now applies to greenfield facilities.
14	Applicability Conditions (4) line 71-73	Consider including any changes to operational practices that improve capture efficiency which can be demonstrated with measured data. This impacts the quantification and assumption of equivalence baseline to project for the capture unit. However, it could be accommodated and supported with data.	The CO2 captured from capture capacity that existed in the baseline but continues to operate in parallel to capacity added through the project activities, is treated as a non-VCS gas stream and is not creditable under this module.
15	Procedures 5.1 line 79	<i>“equipment used to generate airflow for the capture process (e.g., fans);”</i> I think this can be deleted seems to refer to DAC more so than gas sweetening	We have confirmed that in some cases equipment may be used to generate air flow.  However, the text has been edited to remove the example of “fans”.

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16	Procedures 5.1	In general, the additionality and common practice test is critical. I understand it is articulated in VM0040 I wonder if adding exclusions for certain jurisdictions like Alberta is warranted	Under VM0049, the onus is on the project to demonstrate additionality.  Projects that cannot meet the additionality tests, including the common practice test cannot use VM0049.
17	Figure 1 and Figure 2	Suggest including acid gas flaring, sulfur recovery units and incineration in the baseline condition if applicable	Suggestion added to draft
18	Figure 2	Consider listing sources such as capture facility construction materials, land clearing impacts for construction of capture, decommissioning of capture for completeness - even if the assumption is that they are equivalent baseline to project.	We appreciate the suggestion.  This module deals with gas processing plants built and operated to process natural gas using acid gas removal technologies.  Construction, land clearing, construction of capture and decommissioning are not attributable to the CCS project.
19	Figure 2	It is not clear to me the difference between emissions associated with electricity generation as a leakage and direct connect offsite electricity and I believe it is not included in table 1 to discuss inclusion and exclusion.	This emission source has been removed from the module.  Leakage from electricity use was deemed to be covered in the grid emission factors used to determine the project emissions.
20	Figure 2	Consider adding commentary on treatment of VPPAs in this project type for the incremental energy consumption. If prohibited, be explicit. If included speak to hourly matching, annual matching, overbuild etc.	We appreciate the suggestion.  Virtual Power Purchase Agreements are dealt with VT0010.
21	Table 1	Consider adding flaring in the project condition for upsets or intended venting	This source deals with the NG service used to power acid gas conditioning processes not present in the baseline.  We do not consider flaring to be relevant to this emissions source.
22	Table 1	Consider how recycled CO2 is accounted for. The previous Alberta protocol considered any CO2 in the raw gas as recycled CO2 in that it came from the reservoir where CO2 was injected. This would be a conservative assumption. This would require a CO2 gas analysis on the inlet raw gas that comes from	The module has been updated to treat CO2 from wells using enhanced gas recovery, as non-VCS gas, which is not eligible to generate credit.

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		adjacent reservoirs and also a measurement of flow. Both are likely readily available.	
23	Table 1	Consider including acid gas flaring and sulfur recovery in the baseline since operating the project would eliminate both practices relative to an acid gas injection project condition.	Revised text of baseline source to address comment: “Fuel combustion from flaring or incineration of acid gas or acid gas conditioning (e.g. – sulfur recovery)”
24	Table 1	Project Condition emissions “Fugitive and venting emissions from on-site fuel use for components of gas service not present in baseline” Consider including CO2 and N2O even though de minimus, for completeness and consistency. It is awkward to pick and chose which GHG are included within and SSR. Same for	We appreciate your suggestion but have made no change.
25	Table 1	Same as above for project condition emissions “Electricity consumption for acid gas conditioning processes”	We appreciate your suggestion but have made no change.
26	Table 1	Looks like leakage is missing discussion on Emissions associated with Electricity generation. Add include/exclude and justification	This emissions source was removed from the module.
27	Baseline Scenario line 109 110	Reference to additionality in Section 7 VM0049. Section 7.3 says common practice is 20% of compatible facilities in the sector in the country. In this case all Canadian projects are ineligible. Have the US stats been confirmed? Could be beneficial to include current state of adoption of this practice in certain geographies.	The responsibility to demonstrate additionality lies with the project.  Verra will not be establishing and maintaining a “negative list” of jurisdictions that cannot meet the common practice test.
28	Baseline B1 lines 113-121	“No equipment or systems that divert captured CO <sub>2</sub> towards permanent storage were operating at the existing natural gas processing plant before the project start date.” The phrase divert captured CO <sub>2</sub> to permanent storage needs clarification do you mean acid gas injection wells, class II, Class VI, depleted reservoirs, EOR? Maybe best to say that the CO <sub>2</sub> from gas processing (which includes sulphur recovery) was vented or flared or incinerated	Text revised to address.
29	Baseline B3	baseline 3 is comparing to a regulated performance standard, I believe. Over all I find this section confusing given there are 3	Baseline 3 is a standard option and required by ICVCM.

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		<p>baselines described and then other alternatives allowed which can be contemplated relative to one of the 3 specified. Maybe consider specifying the three. B1 is the historical do nothing to sequester CO2 and in that case a flexibility mechanism to allow installation of new equipment and a flexibility mechanism to include refurbishment. B2 is historical permanent storage or CCUS and expansion of capture capacity is allowed. B3 can be described as a performance standard baseline and credits are awarded over and above the performance standard. This section likely needs the most work.</p>	<p>It is intended to represent a counterfactual where the project happens without being motivated by a voluntary or regulatory GHG program.</p> <p>Identifying the baseline through the process of eliminating the alternative scenarios is also a standard practice.</p>
30	Section 5.3.1 Eq. 2 $Q_{Fuel,d,y}$	<p><math>Q_{Fuel,d,y}</math> the definition starting in line 152 where: says the fuel would be for offsite heat/steam. I think it is possible to have fired equipment as well. I suggest remove that constraint in the definition and leave it to any fuel use.</p>	<p><math>Q_{fuel}</math> does not limit the use of gas-fired equipment heat/energy generation.</p>
31	Section 5.4.1 Leakage from Fuel consumption Eq 6 $\sum_d(Q_{Fuel,d,y} \times EF_{Upstream\_Fuel,d}$	<p><math>EF_{Upstream\_Fuel,d}</math> this appears to account for the upstream emissions associated for fuel use. Could be helpful to be specific. are we accounting for upstream processing, transportation and upstream extraction?</p>	<p>We appreciate your suggestion.</p>
32	Section 5.4 Leakage	<p>If we were to include the sulfur recovery process in the baseline and then shut in sulfur recovery in the project condition, We likely need to think about the upstream impacts to Sulphur production and distribution and transport as leakage since the sulfur will need to be replaced by production in another facility in another location. Similarly if the CO2 had been used as CO2 for beverages in the baseline (so temporary storage) we’d need to account for the leakage upstream since the beverage supplier would need to source that CO2 from elsewhere.</p>	<p>The emission impacts of the discontinuation of sulphur recovery would be considered by whatever methodology used by the project to calculate the emissions avoided from the discontinuation of this activity.</p> <p>Again, diverting CO2 from utilization in the baseline is not permitted under VM0049.</p>
33	5.4 Quantification of Leakage	<p>Likely electricity leakage needs to be included or a justification for exclusion needs to be addressed earlier in the document</p>	<p>Electricity leakage was removed from the module. Consensus from public comments and internal research was that this was conservative given the limited impact.</p>
34	General commentary and addition	<p>Consider adding some commentary about recycled CO2 and only crediting for newly injected CO2. Where the waste acid gas stream</p>	<p>Guidance provided on the treatment gas streams originating from wells utilizing CO2 injection.</p>

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		<p>is injected into an active reservoir (where raw natural gas is actively being withdrawn) there is the opportunity for the CO2 to be "recycled" – that is the same CO2 molecule could be withdrawn with the extracted raw gas – separated and re-injected over and over – resulting in an over estimation of the baseline condition and thus the resulting offset. <b>all of the CO2 that is contained in raw natural gas extracted from producing wells in the reservoir will be considered recycled and no credit will be claimed.</b></p>	

