SUMMARY AND RESPONSE TO PEER REVIEW COMMENTS

The proposed *Methodology for the* ***Quantification, Monitoring, Reporting and Verification of Greenhouse Gas (GHG) Emissions Reductions from the Plugging Orphaned Oil and Gas (OOG) Wells*** was developed by ACR and partners (McGill University, Well Done Montana Foundation, Native State Environmental and Fellow Environmental Partners) for potential approval by the American Carbon Registry (ACR).

All new methodologies and methodology modifications, whether developed internally or brought to ACR by external parties, undergo a process of public consultation and scientific peer review prior to approval.

The methodology was posted for public comment from September 27-October 31, 2021. The methodology was reviewed by an independent panel of experts beginning May 24, 2022. Comments and responses of the peer review process are documented here.

#	Reviewer #	Document Section	Reviewer Comment (R1)	Author Response (R1)	Reviewer Comment (R2)	Author Response (R2)	Reviewer Comment (R3)	Author response
1	1	1.1	Suggest rewording: "Stringent regulatory requirements to plug and remediate wells were not in place nationwide until the 1950s; thus, wells plugged before that time are likely to have been inadequately plugged, if at all." Also of note is that even if a well was adequately plugged well plugging is not a "forever" solution and the plug may not maintain integrity over long duration.	Added, "Wells that were considered properly plugged at the time may have degraded further and early plugging records, if any, are unlikely to be complete and accurate. "	Peer Reviewer still think "improperly" should be changed to "inadequately." (In all 3 sentences) "Improperly" implies that there is one proper way to plug a well, but these requirements have changed, and probably will continue to change, over time. For example, a well plugged in the 1950s following "proper" plugging procedures at the time may now be inadequate at	Change has been made.	Comment Closed.	

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					preventing environmental impacts.			
2	1	1	According to the first sentence of section 1.1, "This methodology provides the quantification and accounting frameworks, including eligibility and monitoring requirements, for the creation of carbon offset credits from the reduction in methane emissions by plugging AOOG wells." It doesn't provide a mitigation strategy as stated in the second sentence of this paragraph. The mitigation strategy is well plugging.	Changed to, "This science-based methodology provides a science-based incentive to drastically cut emissions from AOOG wells using carbon credits as one source of funding."	Agreed	Comment closed.		
3	1	1.1	This sentence needs a reference:	Author experience.	Peer Reviewer still thinks this	References have been added.	Comment Closed.	

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			"Additionally, other gases besides methane are often emitted from AOOGs."	Predominantly referring to H2S and VOC emissions that, even in small concentrations, can be hazardous.	sentence needs a reference since methodology does not mention evidence of potentially hazardous concentrations of VOCs and/or H2S in the literature.			
4	1	Figure 1	Delete "for": Well shows for reported production…" Should this say no reported production for last 6 months?	Change made.	Agreed.	Version 1.0 of this methodology will now be limited to Orphan Wells as ACR continues to evaluate the possibility of eligibility for Abandoned Wells. Comment closed.		
5	1	Figure 1	Below Figure 1, #3 states that a well must be emitting methane but this criterion does not show up in the decision tree in	Wells must be emitting methane to generate credits. Eligibility to participate will	This is still unclear in the text. The list under the figure of eligibility requirements still implies that	The figure has been updated to show that a well must be emitting methane to be eligible.	Comment closed.	

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			Figure 1. But then on the next page it states that all orphaned O&G wells are eligible to participate (regardless of whether they are emitting methane?). Not all unplugged wells emit methane.	need to be determined prior to measurements taking place.	all four criteria, including that a well is emitting methane, must be met to be eligible.			
6	1	1.2 second paragraph	Should be "…registering the project with ACR." The next sentence should start "If a well…"	Change made.	Agreed Comment closed.			
7	1	1.2 page 13 and throughout	Be consistent with acronym use. O&G was defined earlier but not used in middle of page ("documenting oil and natural gas wells before they are abandoned", "Oil and gas wells with a designated operator…").	Change made.	This was not done. A search of "oil and gas" throughout the document showed many instances of appearing as "oil and gas" or as "O&G" but it's not consistent. The same is true	Oil and Gas has been replaced by O&G, except in full organization names or methodology name.	Comment Closed.	

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					for greenhouse gas.			
8	1	4.6	Peer reviewer does not understand the last sentence, "A 5% leakage deduction…" Deducted from what? And why?	Referenced Section 7.2 where deduction is explained.	This still has not been adequately explained. Why 5% deduction for an "extremely" low risk?	There was limited research on emissions from wells plugged to current standards and diversion of methane emissions to neighboring wells due to plugging. ACR included this deduction to be conservative in our credit generation. Text added that if more information becomes available, ACR will revisit this deduction.	Comment closed.	
9	1	3.2	The last sentence of this section implies that plugging all wells in a project would reduce current emissions. However, project participants are likely to find that many wells are not	Updated to just "high-emitting wells".	Agreed (although note that the tracked changes revision version says "high-emitting wells", but the clean copy pdf just says, "emitting	Change has been made.	Comment Closed.	

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			emitting. How does this impact the defining of a project where the emissions from the group of wells follow the typical fat-tailed distribution? Including unplugged and non-leaking wells in a project is therefore detrimental to the participant.		wells." The latter seems more appropriate.			
10	1	3.2.2	Delete "and": "…added challenge of and not having a responsible party…". Delete the comma in the last sentence of the paragraph.	Change made.	Agreed Comment Closed.			
11	1	4.1	Why were dynamic flux chamber and high flow sampling approaches excluded? Yes, project proponents can use other approaches if they	Authors did not want to include all equipment that project proponents might use. Equipment must match	The way the current version reads, it implies that a static chamber-based approach is the gold standard, rather than an	Additional information on the High Flow meter added. Other technologies can be approved. Any technology must be correctly applied to	Comment Closed.	

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			are approved by ACR, but why not include these approaches here, as they have been used for measuring methane emissions from AOOG wells as reported in the literature? (And I see later in 4.1.3 a dynamic flux chamber calculation is included.)	conditions in the field. Equipment needed is well-specific. Chamber method is used as an example.	example. Suggest leading with statements regarding all approaches being reviewed by ACR, then following with static chamber details as an example.	a well setting for credits to be created.		
12	1	4	The detection limit of 1.0 g/hour of methane seems unnecessarily low. Will this be achievable by operators that will propose to use a modified approach?	Detection limit changed to within instrumentation specifications due to the unpredictability of emission rates from different wells.	Agree with the change. Although the last added sentence mentions "background emissions measurements." What is meant by this? The background ambient methane concentration in the area? If so,	Changed to "ambient".	Does this refer to ambient methane concentration measurements or methane emissions measurements from the leak point? Peer reviewer suggests this should be "ambient methane concentration measurements."	Changed from just ambient to ambient methane concentration measurements.

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					reword. Also, the 1.0 g/hour rate shows up again in section 5.1.			
13	1	4.1.2	What is the basis for choosing 30 days? Or 2 hours? Is this science-based? Wouldn't the time required for stable emission rates be dependent on chamber design and size?	The time required for the rate measurements to stabilize will vary based on chamber size. The requirement is two hours of stable rate measurements once the rate has stabilized. Thirty days was chosen to span enough time to confirm that a well's emissions rates are consistent over longer terms but also to balance project proponent's	Based on the author response it seems that these numbers (2 hours and 30 days) are NOT science based but a best conservative guess. Given the time and cost involved with emissions sampling, couldn't the 30 days be reduced to a week?	These assumptions will be reevaluated as additional information becomes available. One week leaves the methodology vulnerable to abuse by operators performing well maintenance to increase emissions rates over the short term. Through conversations with numerous subsurface specialists, 30 days was agreed to be a conservative span of time. Either way, Project Proponents will need three trips (two before and one after) for	Comment Closed.	

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				ability to access a well and the costs involved in emissions sampling. As more research is conducted and results from the methodology sampling come in, these numbers may be revised.		measuring. This is an area ACR intends to watch closely and will update, if possible, with more information from the ongoing research in this space.		
14	1	5.2.1	Continuous-in-time is not defined. What measurement rate does this refer to?	Term removed and replaced with "flow rate measurements" to encapsulate different measurement techniques.	Agreed	Comment closed.		
15	1	4	To verify no emissions post plugging it is necessary/required to use the same protocol as for the baseline?	No, just a confirmation sample to ensure that there are no emissions. If emissions are	Agreed	Comment closed.		

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				detected over background, project proponents must measure actual rates using the same protocol to be eligible.				
16	1	4.1.2	Peer reviewer did not see where steady-state and non-steady-state were defined.	6.2.2- Chamber Specifications.	The definition of a non-steady state chamber is insufficient. ("Non-steady state chambers do not require a pump."	Updated. Also, this section is now part of Appendix D.	Comment Closed.	
17	1	4.1.4	For better readability, the last 3 sentences of this section about stable measurements should be moved to the end of 4.1.1.	Done.	Agreed	This section is now part of Appendix D. Comment closed.		
18	1	Equation 4	The green equation text says EQCO2 but the definition in the table is for EQCO2e	Fixed.	Agree, but again in equation 5: shouldn't EQCO2 be EQCO2e?	Issue has been revised.	Comment Closed.	

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19	1	Project Emissions	Shouldn't the project total CO2e emissions be summed for all the well plugging activities in a project? The use of the word "project" gets confusing here and in Equation 4. Is Equation 4 representing emissions from plugging one well and then Equation 5 is the emissions from plugging all the wells in a project?	Clarification added.	Fix this sentence: A project can constitute plugging one well or several, project emissions encompass all emissions for plug all wells.	Sentence has been updated in section 4.4.	Comment Closed.	
20	1	4.7	Testing within 5 cm of the ground surface implies that the P&A well is buried. Is that required in all states? I have seen plugged wells with casing sticking out of the ground.	Added requirement for testing on any above-grade equipment.	Agreed	Comment closed.		
21	1	5.1	I suspect this approach would yield quite a few false	Increased to 5 ppm above background and	Agreed	Comment closed.		

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			positives because of the requirement of concentrations not exceeding 1ppmv above background. In my experience handheld multi-gas sensors do not have that precision or accuracy.	five minutes of sampling should screen out false positives.				
22	1	5.2	Environmental conditions are to be reported. Is it sufficient to obtain these data from a source like weather.com or are site-specific measurements required?	Updates methodology to specify which conditions must be monitored onsite-precipitation and wind speed.	Agreed	Comment closed.		
23	1	4	The requirement of methane detection from 1ppmv to 100% would exclude some instruments like Picarro cavity ringdown spectrometers and Los Gatos Research	Updated to require that any reported concentrations are within equipment detection limits. For background sampling and	Agreed	Comment closed.		

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			cavity enhanced absorption instruments.	post-plugging measurements, 1.0 ppm requirement remains.				
24	1	6.2.2	Steady-state chambers (also known as dynamic) do not necessarily require a pump. You can use a compressed gas cylinder with a mass flow controller.	Updated. This section was moved to Appendix D.	Agreed	Comment closed.		
25	1	4	Do the references provided in Appendix D include resources for both steady state and non-steady state chambers?	Yes. This section was moved to be part of Appendix D.	The Livingston and Hutchinson reference shows up twice. Does this reference describe steady-state chambers? As I understand the other references all used non-steady state?	Livingston and Hutchinson showing twice has been corrected. This reference describes non-steady state chambers. A couple of other references that compare non-steady and steady state chamber methods have been added for clarification. All chamber method	Comment Closed.	

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						sources and calculations can be found on Appendix D.		
26	1	4	How can this approach ensure that, when using a non-steady state chamber, methane concentrations in the chamber will not reach explosive levels?	Safety warning added. Reference updated.	Peer reviewer adds for extra clarification	Safety warning was added in Chapter 4.	Peer reviewer suggest clarifying specifically about methane concentrations building up to explosive levels inside a non-steady state chamber to bring awareness to this potentially hazardous situation.	Clarification has been added in Appendix D
27	1	4	Figure 6 improperly referenced (should be Figure 4).	Updated.	Agreed	Comment closed.		
28	1	5.2	Frequency of monitoring is listed as 1 but an earlier section states 2 2-hour measurement periods that are at least 30 days apart. And the way frequency of monitoring is	Updated.	Agreed	Comment closed.		

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			described is confusing; it's essentially like saying one measurement per measurement. (which doesn't make sense)					
29	1	5.2.1	The last two rows are duplicates.	Removed.	Agreed	Comment closed.		
30	1	6.3	Peer reviewer did not see the continuous-in-time or point-in-time measurement parameters defined elsewhere in the document.	6.2.2- Chamber Specifications.	These were not defined in 6.2.2 but they were deleted from the table. Given that, Peer Reviewer agreed.	Comment closed.		
31	1	Appendices	Peer reviewer did not see a reference for the graphs and data in the Appendices B, C, E.	Updated with latest information and reference added.	Agreed	Comment closed.		
32	2	1.1	Contention that after six idle months, most wells are never returned to production needs a citation.	Added. Data from Enverus.	Agreed	Comment closed.		
33	2	1.1	Are poorly plugged wells eligible for	Poorly plugged wells that have	Agreed	Comment closed.		

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			credits? How are they to be found?	measurable emissions and are able to be plugged are eligible. Located through emission surveys or state records.				
34	2	1.1	"The use of this methodology will support the improvement of AOOG well inventories, as well as the development of more accurate and representative emission factors for CH4 emissions in the US and Canada as data from participating projects become available." – how will information gathered under this standard be made public so as to	Projects are made public on our registry.	Agreed	Comment closed.		

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			contribute to overall understanding?					
35	2	1.1	"Stringent regulatory requirements to properly plug and remediate wells were not in place nationwide until the 1950s; thus, wells plugged before that time are likely to have been improperly plugged, if at all." – needs a citation. Different states established different standards at different times. Would need to better understand leakage rates from pre- and post-1950 plug jobs to support this contention.	Wells "plugged" prior to 1950 were unlikely to have been plugged to today's more rigorous standards and may leak methane. Wells drilled prior to 1950 may not have been required to be plugged. These wells may not appear on a jurisdiction's orphan well list or have any records. These wells are considered eligible under the methodology. The date of	Given that the standard basically says improperly plugged, or poorly plugged, wells are those with emissions more than 1 gram/hour, and not based on plugged before or after 1950. Peer reviewer would still appreciate more nuance in this characterization of the development of plugging regs.	Wells that were plugged prior to the existence of tracking or plugging requirements may be leaking methane but not characterized as "Orphan" by the jurisdiction. These wells are characterized as "Orphan" under this methodology because they have no responsible operator. Appendix F was added to show when regulations came into place in various jurisdictions. Wells that have post-plugging methane emissions must quantify the amount leaking in order to	To rephrase, wells that were plugged before regulatory requirements were in place and that are still leaking are eligible for credit because there's no one who can be dragged in by the regulator to do it – whether or not that party still exists, they didn't have a legal obligation to plug, and thus no regulatory hook. If that's so, there's no moral hazard so peer reviewer is closing comment.	

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				1950 is a general guideline for when US states began to implement plugging requirements.		generate credits. Post-plugged well leaking at a higher rate than 1 g/hr, it is considered poorly plugged and not eligible to participate in this methodology.		
36	2	1.1	"These wells have a higher likelihood of becoming orphaned, therefore transferring liability to the state or province and its taxpayers." – it's more of a transfer of responsibility than liability exactly	Wording updated.	Agreed	Comment closed.		
37	2	1.1	"In almost all jurisdictions, bonding requirements" – people speak more of financial assurance than bonding these days, because financial assurance can include other	Wording updated.	Agreed	Comment closed.		

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			instruments like letters of credit. Bonding is just a subset of financial assurance options.					
38	2	1.1	$280B seems high. Even a million wells at $100k a well would only be $100b.	Updated wording and reference included.	Peer Reviewer would feel better – suggests text to say “up to”	Clarification added.		
39	2	1.2	Eligibility Category 1: I don’t understand why the mere fact that a well was drilled before 1950 that still have a solvent owner would be eligible for credits. Even if plugging wasn’t required at the time, and that is something that varies from state to state and presumably province to province, that doesn’t excuse them from current requirements to plug. If the regulator tells you to plug your	Updated for clarity. Wells that were plugged before 1950 are the focus here because it is less likely that there were plugging requirements and also possible that there is no tracking of these wells. Wells that are considered “plugged” are still eligible.	Agreed	Comment closed.		

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			well, you don't get to say, when this well was first drilled there were no plugging requirements and so you can't make me do it	Wells drilled prior to 1950 are not automatically eligible.				
40	2	1.2	Eligibility Category 2: this would seem to capture every well required to be plugged under state law (usually the trigger is not producing for a certain amount of time and not having an approved idle/TA status). Operators have been using the idle/TA loophole to get out of plugging wells for generations. Solvent operators with non-producing wells should either have to plug them or declare bankruptcy. Arguing that these	Updated to clarify when operated wells are eligible. In many jurisdictions they won't be due to more stringent regulatory regimes. How well a regulation is enforced is not considered, it's whether the well, in its leaking state, is considered to be in compliance by	Peer reviewer would like author to clarify the phrase "without testing or intervention" Does it include reapplying for temporary abandonment status? Also, once the EPA existing source rule comes out, will any amount of leakage be allowed? And won't wells be required to be tested on a regular basis? Some might not,	Version 1.0 of this methodology will now be limited to Orphan Wells as ACR continues to evaluate the possibility of eligibility for Abandoned Wells.	Comment Closed.	

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			wells pass an additionality test because they have successfully exploited a regulatory loophole is callow, disincentivizes regulatory reform, and frankly seems like a poor use of voluntary climate mitigation dollars. Also, some states are closing down this loophole – CA requires long-term idle wells to go onto plugging lists or face huge fees, and CO recently passed regulations allowing the state to say, you know what, you can't keep idling this well, you have to plug it. And in many states, operators have to pass a future economic utility test.	the state. If so, it is eligible.	that fall below de minimis carveouts, but this is a tricky category in light of rapidly changing regulatory landscape…			

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			Just because regulators don't always enforce that seriously doesn't automatically make plugging such wells additional. Strongly recommend limiting credits to true orphan wells – otherwise ACR will take on considerable reputational risk.					
41	2	1.3	Considering the 20-year crediting period for orphan wells…why 20? Seems arbitrary. One would have to make the case that on average, orphan wells take 20 years to be plugged. With the $4.7B in federal funding to plug documented orphan wells and with states increasing their orphan well plugging	Enverus data demonstrates wells currently classified as orphan have had no production for an average of 17 years. Added.	Peer reviewer mentions that one can't really trust Enverus on that, their data is fairly incomplete. https://pubs.acs.org/doi/full/10.1021/acs.est.2c03268 found that only 16% of documented orphan wells have last production date. PR realizes from	For ACR methodologies that employ a performance standard for additionality assessment – as it is in this case, ACR shall review the validity and underlying assumptions of the performance standard for all non-forestry projects every 5 years, at	If the data shows the average is 17 years, there's a logic for the crediting period to be 17 years.	The 17-year average considers wells that remain unplugged, rather than an average time between last production and plugging. ACR is comfortable assuming that these wells will need to wait additional time for plugging, but will monitor these timelines to

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			funds, any estimate for average time to plug an orphan would seem to be in flux. Plus…larger emitting wells will tend to be plugged first, this is certainly encouraged under the REGROW Act…maybe the highest emitting wells will only have an average of 1-2 years before being plugged under new funding regimes. Plus, how to assume that emissions will be continuous and steady over the time periods. Have there been any longitudinal studies of orphan well leak rates?		a practical standpoint that one would need something like 20 years to make the economics of this work for all, but the highest emitting wells. Peer reviewer recommends some kind of regular reevaluation to determine if this 17-year average of orphan to plug holds.	minimum. This is an area of active research and ACR will monitor and update as needed.		confirm that 20-year crediting period remains appropriate.
42	2	1.3	Peer reviewer has already stated that she/he does not think there should be	There are very limited circumstances in which an	Have authors evaluated how active well crediting will	Version 1.0 of this methodology will now be limited to Orphan Wells as	Comment Closed.	

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			credits for non-orphan well plugging. But it's not just whether there are enhanced rules every five years that would be stricter about plugging – any given well could be evaluated by a regulator in any given year and determine that plugging is necessary, so it's very difficult to put a credible timeline on how much leakage is saved. Perhaps more to the point, several states have requirements to do LDAR for idle wells…and even bigger, the EPA is likely to finalize existing source methane standards that require LDAR for all unplugged wells	operated well would be eligible for the methodology, but these wells are often leaking at high rates and, if eligible, should be addressed. There are two 5-year crediting periods so that ACR can do a regulatory review and determine that the well remains eligible.	work in light of the MERP as passed in the IRA? please check out this article: https://www.wvgazettemail.com/news/energy_and_environment/nations-largest-gas-well-owner-says-dep-agreement-shields-it-from-plugging-responsibility-in-wv/article_4819c241-562e-5c60-b06f-065aea6a64ff.html Worth getting access, as it lays out a scenario (that's actually occurring IRL)	ACR continues to evaluate the possibility of eligibility for Abandoned Wells.		

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			across the country. I can't speak for Canada but that would seem to wipe out non-orphan wells from those methodology. All the more reason to limit the methodology to orphan wells.		where an operator says they don't have to plug wells as per regulation because of private agreement with state regulator.			
43	2	2.2	What about methane emitted from the well during the plug job?	Considered negligible.	Agreed	Comment closed.		
44	2	3.2.1	Peer Reviewer asks for clarification regarding what the second sentence of this section is saying. Is it that, regardless of state regulatory requirements, any active well that hasn't produced in six months is considered de facto additional, regardless of the specifics of the state requirement?	There are different classifications for wells within different jurisdictions. Six months was chosen because, according to Enverus data, after six months of non-production, only ~11% of	It's worth noting that in a bunch of states, wells aren't considered idle until they haven't produced for one or even two years. Consequently, thinking this through, this means that operators will be	Version 1.0 of this methodology will now be limited to Orphan Wells as ACR continues to evaluate the possibility of eligibility for Abandoned Wells.	Comment closed.	

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			That seems both sloppy and also morally hazardous insofar as it encourages scofflaw behavior among operators and discourages regulators from enforcing compliance with existing law.	wells are returned to production. Enverus information added.	eligible for credits for otherwise compliant wells that haven't produced for six months. Such compliant wells will have very low methane emissions because of EPA existing source standards and MERP. Maybe this is just self-limiting and Peer Reviewer don't have to worry too much?			
45	2	3.2	Perhaps this is a good section to discuss the REGROW Act's $4.7B for plugging documented orphan wells in the United States. The funding was intended to wipe out the entire	Agree with the word "dynamic." The goal of this methodology is to prioritize plugging of wells that are leaking	Peer Reviewer knows of states wanting to use the credit to stretch REGROW dollars. How to conduct an additionality analysis under	Eligible offsets must be generated by projects that yield surplus GHG reductions that exceed any GHG reductions otherwise required by law or regulation	No state will prioritize methane about safety, which will always come first. Methane will be in the mix, some percentage of the consideration. Figuring out whether	This is an area ACR intends to watch closely and will update, if possible, with more information from the ongoing research in this space.

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			population of documented orphan wells, i.e. those on state/federal/tribal plugging lists, where the jurisdiction a) knows the exact location of the well and b) has gone through some kind of process to determine no solvent owner of record. If I understand correctly, this is basically the criteria for orphan wells to be covered under this methodology. When the documented orphan well population seemed like it was ~57k, the funding amount likely would have taken care of the entire population. But in December 2021, states filed	methane by providing a financial incentive for addressing high emitting wells. The orphan well inventory may be addressed with the REGROW Act and state funding, or many more wells may be added to the orphan well inventory if and when the fossil fuel industry transitions. ACR will monitor and if the plugging of AOOG wells is no longer deemed addition, the methodology will be retired.	such circumstances?	or any GHG reduction that would otherwise occur in a conservative business-as-usual scenario. While states might/will use REGROW Act or other funds to plug wells, the prioritization mandated by the government differs from the one for this methodology. ACR's first priority is plugging wells that emit methane, while government/states prioritize on plugging wells that impact community safety. In the case that a state requires that the first priority be plugging high	and how to discount for how methane is weighted in state orphan well closure decisions seem hard, and perhaps not possible for this round of the standard, but it's definitely an area to watch. This space is evolving rapidly.	

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			with the Department of Interior closer to 130k wells, with an estimated closure cost of $8.5B, or double the amount of funding available. So, I can buy that there's still some additionality for the documented orphans because not all can be covered by the federal funding. But there's also state funding which should be accounted for – and you could imagine using the combined federal and state funding amounts and the orphaning rate for any particular state to determine how many years on average ACR funding would accelerate well closure. Of			methane emitter wells, then in that state, the additionality requirement would not be met.		

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			course, this length of time is dynamic depending on the state's funding level in any particular year, taking into account average closure costs. But at the same time, there's a tension between the fact that the REGROW funding specifically targets the highest emitting wells, and these are also the wells that people trying to get ACR credits will go after – since maybe only 10% of orphan wells emit enough methane to generate a meaningful amount of credit. And so, you can make the case that the wells most likely to be plugged using ACR credits					

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			under this methodology are also the wells likeliest to be plugged soonest using REGROW funding. To me, this makes the additionality calculation actually quite dicey and suspect, even for the orphan wells (I've expressed my doubt about additionality with respect to active wells with responsible owners).					
46	2	4	How often do a well's emissions come from more than 10cm away from the wellhead? One wonder whether it would be worth seeing how methane emissions within, say, 10 meters of a wellhead compared to true background.	Emissions that far away could indicate a compromised casing which would hopefully be addressed by plugging. If not, the post-plugging sampling should detect these,	If one doesn't measure 10m, say, from the well in the first instance, then post-plugging sampling that's also not measuring 10m away /also/ won't pick up anything awry –	The main path of methane emissions will be the wellbore. If methane is emitting elsewhere, emissions will not be detected coming out of the wellbore during initial sampling and thus not considered under ACR's	Comment Closed.	

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				and the credits will not be issued.	but reviewer agrees that a good plug job ought to deal with such leaks. Peer reviewer is not demanding an OGI survey for a football field around a well, but provoking deeper thought on this issue.	methodology. It is unlikely that the emissions will be redirected from the wellbore to elsewhere in the subsurface due to plugging- in an orphaned reservoir, there is no energy driving methane away from the plugged wellbore to another outside of that reservoir's production spacing. There is limited research on this topic, ACR will reevaluate if more information becomes available.		
47	2	4	On seasonal variability. It seems good the two tests are being taken a month apart, but what the science tells us, if anything, about	No data on this. As more becomes available, ACR can update the methodology.	Agreed	Comment closed.		

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			month over month over month variation					
48	2	4	Are these two readings 30+ days apart averaged to generate the estimated kg/yr figure?	Yes.	Agreed	Comment closed.		
49	2	5.1.2	Curious about selection of the 100-year GWP versus a 20-year GWP. Not that I'm suggesting a change, just curious if this is something that's true across ACR methodologies	100-year GWP is Carbon Market standard.	Agreed	Comment closed.		
50	2	4.2	Peer Reviewer has already mentioned emissions from the well during plugging as a possible thing to consider. What about emissions from land use change to build roads, if necessary?	Outside the scope of the methodology.	Agreed	Comment closed.		
51	2	4.3	In the final parenthetical, a typo ("porphan")	Fixed.	Thanks	Comment closed.		

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52	2	5.1/ 4.7	Background methane is 1.8 ppmv. So the standard for whether a well is unacceptably leaking a reading over 2.8 ppmv? Seems maybe high for the threshold to be more than 50% over background.	Updated to 2 ppm or more over background.	Peer Reviewer requires more clarification because before, a 2.8 ppmv reading was considered a poorly plugged well, and now it's 6.8 ppmv that's a poorly plugged well? If so, on what basis?	Confirmation sampling needs to be measurably over ambient methane concentrations. If emissions near plugged well are >2 ppm above background, the plugger must quantify the leak. If the leak is >1 g/hr, the well is considered poorly plugged.	This makes sense, thanks. Comment Closed.	
53	2	4.7	When does this test have to occur? There are specifications for when the pre-test occurs but not the post-test. And does it need to be repeated, to make sure the plug job is holding?	Some jurisdictions require site remediation and wellhead may be cut off below grade and not available for screening. Whenever post-plugging screening fits	Agreed	Comment closed.		

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				into operations is acceptable.				
54	2	4.7	Can the concept of transferred emissions from a plugged well to an unplugged well in the same pool be tested somehow? Does ACR have any kind of research budget? Maybe in partnership with a local university, or NETL?	Research is limited but it's very unlikely that plugging a well would drive additional emissions in another well. If more research becomes available, ACR will update. Leakage deduction addresses this low probability.	Accepted	Comment closed.		
55	2	6	The 2009 report on plugging elements is out of date. Instead use the following two resources: https://www.gwpc.org/sites/gwpc/uploads/documents/publications/State_Regulations_Report_2017_Final. pdf starting	Updated.	Thanks	Comment closed.		

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			on p. 65; https://www.gwpc.org/sites/gwpc/uploads/documents/publications/Well_Integrity_Elements_Revised_1_19_2021_002.pdf starting on p. 9.					
56	2	6 then 5.2	How will ACR review plug jobs for their compliance with state/provincial law and the API RP (presumably reviewing both and requiring whatever is more stringent for any particular plugging element?) – will each plug job be independently reviewed by ACR staff for compliance?	Plugging must be signed off by relevant agency.	OK, but I'm still not sure what it is you're doing with the API RP and the state/provincial plugging regs. Are you determining if a jurisdiction's plugging requirements are adequate? Because based on the response, seems like you're not analyzing individual plug jobs.	ACR is not determining if a jurisdiction's plugging requirements are adequate, that is outside of the scope of this methodology and our work. Requirements will address fluid migration, including methane coming out of the wellbore. ACR is asking for plugging report signed off by the appropriate regulatory agency in each jurisdiction as described in	Peer reviewer inquiries about how the API RP factors into things if ACR is just going to accept the state certificate of well closure in all cases anyway. Peer Reviewer agrees with that, so there are no objections to the RP reference, even though Peer Reviewer does not see mechanically how it applies.	ACR requires that operators demonstrate plugging approval by applicable regulatory body and post-plugging confirmation sampling.

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						Chapter 6. ACR will accept state certification of well closure.		
57	2	Definitions	Inactive well – doesn't the standard elsewhere define inactive as non-producing for at least six months?	Updated.	Thanks	Comment closed.		
58	2	Definitions	O&G Commission/Regulator – the fifth word should be "has" rather than "have." There are a bunch of typos throughout, and the document should be reviewed by a copy editor	Updated.	Thanks	Comment closed.		
59	2	Definitions	Orphan well – this is wrong. In many cases, orphan wells have some records of drilling. The no solvent owner part is right. In IIJA, the REGROW Act defines orphan wells as how	Updated.	Agreed	Comment closed.		

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			the states define them, or "a well eligible for plugging, remediation, and reclamation by the State." Which means, they're on a state list, the state has determined no solvent owner of record and also knows where the well is located (and may know more details about the well like age, depth, etc., and may even have some financial assurance, though likely not much), and has taken responsibility to plug/remediate.					
60	2	Appendix A	The IOGCC cite is out of date. See p. 28 of the latest report, https://iogcc.ok.gov/sites/g/files/gmc836/f/documents/202	Updated.	Agreed	Comment closed.		

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			2/iogcc_idle_and_orphan_wells_2021_final_web_0.pdf , which has a count of 92,198 documented orphan wells and 310k-800k undocumented orphan wells. See also DOI's report summarizing state NOI submissions at the end of December 2021, which found 130k documented orphan wells (https://content.govdelivery.com/accounts/USDOI/bulletins/30416b5).					
61	2	A.1	Probably better to use "financial assurance instruments" rather than "bonds." Other examples of financial instruments include letters of credit.	Updated.	Agreed	Comment closed.		

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62	2	A.2	There seems to be a sentence fragment: "To avoid abuse of the TA."	Updated.	Agreed	Comment closed.		
63	2	A.2	"Therefore, it can be concluded that plugging wells at the end of their productive life, although required by law, is not uniformly enforced, and is not the observed trend." I'm with you until the last clause. In fact, something like 50% of all the wells that should have been plugged have actually been plugged – at least 1.5m wells have been plugged since O&G development began in the U.S. So you can't just assume that, despite regulations requiring plugging, it's not enforced, no one	This has likely led to an increase in the orphan well inventory!	Please clarify whether level of enforcement influences eligibility.	Compliance is determined by legal requirements, not enforcement. Abandoned wells have been removed from version 1.0 of the methodology, so pluggers will only need to demonstrate that there is no operator responsible for the well, that the well is leaking, and that it is located in the US or Canada.	Comment Closed.	

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			really has to plug, and thus all plugging is additional.					
64	2	A.3	Well, but state plugging funds do exist, and it's an empirical question in any given state how long it will take any given orphan well to be plugged, depending on the size of the state plugging fund, and depending on the distribution of the $4.7B in federal plugging. And it will vary considerably state to state.	The average time since last production for today's orphan wells is 17 years (information added to methodology). The goal of the methodology is to prioritize wells that are leaking.	Agreed	Comment closed.		
65	2	A.5	Peer reviewer still does not think that wells with solvent owners should get this credit for reasons discussed above. But if ACR does proceed, would a well that's been	Well needs to be in compliance in the current (leaking) state and they need to demonstrate that it could remain that way	This assumes no changes in regulation, and some jurisdictions require demonstration of future utility, and so you'd have to	Version 1.0 of this methodology will now be limited to Orphan Wells as ACR continues to evaluate the possibility of eligibility for Abandoned wells.	Comment closed.	

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			idle for ten years not get any credit at all? If the average time to plug is 10 years and the operator doesn't plug until year 10, I don't see why the plugging could be considered additional.	for an additional five or ten years. It doesn't matter how long it's been idle prior to plugging. This eligibility will apply to very few operated wells.	assume ability to make such a showing.			
66	2	Appendix B	Table should be updated with data from latest IOGCC report	Done.	Agreed	Comment closed.		
67	2	Appendix C	Data source? US v. Canada?	Citation added. US.	Agreed	Comment closed.		
68	3	General	Peer reviewer is concerned about the inclusion of abandoned wells. These wells should be plugged by their owners, not by third parties. Peer reviewer thinks it is fine to encourage third parties to invest in plugging orphaned	There are very limited circumstances in which an operated well would be eligible for the methodology, but these wells are often leaking at high rates and, if	It does not matter whether it would be a common or uncommon occurrence. The question is additionality. And the authors have not demonstrated how plugging	Version 1.0 of this methodology will now be limited to Orphan Wells as ACR continues to evaluate the possibility of eligibility for Abandoned Wells.	Comment closed.	

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			wells, but including abandoned wells introduces a very large moral hazard issue. It disincentivizes companies from acting responsibly and disincentivizes states to update their financial assurance requirements. Peer reviewer would strongly recommend excluding abandoned wells with solvent owners from the protocol. If the authors feel strongly that they should be included, Peer reviewer thinks they need to provide a more robust justification, including more detail on why 1950 is a relevant cutoff year.	eligible, should be addressed. There are two 5-year crediting periods so that ACR can do a regulatory review and determine that the well remains eligible.	these wells would be additional. If they have solvent owners, it is the responsibility of the owners to manage these assets. I agree that wells with high methane leak rates should be addressed, but I disagree that this is the appropriate mechanism to do so.			

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69	3	p. 10	Is “HSI” a typo? I’ve never heard of it. Maybe the authors mean “IHS”?	HIS. Corrected.	Needs revision, probably due to Autocorrect in Word.	Change have been made.	Comment closed.	
70	3	p. 10	The statement “Inaccurate reporting of AOOG well count and emission volumes are a problem that per-sists in every major oil and gas producing country” deserves a citation. It is a very sweeping empirical statement.	Text updated.	Agree	Comment closed.		
71	3	p. 10	It would also be helpful to have a citation for the statement “Stringent regulatory requirements to properly plug and remediate wells were not in place nation-wide until the 1950s”	This is to bring awareness to the fact that wells that were plugged prior to well plugging standards and good record keeping may not have been well plugged, could	This still needs to be addressed. The authors are making a factual claim, and use 1950 as an important cutoff year for determining eligibility. They need to justify why 1950 is an	Appendix F added to show when plugging regulations took effect in each state and/or province. Wells plugged prior to these dates that may still be leaking methane are considered Orphan under this methodology due to	Comment closed.	

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				potentially still be leaking, and are considered orphan under the methodology even if the jurisdiction considers them plugged or does not have a record.	appropriate year to use as a cutoff, and they need to cite the appropriate evidence.	having no responsible operator.		
72	3	p. 11	The $280 billion estimate comes from a report that uses a very crude method to estimate future plugging costs. I would not put much weight on that estimate. Peer reviewer thinks it's fine to include in this document, just make clear that it is a very rough estimate.	Added	Agreed	Comment closed.		
73	3	p. 11	Peer reviewer would suggest placing more emphasis on the	Outside of the scope of the methodology.	Agreed	Comment closed.		

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			need for policymakers to reform financial assurance requirements so that wells do not become orphaned and that operators clean up their wells, as responsible operators should.	We try to highlight that this is part of the problem that has led to the current large inventory of orphan wells.				
74	3	p. 13	1950 seems like an arbitrary cutoff date, and the authors have not provided citations for their claim that the 1950s were the time when regulations proliferated. Peer reviewer thinks this needs more evidence, and the authors need to better justify their choice of the year 1950 as a cutoff date. I am not persuaded that methane	Updated to include 1950 as a general date for regulations coming into place. Wells that were previously plugged may still be considered eligible even if they don't appear on a jurisdiction's orphan well inventory.	Peer reviewer is pleased to see that the methodology has removed the 1950 threshold. However, they seem to have replaced it with no threshold at all. See comment above on my concerns over additionality from wells with solvent operators.	This is less of a threshold and more of a naming convention for "unknown orphans". Wells that were plugged prior to regulations being in place may still be leaking and not on any state list due to lack of records or being classified as "plugged." This is to say that these wells would be considered orphan	Comment closed.	

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			mitigation from plugging abandoned wells drilled before 1950 can be safely considered "additional." It seems like the "Regulatory Surplus Test" may be designed to address this issue, but the description in section 3.2.1 is difficult for me to understand. Does the Regulatory Surplus Test apply in all cases? It's difficult for me to tell from the text, but my best reading is that it does not.			because they have no designated operator, even if they do not appear on the "orphan list". Language modified to provide clarity.		
75	3	1.3	Why have the authors chosen the time periods of 20 and 5 (up to 10) years? Peer reviewer thinks there should be some explication as to why these time frames are chosen	The average time since last production on today's inventory of orphan wells is 17 years (information added to text),	Agreed	Comment closed.		

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			and why they are appropriate. In addition, what is a "leakage deduction" and why is the level of the deduction 5%? This is not explained at all.	and there are still many to plug and more wells being added to the inventory, so we used 20 years. Five years (with option for another 5-year renewal) was chosen as a cut-off for operated wells, however it is the responsibility of the project proponents to demonstrate that their well would be in compliance for that duration.				
76	3	2.2	Does the boundary include methane emissions that may be occurring around the wellbore (but not	We include methane emissions that will be prevented	Agreed	Comment closed.		

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			from inside the wellbore) that are caused by subsurface methane leakage? Peer reviewer would think that it should, but it's not quite clear from the language in this section.	when the well is plugged. If nearby emissions cease after plugging, they are eligible. This will be difficult to demonstrate, but possible.				
77	3	3.1 then 1.3	Does the counterfactual assume that the well will continue emitting methane at the same rate for some period of time (e.g., 20 years)? Do the authors have empirical evidence that AOOG wells emit methane at constant rates over long time periods? One could imagine methane leaks declining over time as reservoir pressure declines, but one could also	Yes. Current monitoring exists for this long of a time period, but it is also possible that the well could continue to leak beyond the 20-year crediting period if not plugged.	This is not addressing the question. The question is whether wells tend to emit at constant rates over 20 years, or whether their emissions tend to increase or decrease over time? I am not suggesting the protocol attempt to account for this variation, but am suggesting that	Language added to acknowledge the uncertainty in decline curves, as well as uncertainties due to expanding research in this area and well and cement degradation. ACR will monitor and update, if necessary.	Comment closed.	

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			imagine leaks increasing over time as subsurface casing or surface equipment degrades. Peer reviewer thinks the authors should address these issues and justify any decisions they make about the assumed rate of future emissions under a no-plugging counterfactual.		the authors acknowledge this uncertainty. Better quantification of emissions over long durations (e.g., 20 years) could allow for a more precise quantification of the counterfactual, and thus the crediting amount. This could be an improvement in a future protocol when more data are available.			
78	3	3.2.1	As noted above, Peer Reviewer is not persuaded that projects that plug abandoned wells with solvent owners can safely be considered	Previously addressed. It will be difficult to meet eligibility criteria for operated wells, impossible in	See comments above		Comment closed.	

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			additional. Peer reviewer best reading of section 3.2.1 is that it would consider such efforts additional so long as the well was drilled before 1950, which is an arbitrary cutoff.	some jurisdictions due to more stringent regulations. 1950 is a guideline and does not impact eligibility.				
79	3	4.1	Just noting that the measurement technologies are not my area of expertise, so I offer no comments on them.	Thanks. This is an evolving space and quantifying emissions, rather than just detecting them, is a rapidly expanding area.	Agreed	Comment closed.		
80	3	4.2	Did the authors consider including the embedded GHG emissions in the steel and cement used in plugging? I'm not sure about this, but those emissions may be a similar order of magnitude to the emissions associated	These are considered to be outside of the boundaries, carbon market standard.	Peer Reviewer suggest that whether this is the case, then the carbon market standard would be flawed. Please clarify.	This methodology does not consider embedded CO2 emissions from cement and steel because those are direct emissions (Scope 1) accounted annually by the cement and steel industries directly.	Comment closed.	

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			with fuel combustion. And it would be reasonable to include those embodied emissions, since the steel and cement would not be used for any other purpose, whereas other embodied emissions (e.g., emissions embodied in the steel of a drilling rig) would be spread across many other projects over its lifetime. Peer reviewer would encourage the authors to include these emissions in their accounting.			Most importantly, those emissions are outside the control of carbon offset project developer, as they do not happen within the project boundary, or because of project existence - cement and steel CO2 emissions do not enter the atmosphere at the plugging Well site. On the contrary, in order to plug wells at different sites, diesel is combusted by the equipment needed, and emissions generated from combustion do enter the atmosphere at Well geographic location. For these kind of projects, diesel combustion		

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						happens because of project existence within project boundaries, and under the control of the project developer, hence those emissions are included.		
81	3	Equation 6	Typo in the last sentence “porphan”	Fixed.	Agreed	Comment closed.		
82	3	7.2 then 4.6	Again, the term “leakage deduction” should be defined here. After reading this section, peer reviewer understands what it means, but it still needs a little more explanatation.	This is a commonly used tool in the carbon markets to address very low risks. Clarity added in text.	Agreed	Comment closed.		
83	3	p. 38 top	Just noting here that some US states use the term “plugged and abandoned” instead of “plugged.”	Different terminology was a big challenge during methodology development. ACR tried to	Agreed	Comment closed.		

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				provide clear definitions.				
84	3	A3	Peer reviewer would suggest citing Raimi et al. (2021) for updated cost estimates, which show costs for some wells of up to $1 million.	Added.	Agreed	Comment closed.		
85	4	Acknowledgements	Peer reviewer has concerns about the methods used by the Well Done Foundation. In viewing some of their videos and photos, Peer reviewer knows they use a personal gas meter for methane concentration measurement. This is not appropriate. Also, they have reported emission rates from unplugged abandoned wells that are much, much	To generate credits, project proponents must follow methodology guidance.	Concerned about this still.	Organizations that supported the development of the methodology will be treated the same as other project developers and held to the same standards. Methodology updated to include guidelines for measurement methods to be approved including: • Requirement for measurement equipment to be operated in	Comment closed.	

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			higher than literature values – much higher than what is reported in the literature for actively producing wells.			accordance with manufacturer's specifications – ensuring that data is accurately aggregated over the correct amount of time. • Date, time, and location of methane measurement could be documented, so verifier and auditors can review measured data – video, picture, print out, report, etc. • Measurements must be taken by a qualified specialist who will have training and field experience with the specific equipment and		

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						methods that have been proposed and approved by ACR for use at the targeted well sites.		
86	4	1.1	"provinces" – is this methodology intended for use in Canada as well as the US? Mostly US data and regulations are cited.	Methodology is for both US and Canada.	Agreed	Comment closed.		
87	4	1.1	The Kang et al., 2016 study did not "show that methane emissions from AOOG wells persist over multiple years and likely decades" – it didn't make measurements over those time scales. It did make measurements from wells that were old, but so do all the other studies.	Text updated.	Agreed	Comment closed.		

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88	4	1.1	It's somewhat disingenuous to say that "less than 1% of AOOG wells… have been measured and documented" to create emissions factors – this is the same situation for the entire oil and gas supply chain, and furthermore, all the published studies agree that most abandoned wells are either not emitting or a very small source and a small number are a large source (also the same situation for the entire supply chain). This needs to be added here!	Text updated. Many wells are not leaking methane. The goal of this methodology is to prioritize wells that are leaking methane.	This part of the text has not been updated correctly. It still says "Currently, less than 1% of AOOG wells in Canada and the U.S. have been measured… Despite questions as to the representativeness of these measurements from this limited number of wells, they are being used to estimate national scale methane emissions." This is a misrepresentation of the EPA inventory, which for much of the rest of the oil	The sentence has been changed to accurately reflect ACR's intent behind the original statement.	Comment closed.	

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					and gas supply chain DOES NOT EVEN USE MEASUREMENTS, only estimates. Is ACR saying it's appropriate to expect that EPA can measure all the 1-3 million inactive wells in the US, which it doesn't regulate? Also, just because emission rate measurements are made does not mean EPA will incorporate them into the inventory. They will incorporate them if they make a big difference in the inventory or if there is a			

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					published study that informs WHY or HOW wells are leaking.			
89	4	1.1	Inconsistent use of "CH4" versus "methane" throughout	Consistency added.	Agreed	Comment closed.		
90	4	1.1	"Additionally, other gases besides methane are often emitted from AOOGs" – is there a reference? Do you have data for CO2 emissions?	Author experience and text updated.	Agreed	Comment closed.		
91	4	1.2	What about a well drilled before 1950 that a state still has in the active category on their books? Would this be considered eligible? Please clarify.	Only if it meets all other criteria. 1950 is just a guideline for when laws started to come into place.	What is the reference for 1950?	This is less of a threshold and more of a naming convention for "unknown orphans." Wells that were plugged prior to regulations being in place may still be leaking and not on any state list due to lack of records or being	Comment closed.	

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						classified as "plugged". This is to say that these wells would be considered orphan because they have no designated operator, even if they do not appear on the "Orphan list". Language modified to provide clarity.		
92	4	1.3	Earlier, it said that some wells had likely been leaking for decades, are you allowing for back dating the emission rates in that case? Or is the credit for 20 years after the plugging. This is unclear.	Only emissions that are prevented through plugging are eligible.	Was a change made in response to this comment?	No change has been made. The Crediting Period section has been updated to specify that the 20-year crediting period is reflective of the 20 years of prevented emissions from plugging a Well.	Comment closed.	
93	4	2.2	What happens to the onsite storage tanks if they aren't required to be remediated under	Outside the scope of the methodology. Some jurisdictions	Was a change made in response to this comment?	No change has been made ; storage tanks are outside of the scope of the methodology. State	Comment closed.	

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			this project? Would they still be in place after the well plugging?	have requirements for site remediation. Emissions from onsite equipment are not eligible under the methodology unless it can be demonstrated that they are coming directly from a well and that they cease after plugging.		requirements will govern. Only emissions coming directly from the Wells are eligible. This is described in Figure 2.		
94	4	2.2	What is an SSR?	Sources, Sinks, Reservoirs	Agreed	Comment closed.		
95	4	4.1	Peer reviewer thinks ACR should be more specific about the gas detector requirements. First of all, it's very difficult to just measure "methane" – and as written this could include personal gas	Updated to require that any readings are within factory specifications for meter used. Some highly sensitive meters may be damaged at	Peer Reviewer suggest that personal gas meters should not be allowed for this methodology. Peer Reviewer does not agree with this change.	Only meters that are able to quantify methane at appropriate concentrations are allowed. Language added to clarify that equipment must be able to quantify emissions, not just	Comment closed.	

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			meters which are not accurate for atmospheric quantification.	high concentrations (early field trials have found this) Only during post-plugging sampling do we specify a sensitivity.		detect methane. For the post-plugging confirmation sampling, a detection limit of 1.0 ppm methane concentration is required.		
96	4	4.1	Where does the minimum detection limit of 1 gram per hour come from? This is probably a lot lower than most people will be wanting to measure for carbon crediting purposes.	Updated to require that any readings are within factory specifications for meter used. Only during post- plugging sampling do we specify a sensitivity.	The meter does not read in grams per hour – it will likely read in ppm? Not sure what the response here is referring to. It is hard to find this comment now because the section numbers have been deleted but if you are now asking for a detection limit of 1 ppm that would be lower than	Quantification of methane emitting from the well is required for the pre-plugging sampling. This incorporates both concentration and flow from the well. Post-plugging confirmation sampling requires detection of methane above background with a meter that has a detection limit of 1.0 ppm. If the measurements near the well exceed	Comment closed.	

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					atmospheric methane (2 ppm) which would not be possible.	ambient methane concentrations in the area, the well must be re-quantified to determine emissions reductions, if any.		
97	4	4.1	Overall, the method is written with a lot of attention to and detail for the chamber measurement. This is not likely to be a measurement that many environmental consulting or oil and gas companies will be using, in the peer reviewer experience. The recommendation is at least mentioning some of the other methods that have been used such as the high flow, downwind tracer, vent bag, etc.	References added, but no other method is yet approved. The high flow (especially pairs with a OGI camera) looks promising and ACR hopes to officially approve soon. Even the chamber method can be used incorrectly, so it's up to the project proponents to come up with	Is this document not the one where methods will be approved? Or is there a separate method approval process?	This document mentions that hi-flow sampler, as well as chamber methods have been approved by ACR so far. Other technologies/methods could be accepted, but ACR will not provide a comprehensive list of available potential technologies in the methodology. As technologies are approved while each project GHG Plan is prepared, they will be	Comment closed.	

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				the best equipment for the site. ACR has had many discussions on this topic.		compiled by ACR and provided to project developers upon request. Approval of a technology does not equate to approval of credits, technology must be applied correctly by a trained specialist (defined in the methodology), and used in appropriate situations.		
98	6	4.1.2	Where does the 30-day period for temporal variation come from? Is this common? This is a lot of work and isn't in the EPA inventory. Also, for post-plugging verification, Peer reviewer recommends "no methane enhancements above background" rather	This requirement is mostly to prevent any tampering with a well that would increase emissions. As more information becomes available on temporal variation, ACR	Please do the following revisions, document says now "no emissions enhancements about background" and it should say "no methane enhancements above background"	Change has been made.	Comment closed.	

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			than no emissions above background.	will update the methodology. "Enhancements " added.	other than that agree.			
99	4	4.2.1	Why isn't the global warming potential provided here? I'm curious to see what it is myself.	The is subject to change, based on the IPCC. Currently the 100-year is 28x, with another 2 due to this being fossil methane for a total multiplier of 30. Using 100-year is industry standard.	Agreed	Comment closed.		
100	4	4.3	On page 25, it says the crediting period is 5 for operated wells – Peer reviewer is not sure what this means? Aren't all the wells in this method abandoned or orphaned?	Wells with operators get a maximum of five years per crediting period, if eligible can be demonstrated. Orphan wells get one 20-year	Agreed	Comment closed.		

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				crediting period.				
101	4	5.1 then 4.1	These “multi-gas” sensors are not for environmental use. They are for determining explosion risk only. Also, clean air has approximately 2 ppmv methane so it’s not appropriate to ask for a lower detection limit of 1 ppmv of methane for your sensors. This is an issue throughout the method.	Project proponents are required to select appropriate equipment. Multi-gas sensors can be used if they can detect methane specifically. Project proponent is measuring methane concentrations above baseline, so any background methane is accounted for.	Peer Reviewer Disagrees. Multi-gas sensors are not appropriate for environmental monitoring.	Language added to clarify that methane must be the specific gas that is being tested for.	Comment closed.	
102	4	6.2 then 4.1.4	What about in non-chamber-based methods? All of this is so specific to the chamber method.	Chamber method is used as an example, other equipment may be approved.	How are these other methods approved? What is the process?	Detail added to include High Flow meter. Other technologies could be accepted, but ACR will not provide	Comment closed.	

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						a comprehensive list of available potential technologies in the methodology. As technologies are approved while each project GHG Plan is prepared, they will be compiled by ACR and provided to project developers upon request. Approval of a technology does not equate to approval of credits, technology must be applied correctly by a trained specialist (defined in the methodology), and used in appropriate situations.		
103	4	Appendix A	If the methodology is going to refer to "wells with no production within	This methodology was designed so that it will be	Peer reviewer asks for clarification here since on paper	Version 1.0 of this methodology will now be limited to Orphan Wells as	Comment closed.	

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			the last 6 months", this is going to include a lot of marginally producing and shut-in wells. See Townsend-Small and Hoschouer, 2021: https://iopscience.iop.org/article/10.1088/1748-9326/abf06f/meta Peer reviewer thinks ACR needs to be more specific about what kind of wells this method applies to, or maybe it's ok to have people plug wells with a solvent owner?? Would the owner get the carbon credit?	very challenging for an operated well to meet eligibility criteria. If an operator has a compliance obligation to test, repair, or plug a well, it will not be eligible. If no requirement exists, it would be possible for a solvent operator to plug their wells early-thereby preventing methane emissions- and receive credits for up to 10 years.	there is an obligation to plug a well if it isn't producing after a certain amount of time, but in reality, this does not happen.	ACR continues to evaluate the possibility of eligibility for Abandoned Wells.		
104	4	Appendix D	Lots more room for diversity of methods here if you want	Developing area- ACR will continue to monitor	Please provide more clarity on process to approve	Description for High Flow sampler added to the methodology in chapter four.	Comment closed.	

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			people to apply this method!	methane measurement technologies and continuously update.	technologies to be used for measurement, since it's not explained in the method.	Other technologies and methods will be approved as they are proposed by project developers and approved by ACR when project proponent submits GHG Plan.		