



Refining Decarbonization Beyond Energy Optimization Webinar

Q&A responses from recorded presentation. Please contact us at workwithus@src.sk.ca for more information.

1. Question: What is the best source of information on specific CO₂e emissions in ore processing, where electrification could be a potential solution? E.g., specific step or process unit.

Answer: For large emitters (such as cement producers or steel mills), overall emissions are reported to the ECCC (Greenhouse Gas Emissions Reporting Program). However, most minerals processing plants are not required to measure, monitor, or record emissions from processing plants (outside of power generation or diesel use). This is an area that we think is a gap. Please see Slide 33 of the presentation for the different methods of GHG emissions measurement. As you will see, a lot of them are factor or mass balanced based. Only 10% are direct monitoring.

2. Question: Do you have any insight on the long-term ramifications of underground carbon storage? E.g., seismic implications, groundwater quality, soil quality?

Answer: Great question. As far as we are aware, there have just not been any storage projects long enough to be able to answer this definitively (e.g., Quest, Boundary Dam) but all storage projects are being monitored extensively for any signs of long-term effects.

3. Question: Is carbonate rock reactive? Would it or could it be classified as potentially acid-generating?

Answer: Carbonate minerals are very reactive and contribute to alkalinity and not acidity. They will precipitate in alkaline environments and react with acids to neutralize them (releasing CO₂ as a result). They are therefore not acid-generating.

4. Question: It seems like there's a variety of ways of measuring emissions, which also all seem suitable. Would a world "standard for reporting" for this data be a good approach so that there's more efficient and consistent interpretation and evaluation of the data?

Answer: Yes definitely. However, the application of certain methods can be impractical under certain conditions. The economics of these approaches is also a consideration so prescriptive requirements should be flexible enough to consider practical and economic conditions.

5. Question: How does the Canadian National Inventory track the 7 GHG?

Answer: They use the best available data (such as the reporting from large emitters and factorized estimates) to estimate emissions of industries.

6. Question: So CO₂ has a relatively low GWP from the table. Does the general public know this?

Answer: We can't speak to the entirety of the general public but in our experience, there is limited awareness of this especially given that GHG emissions are often reported as CO₂ equivalents. However, even though CO₂ has a lower GWP, it has a much larger output than some of the higher GWP gases, such as CFCs, so its overall impact is still large.

7. Question: What type of carbon is being captured? CO₂? Are we capturing the most detrimental gas? What about the GWP table?

Answer: When we say "carbon capture" we mean CO₂. We would not use this term for methane for example. As per the previous question, the impact of a GHG emission is both its GWP and quantity of release, so what is most detrimental is a combination of these two factors. The focus of industry and regulators is on "large emitters" as these are the largest contributors considering both GWP and quantity.

8. Question: Do we understand enough about the oceans to carry out CCUS from the oceans?

Answer: CCUS involving oceans is an important nascent research area and SRC is not involved with this currently.

9. Question: What percentage of carbon credits improves the economics? Surely using the best technology with no leaks would provide the economic incentive without carbon credits or not?

Answer: The economics of carbon credits are case-specific. As to whether they incentivize the "right objectives," they can be considered a source of revenue to incentivize reducing carbon emissions to techno-economically feasible levels as part of a larger toolkit.

10. Question: What about nuclear energy?

Answer: Nuclear energy is a lower carbon source of energy.

11. Question: Considering the substantial energy requirements involved, is the implementation of carbon storage and conversion technologies truly beneficial?

Answer: It is definitely case-specific and the technology and economics need to be assessed on a case-by-case basis. SRC has worked on projects where the benefits have outweighed the costs (both capital and operating) and also where they haven't. This is why it is important to study on a case-by-case basis.

12. Question: Are you able to show the list of conferences you will be at again?

Answer: You can view the list here: <https://www.src.sk.ca/news/webinars-connect-and-learn-our-experts>. SRC will also be at the CIM convention in May!

13. Question: Are you doing any research on reducing green hydrogen costs; if not, who do you consider leading organizations in this area?

Answer: It is an area that we could look at if requested. We would have to know more details on what type of costs you are referring to (production, transport, pricing) and we can point you to organizations working on this. Please reach out to us if you are interested.

14. Question: How is this redefining decarbonization for mining? Seems like a pretty standard definition of CCUS not specific to mining?

Answer: Decarbonization for mining is often only looked at through the lens of optimization of processes and energy sources. Our presentation focused on sharing information to support that CCUS and other emissions reduction technologies should be considered as part of an overall decarbonization strategy. Carbon mineralization was a specific example of this for mining that we presented. Many of the CCUS technologies presented can be applied directly to mining processes but are not always considered as part of a mining operations decarbonization strategy.

15. Question: Can your scope 3 be negative if you are saving energy for your customers?

Answer: This is a very good question. We are not entirely sure and could look into it for you. One question back to you: would your client claim those reductions as Scope 1 or 2 emission reductions? If so, it might be hard to claim these reductions as your own (and might be considered double counting).

16. Question: Based on your experience, in mining, what percentage of CO₂ reduction is expected from electrification vs energy optimization vs CCUS? Are we talking 60% - 20% - 20% for example?

Answer: It is definitely case-specific. If there is significant diesel use for example, then the percentage of electrification (through electric vehicles) would be very high versus an underground mine that is already electrified.

17. Question: Related to this previous comment on remote areas, how competitive is wind + storage becoming to replace diesel?

Answer: Wind + storage is already cost competitive to diesel generation in some areas depending on the scale and the cost of delivered diesel. It's also important to note that the decision between diesel and renewables + storage does not have to be an all-or-nothing decision. In our experience, incorporating smaller amounts of battery storage can typically reduce diesel consumption by at least 25%, and renewables are about 25% the levelized cost of energy (LCOE) of diesel at low penetrations.

18. Question: How can we reliably quantify and accelerate permanent CO₂ mineralization in tailings-based pastefill systems at scale?

Answer: We need to increase awareness within the mining sector of these technologies and encourage much more research & testing into their effective application.

19. Question: Can we accurately measure how much CO₂ is captured over time in backfill stopes?

Answer: Measurement of GHG reductions is challenging for many applications but there are technologies being developed for this purpose. Accuracy and representativity (especially where regulations or credits are involved) are important considerations and need to be looked at on a case-by-case basis.