The potential for blockchain technology in Alberta's carbon offset mechanisms pertaining to large emitters

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Background on carbon offsetting for large emitters

Under Alberta's Climate Change and Emissions Management Act (CCEMA), the Carbon Competitiveness Inventive Regulation (CCIR) requires facilities emitting more than 100,000 tonnes of greenhouse gases annually to to limit emissions based on a product- or facility-specific benchmark.[1] Flexible compliance with the regulation means emitters have the option to reduce emissions on-site, purchase carbon offsets from off-site unregulated projects, purchase or use emission performance credits from off-site regulated projects, or pay the value of the credits directly into the Climate Change and Emissions Management Fund (CCEMF).[2] If the second or third option is chosen, the Alberta Emissions Offset Registry (AEOR) and the Emissions Performance Credits (EPC) Registry, which are operated by the CSA Group on behalf of the Government of Alberta, serve as the infrastructure for trading carbon offsets. On the registries, the standard unit for all GHG emissions is one carbon offset or one emission credit, both of which represent a one-tonne of carbon dioxide-equivalent reduction in greenhouse gas emissions. The price of each offset/EPC is agreed upon between the seller and buyer and is not made public, but is almost always cheaper than credits from the CCEMF. To qualify for selling credits into the AEOR, unregulated projects such as wind power plants, solar farms, or land tillage reduction projects must "follow strict government approved protocols that ensure emissions reductions are real, demonstrable, and quantifiable, additional to what would have occurred otherwise".[3] To list EPCs into the EPC registry, a facility regulated by the CCIR must generate EPCs by surpassing their benchmark and the excess emissions reductions, and these excess reductions must be registered on the registry and be issues credits from the Government of Alberta before they can be sold or banked and used.

[1] https://www.alberta.ca/carbon-competitiveness-incentive-regulation.aspx
[2] https://www.alberta.ca/assets/documents/cci-fact-sheet.pdf
[3] https://www.csaregistries.ca/albertacarbonregistries/home.cfm

Accounting challenges associated with large emitter offsets and EPCs

As carbon offset markets around the world continue to evolve, there exist some significant challenges related to carbon accounting that also impact the AEOR and EPC registries in Alberta.

Challenge 1: Administrative costs

The manager of the registries charges $250 + $0.05/tCO2e per transaction by a lister and per exchange.[4] For a typical year, the registry operating cost would then be ~$1,000 for ~15,000 tCO2e.

Challenge 2: Cybersecurity risks

Most registries administer offsets and credits using traditional databases that users interact with through a web interface. Unfortunately, this makes them exposed to hacking or even direct manipulation by employees who have access to the server, such as an EU ETS case where 350,000 tCO2e was lost, equivalent to €89,000.[5] At the moment, manual company controls like passwords and controlled access on servers are used to prevent unauthorized manipulation.

Challenge 3: Double counting of offsets

In any offset system, there is a risk that a project developer might list their project to another system as well.[6] Alberta's system is limited to only emission reductions that take place in Alberta. However, many voluntary offset systems allow projects from across the world. This poses significant risk to the 2 degrees C target made by the UNFCCC, if international carbon offsets are over-reported and ease climate policy aggressiveness as a result.

Proposed Blockchain Solution

Blockchain technology serves as a viable solution to tackle all three problems identified above. Quantification and verification costs and burden can be partially reduced through a blockchain based data collection service where meters are used and could be connected to the internet. To do so, AEOR/EPC must install digital meters that can report to the internet in a facility, a third-party verifier could pre-verify that meter for offset quantification. If a facility converts a gas

[4] https://www.csaregistries.ca/reductions/howto_e.cfm
[5] http://foreignpolicy.com/2015/01/30/climate-change-hack-carbon-credit-black-dragon/
[6] http://theredddesk.org/sites/default/files/resources/pdf/sei-wp-2014-02-double-counting-risks-unfccc.pdf

vent system to a flare system and connects a gas flowmeter here to the internet, the newly measured amount of gas can be considered to be flared and therefore avoid gas venting (~25x GHG reduction). Offset projects could: gas flaring or cogeneration sites (where gas or fuel flow can be considered to supplement a baseline practice) or wind or solar farms (anything where electricity less carbon-intensive than the grid average is used) Conversion mechanisms depend on the protocol used, the regulator's prescribed carbon intensity factor[7], and verification. To begin, a pilot project within AB registry of 1,000 tCO2e tokenizable projects for one year to compare overall efficiency to current registry (such a test can tell us details of how it works, identify knowledge gaps, identify differences in theory and execution). As well, to help prevent a project developer from selling an offset twice, a blockchain offset system could allow users to more easily check the geospatial and temporal data related to an offset project against other registries, or could be integrated with other carbon offset markets around the world to verify the count.

Discussion and conclusion

Less than half of offsets that have been registered on Alberta's offset market could have been digitally trackable tracked. A large majority were analog and from the land-sector. However, the Auditor General prefers projects that have better quality of records, which digital tracking offers. Saved administrative costs for the system are significant. However, the reduced cost for projects would differ by project. Therefore, this project will need to earn the support for the regulator early. Such blockchain technology will improve the integrity of offset credit data, stands to make it attractive to international markets, eases possibility of future incorporation with another carbon market in the future which can make carbon offsetting cost-efficient. Also, it allows room for future smart contracting services that electric utilities can directly interact with "green customers" through in order to provide mico-generation credits.

However, there are some risks. Since this system only works with digitizable measurements, it could fragment the offset market and reduce investment in land-based projects until technologies that can digitally measure those projects are implemented. It also favours large-scale offset projects that can afford the cost of integrating internet connectivity to digital meters. Lastly, the digital meters must be tamper-proof to ensure the measurement source is not manipulated by a facility. This problem already exists today though and is largely regulated by Measurements Canada.

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7 http://aep.alberta.ca/climate-change/guidelines-legislation/specified-gas-emitters-regulation/documents/CarbonEmissionHandbook-Mar11-2015.pdf