The Atlas Carbon Sequestration Hub Project

In March, 2022 the Alberta government announced that the Atlas Carbon Sequestration Hub (the "Atlas Hub"), which is a proposal backed by Shell Canada Ltd. ("Shell"), Suncor Energy Inc. ("Suncor") and ATCO Energy Solutions Ltd. ("ATCO") had been selected to proceed under the first RFPP round. The purpose of this round was to evaluate proposals to develop CO_2 storage projects serving Alberta's industrial heartland region near Edmonton.

Shell is the key participant involved in the Atlas Hub. It developed and operates the Quest CCS project, which captures CO_2 from the Scotford heavy oil upgrader (the "Upgrader"). Shell also owns 100% of a refinery and chemicals plant located adjacent to the Upgrader. The company has made it clear that it wishes to be a world leader in providing CCS solutions, and so has been working for years on creating an open-access storage hub near its Scotford complex northeast of Edmonton.

In July, 2021 Shell first announced a plan to add new carbon capture equipment at both the Upgrader and the Shell Refinery, which it calls the "Polaris" project. Shell's efforts to progress Polaris have been successful in attracting other companies to support its project, as follows:

- Suncor and ATCO announced in May, 2021 that they would be working together to develop a clean hydrogen project at ATCO's Heartland Energy Centre. This H_2 plant will be located near Fort Saskatchewan, beside Suncor's refinery, which happens to be close to the Scotford Upgrader.
- In September, 2021 Mitsubishi Corporation ("Mitsubishi") and Shell signed a memorandum of understanding relating to a H_2 plant that Mitsubishi wants to build near the Scotford complex.
- In March 2022 Keyera Corp. ("Keyera") and Shell announced that they would be collaborating on industrial decarbonization projects in Alberta, including the Heartland Area.

Shell's stated goal for Polaris was to eventually create a hub with CO_2 storage potential of more than 10 MT/year.

Below are additional details about Shell's original Polaris announcement and the plans announced by other participants that may eventually use the Atlas Hub.

Shell's Polaris Project

Shell operates the Scotford complex which is comprised of three components:

1. The Upgrader, which uses an H_2 addition process to upgrade bitumen from oil sands mines north of Fort McMurray into light synthetic crude [(1)];
2. The Shell refinery, which processes synthetic crude from the Upgrader into products such as gasoline, diesel, jet fuel, propane, and butane; and
3. A chemicals plant which uses byproducts from the refinery to help manufacture styrene and glycol.

In 2015 Shell started up the Quest CCS facility to capture and store CO_2 produced by the Upgrader. The upgrading process adds H_2 to the bitumen, breaking up the large hydrocarbon molecules to create synthetic oil. The H_2 used in upgrading is produced from natural gas using a process known as "Steam Methane Reforming". SMR is a production process in which high-temperature steam (700°C–1,000°C) is used to produce H_2 from methane. SMR breaks down methane into H_2 and CO_2 molecules. The CO_2 captured by the Quest facility is from a high-pressure stream produced by SMR units used at the Upgrader.

On June 26, 2024 Shell and ATCO announced that they have made final investment decisions to proceed with both of the Polaris and Atlas projects. Shell's Polaris carbon capture facilities will produce approximately 650,000 tonnes/year of CO_2 (comprised of 40% of emissions from the Upgrader and up to 22% of emissions from the chemicals plant). The CO_2 will be transported and stored through the Atlas Hub, which consists of a 22 km pipeline to two storage wells for injection more than two km deep into the same geological formation used for Quest. This initial phase of the Atlas Hub will be owned 50/50 by Shell and ATCO and will be an open-access hub able to store other industrial emissions from the Heartland Area. Both projects are planned to be operational by the end of 2028.

The Suncor and ATCO Hydrogen Project

Suncor and ATCO announced that they would work together on a project to produce over 300,000 tonnes/year of H_2 with SMR using CCS technology to capture over 90% of the CO_2 emissions. Suncor owns a refinery near Fort Saskatchewan that processes 146,000 Bbl/d of synthetic crude from oil sands upgraders and produces gasoline, diesel, and jet fuel. Approximately 65% of the H_2 from this project would be used in Suncor's refinery processes as well as for the cogeneration of steam and electricity at

its plant. The plan is to make the rest of the H_2 available for local markets, including using up to 20% for blending into natural gas sent to ATCO's customers.

The project will be constructed on the site of ATCO's 2,000 acre Alberta Heartland Energy Centre. ATCO owns a natural gas distribution utility that serves 2,100 customers in the Fort Saskatchewan area. The company has developed an H_2 blending project at this site which injects 5% H_2 by volume into the natural gas stream used to fuel customer's homes and businesses. ATCO started testing this project in late 2022 with H_2 sourced locally. It plans to have an on-site electrolyzer in place by the end of 2024, at which time the injection rate could increase to 20%.

Mitsubishi's Hydrogen Project

Mitsubishi announced that it is developing a plan to build a clean H_2 facility near Shell's Scotford complex, to be completed in the latter half of this decade, and that Shell would provide CCS service for this project through its Polaris initiative. The Mitsubishi plant will produce 150,000 tonnes/year of H_2 using an SMR process, and plans to use the H_2 to produce ammonia for export to Asian markets.

Keyera's Involvement

Keyera is an Alberta-based midstream company that owns and operates many large natural gas processing plants in the western part of the province. It also controls a major NGL fractionation plant in the Heartland Area near Edmonton. In May, 2022 Keyera and Shell announced that they will work together to build an open access gathering and distribution network to transport CO_2 from Keyera's NGL fractionation facility and other operations in the region to Shell's storage hub.

Keyera's involvement in Shell's plan is interesting as Keyera's gas processing and NGL facilities potentially give it wide access to many CO_2 emissions sources in western Alberta. The announcement of this collaboration also mentioned that Keyera owned a pipeline capable of transporting H_2 that could be used to complement a H_2 manufacturing and distribution network within the Heartland Area.

In Summary

Shell has been assembling an impressive array of companies to be participants in plans involving the Atlas Hub. Its Polaris project is an important first step in this regard. The Atlas Hub could facilitate a significant amount of clean H_2 production at the plants proposed by ATCO, Suncor and Mitsubishi, which fits well with the Alberta government's initiative to make the province a major clean hydrogen production centre.

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Additional Information:

1. Shell operates and owns a 10% interest in the Upgrader and the Quest CCS project.