

Economic and Environmental Impacts of Alternative Energy Sources for Canada's Oil Sands Development: a Hybrid LCA Approach

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The price and availability of natural gas in North America has forced energy intensive industries to reassess their fuel supply options. This is especially true of the in situ oil sands operations in Alberta that consume large quantities of natural gas. We will apply a hybrid LCA model to investigate the implications of using coal to supply heat, electricity and hydrogen to oil sands operations as an alternative to natural gas. Coal is an inherently dirty fuel and rail systems are costly to build and maintain. However, the fuel itself is relatively cheap, abundant and nearby. In addition, technologies exist today that minimize many of the environmental problems associated with this fuel. In addition to the capture and removal of conventional pollutants such as NO_x and SO₂, the potential for CO₂ capture and storage exists.

Applying the life cycle analysis framework to this problem is essential as the upstream and indirect impacts of these two options are non-negligible. The comparison between these two options will include economic and environmental impacts of the entire infrastructure required to operate these facilities. This includes the impacts of extracting and shipping the fuels from their source to Northern Alberta as well as the transport of materials, construction and operation of energy conversion facilities close to the oil sands operations.

This hybrid analysis will combine the benefits of the process based framework (along with process level data specific to oil sands operations in Alberta) and a Canadian economic input-output LCA model in order to address the economic and environmental impacts of the two scenarios.