TIAX Executive Summary

When comparing alternative transportation fuel greenhouse gas (GHG) emissions, it has become customary to consider not only the tailpipe or tank-to-wheel (TTW) emissions, but also the upstream or well-to-tank (WTT) emissions.

California is in the process of adopting and finalizing its Low Carbon Fuel Standard in which the full fuel cycle, well-to-wheel (WTW) greenhouse gas (GHG) emissions of all transportation fuels sold must be reduced by 10% from baseline levels by 2020. At the federal level, U.S. EPA has also considered the WTW emissions of transportation fuels in its recent Renewable Fuels Standard 2 (RFS2) rulemaking.

The tool employed by both regulatory agencies in their rule development efforts is the "Greenhouse Gases, Regulated Emissions, and Energy in Transportation" (GREET) model developed and maintained by Argonne National Laboratory. The default inputs in the GREET model for gasoline and diesel derived from conventional crude oil are based on U.S. average values for crude oil recovery energy, flaring/venting emissions, and refining energy. For oil sands, two default recovery pathways are provided (both with onsite upgrading), with the resulting synthetic crude oil (SCO) sent to the refinery.

Because there is a wide range of energy used to recover and refine different crude oils, there is a concern that utilizing average values is not optimum for regulatory/policy making purposes. The objective of this project is to provide a transparent quantification of WTT GHG emissions for specific Canadian crude oils and other major crude oils utilized in the United States.

We found that:

- There is a wide range of WTW emissions for the conventional crude oil pathways.
- The SCO-Mining pathway WTW emissions are within the range of those for the conventional crude oils. However, the mining pathway likely has direct land use change emissions that are not accounted for here.
- On average, the synbit/dilbit pathway emissions considered here are 10% higher than the average conventional crude oil pathways considered. However, there is overlap between the conventional and synbit/dilbit emissions.

- In general, the level of uncertainty associated with the pathways within the sensitivity bounds does not significantly change their relative WTT GHG emissions rankings and suggests that the analysis values offer a reasonable estimate of the GHG emissions for the different crude oils.
- This analysis is based entirely on publicly available data. The benefit is that the results are transparent and may be utilized for transportation policy and regulation if desired. On the other hand, the analysis could be improved with the availability of more data from oil sands operations.
- Although the GREET default values for the conventional crude oil pathways are within the range of our results, the range is quite large (20 g/MJ range).
- For regulatory purposes, it may be appropriate to monitor the quantities of different crude oils being utilized relative to baseline quantities to ensure that carbon reductions are actually achieved.