ALBERTA INNOVATES

CLIMATE CHANGE INNOVATION AND TECHNOLOGY FRAMEWORK

Awardee Summary

CCITF PROGRAM	Clean Technology Development
PROJECT TITLE	Alberta Biojet Initiative (ABI): Upgrading of University of Alberta's LTH technology to Biojet (CFREF related)
SECTOR	Cleaner Oil and Gas Waste to Value-Added
ORGANIZATION	University of Alberta
PROJECT LEAD	David Bressler
AI PROJECT ADVISOR	Christine Murray
GRANT AMOUNT	$1,500,000
START DATE	1/1/2019
END DATE	12/31/2021

PROJECT OBJECTIVE: To simultaneously develop two pathways to generate biojet fuel from a range of model compounds and Alberta-sourced lipid feedstocks, waste oils and fats, and various low-grade crop oils.

PROJECT PROFILE: The Provincial and Federal governments of Canada have committed to transitioning to a low-carbon economy. According to the recently released Biofuels for Aviation: Technology Brief (International Renewable Energy Agency, 2017), the level of greenhouse gas emissions from the aviation sector would make it the eighth-largest emitter globally if it were considered as a country. Thus, lowering the greenhouse gas emissions of the aviation sector has become a key focal point to mitigate the effects of climate change and move towards a global low-carbon economy. While biojet fuel is currently available as a boutique novelty fuel, high production costs translate to pricing that cannot compete with fuels generated from fossil derivatives. Therefore, the viability of biojet will require development of advanced technologies that can improve process economics and overall performance.

The Lipid-to-Hydrocarbon (LTH) technology, which was developed and patented by Dr. Bressler's group at the University of Alberta, can convert a wide range of lipid feedstocks into platform chemicals and solvents, as well as drop-in naptha (gasoline) and distillate (diesel) fuels. Recently, the Bressler group has identified, and been awarded national stage patents internationally for, a novel process that can substantially increase the amounts of branched hydrocarbons in the liquid project generated through the LTH process. This is of key interest to the aviation industry as branched hydrocarbons are necessary components of jet fuels that confer desirable properties such as a reduced freezing point.

The present study aims to simultaneously develop two pathways to generate biojet fuel from a range of model compounds and Alberta-sourced lipid feedstocks, waste oils and fats, and various low grade crop oils. The latter feedstock includes yellow and brown restaurant greases, oils from agricultural (and potentially

forestry tall oil), as well as tallow from the rendering industry. The first approach will be focused on modifying standardized isomeration approaches currently utilized for the creation of jet from hydrocarbons and other renewable fuels. The second will focus on the optimization and deployment of a novel patented process developed by the Bressler laboratory. This dual approach is greatly strengthened through the partnership with the expertise and infrastructure of CanmetENERGY and the dual approach will allow benchmarking and reduced risk to the project outcomes. Adoption of a biorefining approach to generate various fuel, including biojet, and solvent fractions is anticipated to improve process economics. Through close collaboration with CanmetENERGY and FORGE Hydrocarbons, a University of Alberta spin-off company that is currently demonstrating the LTH process at the 30 million liter scale through $4.2 million in funding from Sustainable Development Technology Canada and over $16M of additional provincial and private investment, it is anticipated that any developed technologies will be directly incorporated into existing or subsequent commercial facilities including one that is under negotiation for potential location in Alberta.

GHG EMISSION REDUCTION SUMMARY: