

Continuation of Drop-in Biofuels project

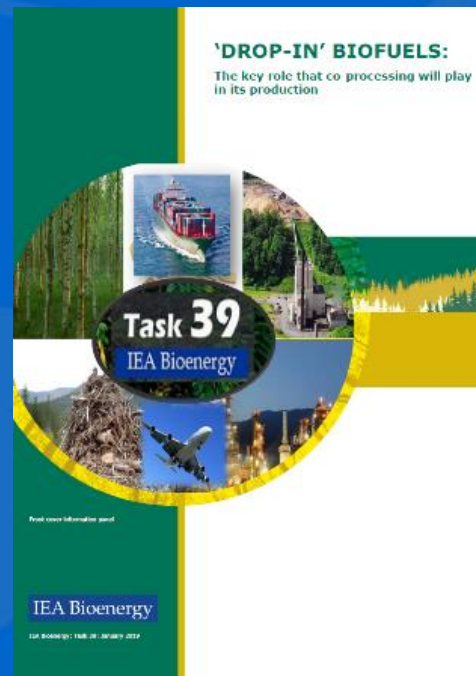
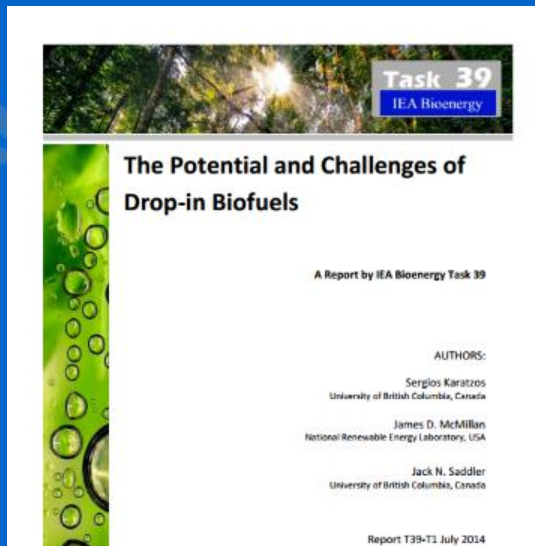
(Production of lower carbon intensive (CI) transportation fuels)

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Forest Products Biotechnology/Bioenergy Group: IEA Task 39



Drop-in biofuels reports (2014 & 2019)



Definition of “drop-in” biofuels

- Drop-in biofuels: are “liquid bio-hydrocarbons that are: **functionally equivalent** to petroleum fuels and **fully compatible with** existing petroleum infrastructure”

Focus on Feedstocks (availability, cost and “sustainability”)

- Near term feedstocks:
 (“Conventional”)

Oils, fats, and greases (OFGS) or Oleochemical feedstocks

- Used cooking oil, tallow, tall oil
- Vegetable oils: soybean, canola, rapeseed, etc.
- Alternative oilseed crops:
 camelina, carinata or algae oil

- Long term feedstocks (Biomass):
 (“advanced”)

biocrudes/bio-oils

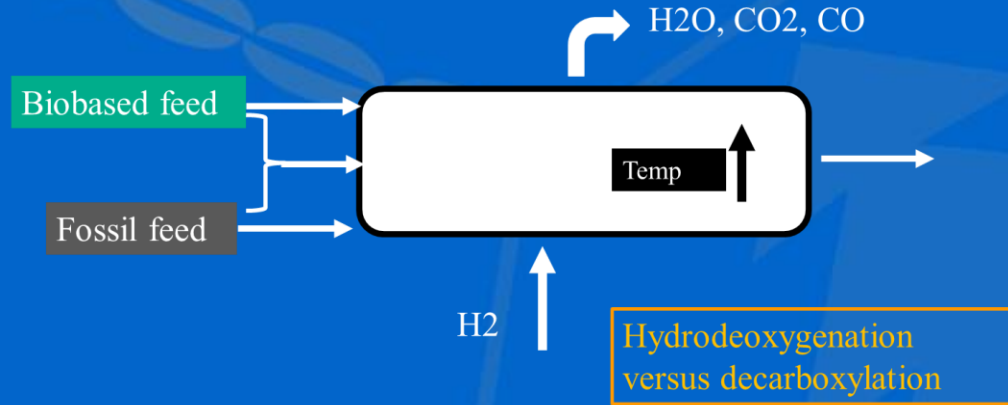
- Fast pyrolysis biocrude
- Catalytic pyrolysis biocrude
- Hydrothermal liquefaction biocrude
- etc.

Strategies for drop-in expanding drop-in biofuel production

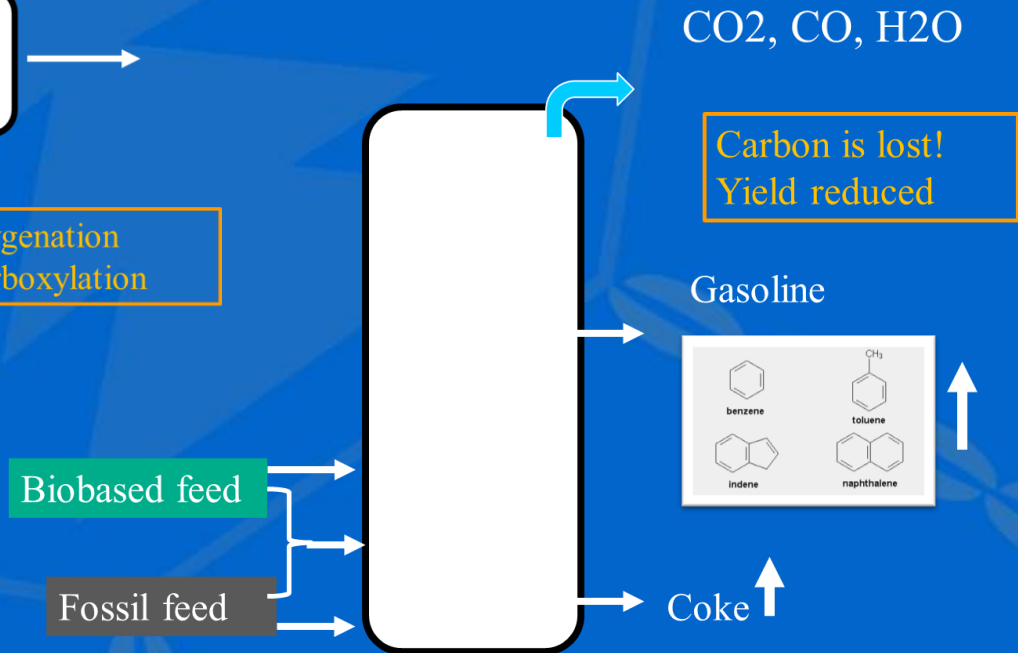
- Stand-alone units (e.g. “renewable diesel focus”)
 - Time needed for the projects, cost, permit risks and uncertainties
- Co-locating, enabling utilizing the existing supply chain, hydrogen
- Repurpose existing infrastructure (e.g. World Energy (AltAir) in California, ENI Italy, Total La Mede, France)
- Co-processing of biobased intermediates in existing refineries to produce fossil fuels with renewable content (lower carbon intensity)
 - Lowest cost for expanding drop-in biofuel
 - Decrease the crude oil demand for fossil fuel refineries

Possible insertion points

Hydrotreater co-processing



FCC co-processing



Tracking the “green” molecules (CI of the final fuel)

- Policies such as the LCFS have incentivised refineries to co-process
- However, need to determine the carbon intensity/ renewable content (the “green” molecules) of the co-processed fuels
- How do the different methods used to track “green” molecules compare?:
 - e.g. Mass balance/C14 by Accelerator Mass Spectrometry (AMS)/C14 by Liquid Scintillation counting (LSC)/C13/etc.