Sustainable Alternative Jet Fuels

Life Cycle GHG Emissions Modeling

Jim Hileman

U.S. Federal Aviation Administration

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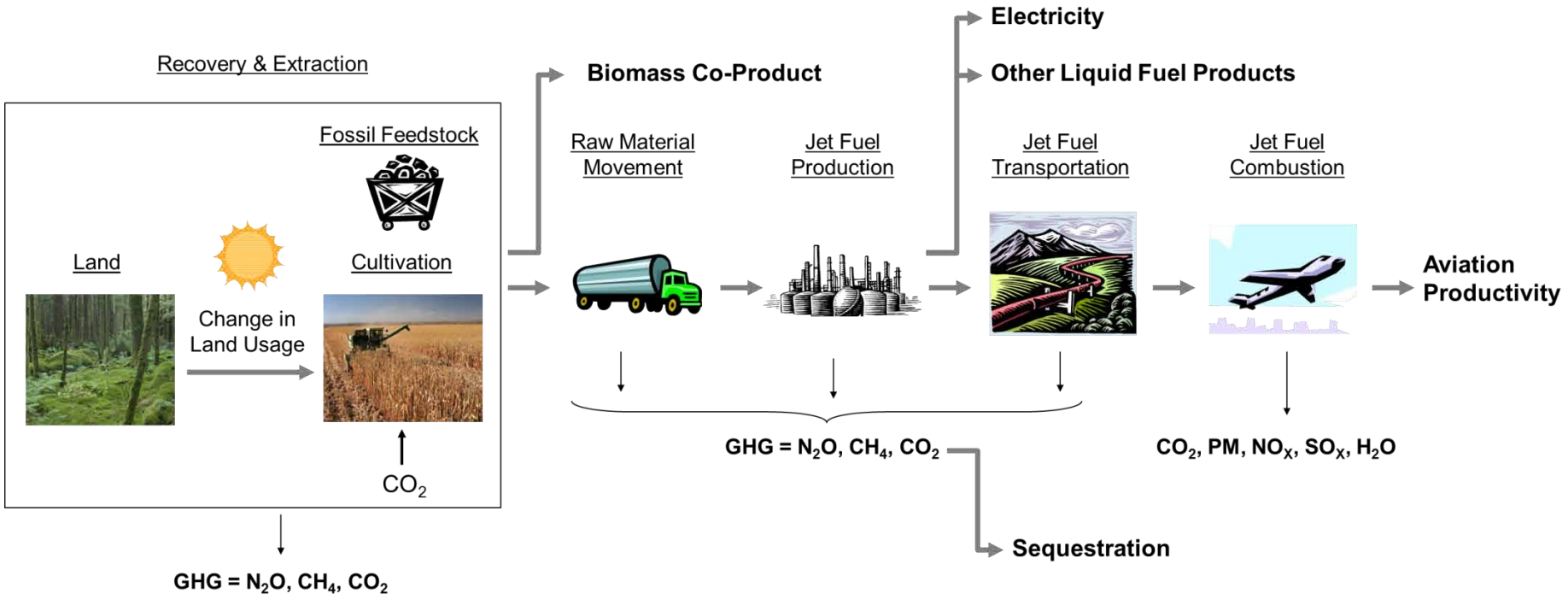
Federal Aviation Administration

Life Cycle GHG Emissions



Stage #1: Extraction of resource (e.g., crude oil, natural gas, coal, biomass)

Stage #2: Pipeline, tanker, rail and truck transport to refinery

Stage #3: Refinement to produce transportation fuel (e.g., gasoline, diesel, and jet fuel)

Stage #4: Pipeline transportation, blending with additives, transport to bulk storage, and loading into aircraft fuel tank

Stage #5: Combustion

GHG Life Cycle Inventory (LCI)

- **Reasons for Creating a GHG LCI:**
  - Voluntary reporting to inform public that an existing fuel pathway is “green” relative to conventional fuel or voluntary goal to reduce GHG emissions
  - Analytical exercise to understand the scenarios wherein a future fuel pathway would be “green” relative to conventional fuel
  - Meeting a regulation: EISA Section 526, EPA Renewable Fuel Standard (RFS2), California Low Carbon Fuel Standard (LCFS)

- **CAAFI efforts have been focused on voluntary reporting and EISA Section 526**

Key Question

Is an alt jet fuel 'greener' in terms of life cycle GHG emissions than conventional jet with some pre-defined baseline?

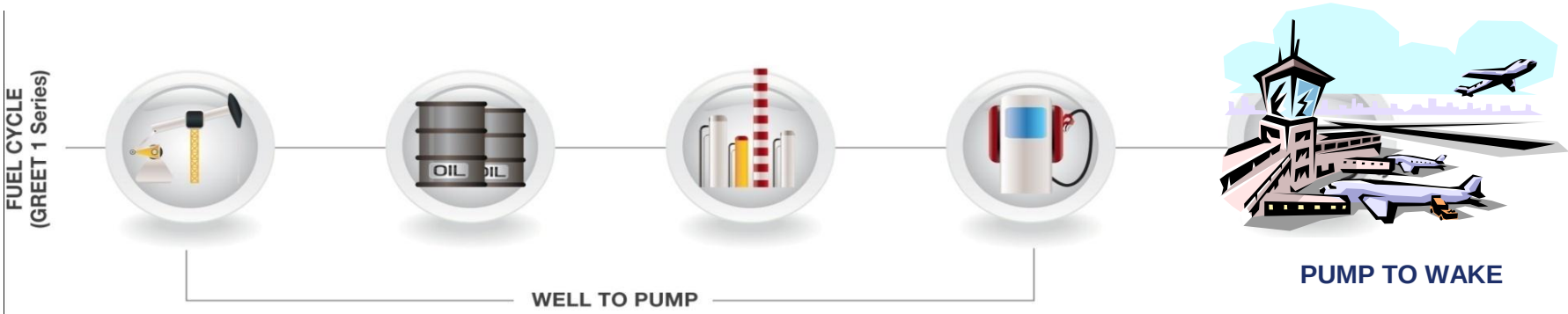
Several ways to check this:

- EPA RFS2
  - If fuel qualifies, then answer is yes
  - Petition process is available online*
- Existing Life Cycle GHG Tools
  - Existing databases and computing platforms could be used (e.g., GREET, RSB)
  - May need Co-Product Allocation (i.e., energy or economic value instead of system expansion unless appropriate model is used)
  - Account for Land Use Change Emissions (using values from existing regulations or best practices)
- Application of Rules and Tools Guidance**

* http://www.epa.gov/otaq/fuels/renewablefuels/compliancehelp/rfs2-lca-pathways.htm
** http://web.mit.edu/aeroastro/partner/reports/proj28/greenhs-gas-ftprnts.pdf

GREET Model

- GREET (Greenhouse gases, Regulated Emissions, and Energy use in Transportation) has been supported by U.S. DOE EERE since 1995
- Originally designed for ground transportation
- Current development includes jet fuel lifecycle analyses from conventional and alternative feedstocks – created with input from FAA-funded research*
- GREET and its documentation are available at *http://greet.es.anl.gov/*
- The most recent GREET version (GREET1_2011) was released in October 2011
- Documentation forthcoming



Latest version of GREET.1.2011 contains Conv. and Alt Jet Fuels

* http://web.mit.edu/aeroastro/partner/projects/project28.html

Summary & Next Steps

Summary

- Life cycle assessment is critical to determine whether a potential alternative fuel will reduce GHG emissions
- Should link method for estimating Life Cycle GHG emissions to the question being asked
- GREET (and tools like that of RSB) are likely good enough for compliance with EISA Section 526 and voluntary measures
- GREET.1.2011 has select alternative jet fuel pathways

Next Steps

- FAA funded researchers at MIT are continuing to work with GREET development team on new pathways
- Research being conducted to examine multiple databases (e.g., Roundtable Sustainable Biofuels) and policy frameworks for estimating life cycle GHG emissions

Thank you!

Jim Hileman

Chief Scientific and Technical Advisor
Office of Environment and Energy

James.Hileman@faa.gov

202-493-4293

www.caafi.org