ASCENT & USDOT Volpe Center Support for FAST-SAF Grantees

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USDOT Volpe Center's Mission & Capabilities

Improve the nation's transportation system by anticipating emerging issues and advancing technical, operational, and institutional innovations for the public good.

- Safety and Security Assessments
- Engineering and Technology Deployment to Enhance Transportation
- Human Factors, including Human-Automation Interaction
- Applied Data Science
- Impartial Investigations and Program Evaluations
- Environmental Analysis, Science, and Engineering
- Knowledge Transfer and Capacity Building to Maximize Impact
- Systems and Infrastructure Modernization and Optimization

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ASCENT – Aviation Sustainability Center

FAA Center of Excellence for Alternative Jet Fuel & Environment

Conduct research to inform FAA's decision making on environmental impacts of aviation

FAA
Environment & Energy

ICOA - International Civil Aviation Organization

NOISE

AIR QUALITY

ENERGY

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FAA ASCENT & USDOT Volpe Center Support for FAST-SAF

Technical support available to analyze potential SAF supply chains

Regional Supply Chain Configuration

- **Feedstock availability,**
- **Strategic plant siting,**
- **Optimal transportation solutions**

Performance Assessment

- **Basic conversion economics,**
- **Qualifying policy & support,**
- **Fuel characterization**

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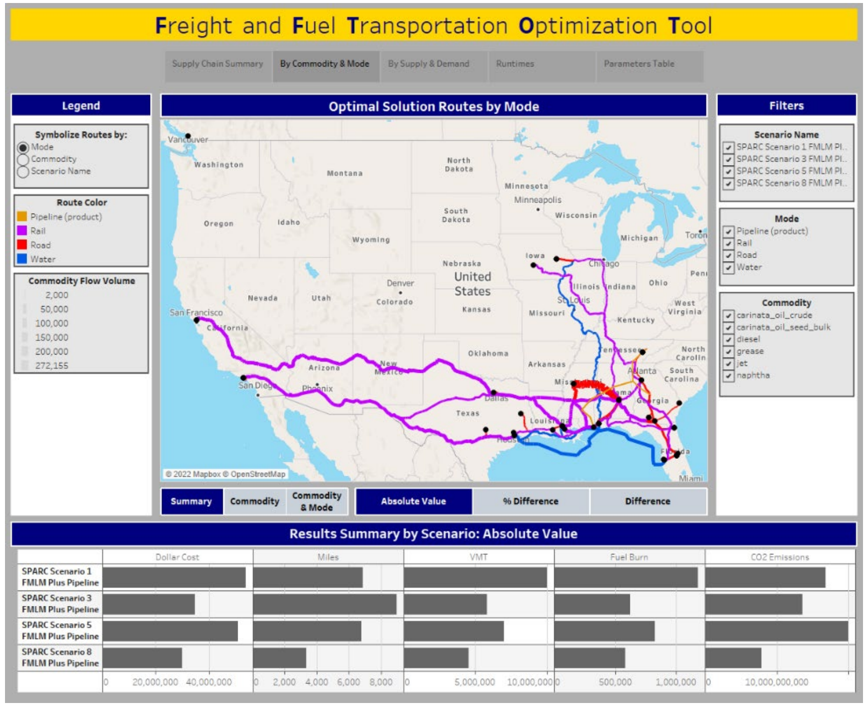
Freight and Fuel Transportation Optimization Tool (FTOT)

Overview:

- Flexible scenario testing tool.
- Created by Volpe in support of the FAA, DOE, and the Office of Naval Research (2012-present).
- Optimizes supply chain routing and flows to maximize delivery and minimize cost.
- Multimodal network: road, rail, waterway, pipeline, multimodal facilities.

Outputs:

- Optimal routing, flows, and mode choice.
- Optimal solution costs, emissions, VMT by facility, commodity, and mode.



FTOT Available at:

https://volpeusdot.github.io/FTOT-Public/

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FTOT can explore effects of changes in:

- Demand and Supply
- Multimodal Transportation Infrastructure
- Supply Chain / Industry Infrastructure
- Disruption and Resilience

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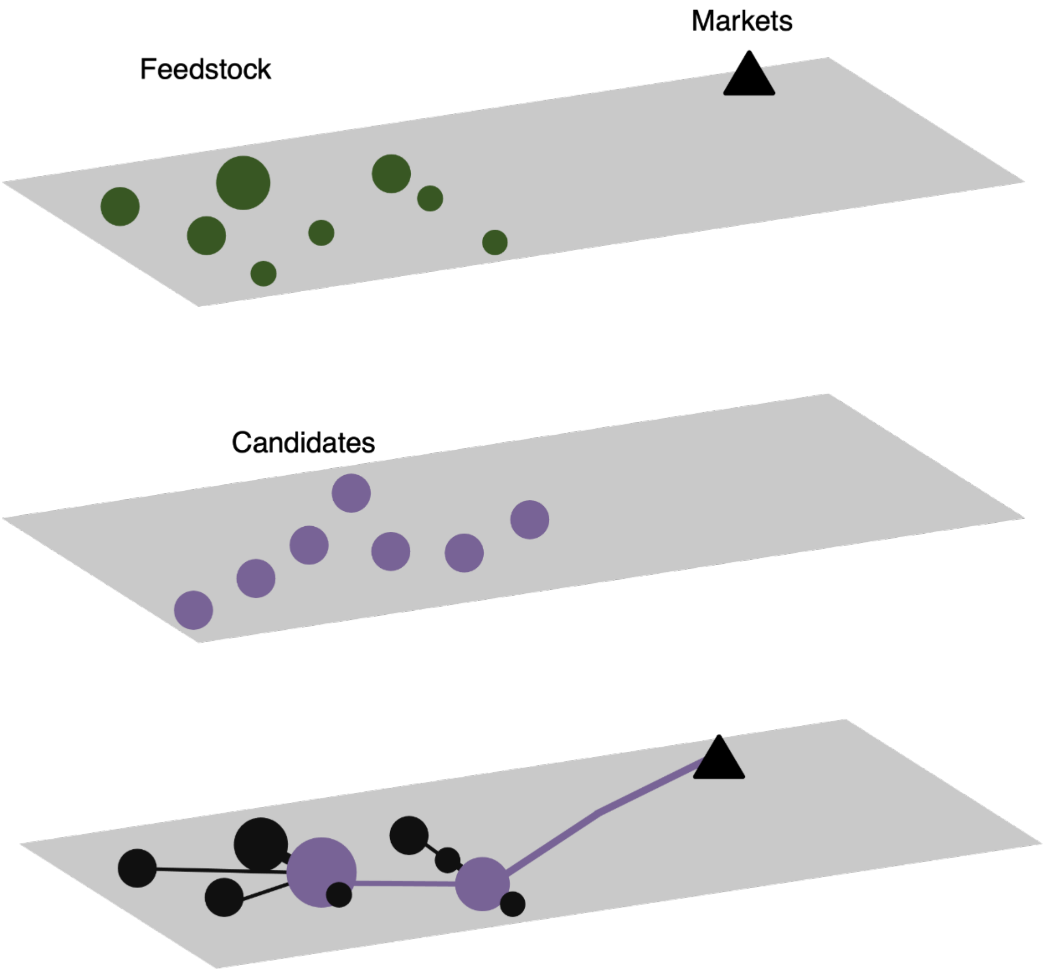
Tailoring Regional Supply Chain Analysis

Regional Feedstock & Market Analysis

Ranked Siting Analysis

Logistical Optimization



Define Region
- Build feedstock and market nodes
- Collect infrastructure data

Candidate Selection
- Quality locations that show potential
- Limited Quantity for optimization

Optimization
- Determine the optimal combination of candidates

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Performance Assessment

What are the economic and environmental performance of regional supply chains?

Performance Assessment

- Basic conversion economics,
- Qualifying policy & support,
- Fuel characterization

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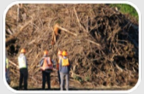
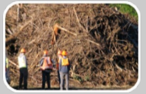
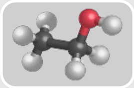
Comparative Techno-Economic Analysis

- Variety of pathways and feedstocks
- Common financial analysis
- Capital and operating cost
- Products and revenue
- Potential policy support

Process	Feedstock					
	FOGs	Vegetable Oil	Ag Residue	MSW	Forest Residue	Alcohol
HEFA						
CH						
GFT						
Pyrolysis						
ATJ						
Feedstock Prep						

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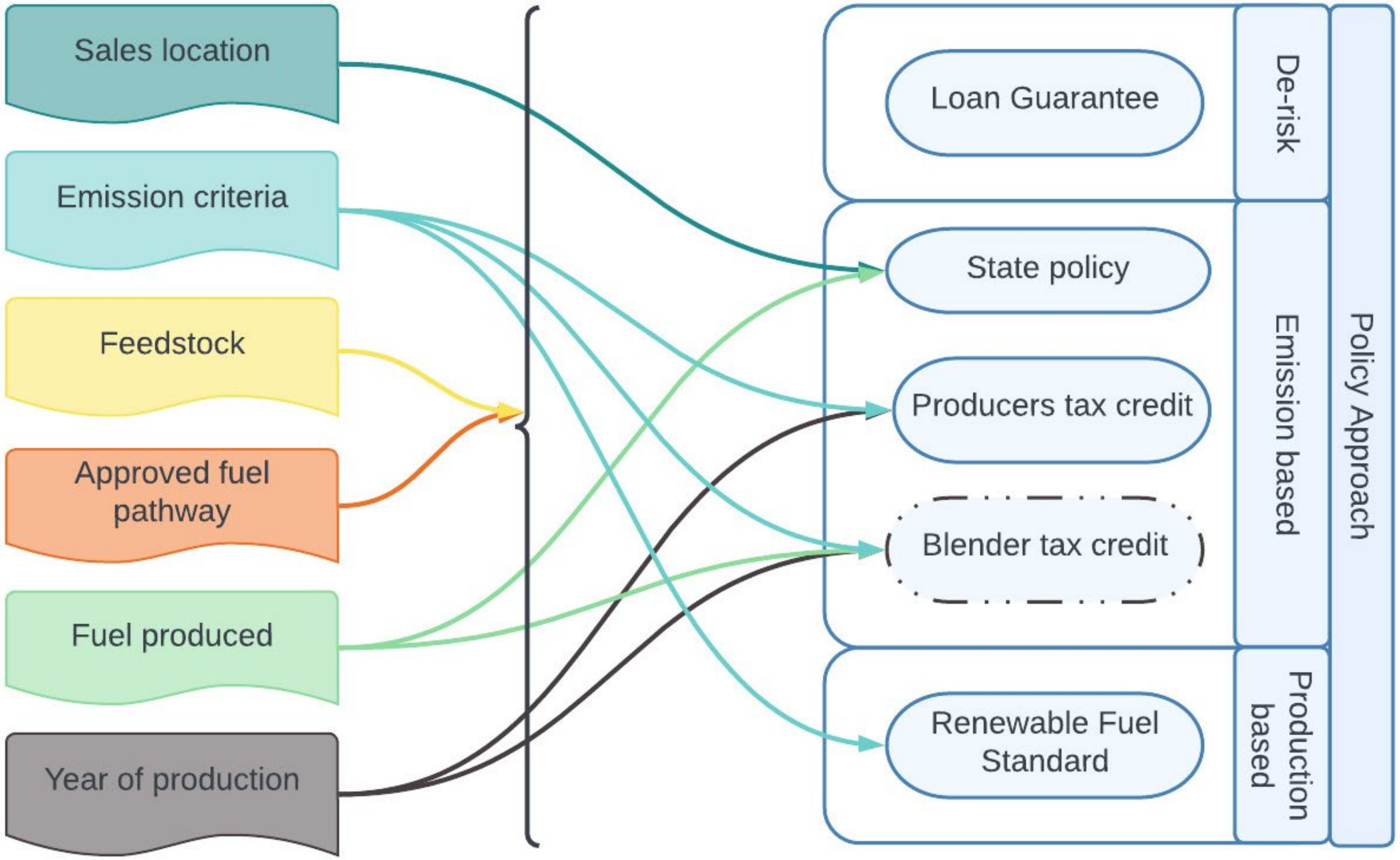
Policy & Support Programs

- Federal and state policy and programs
- Variety of feedstocks and pathways
- Links to primary sources
- Values



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Fuel Characterization

- Batch certificate of authentication service
- Quality assurance of downstream blended fuels
- Due diligence on demonstration plants and other scale-up processes

This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

INTERNATIONAL

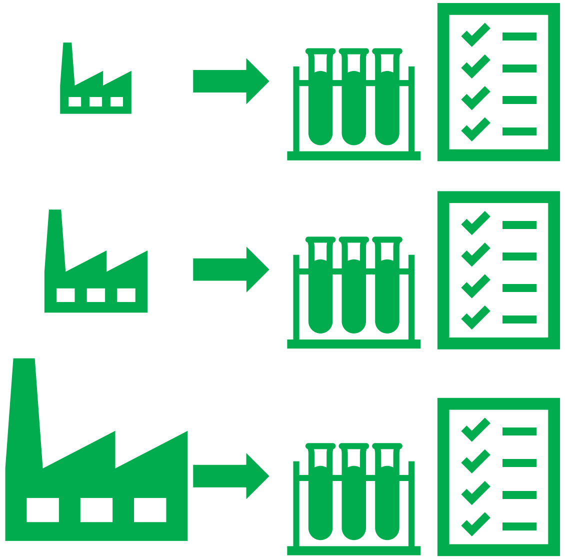
Designation: D7566 – 21

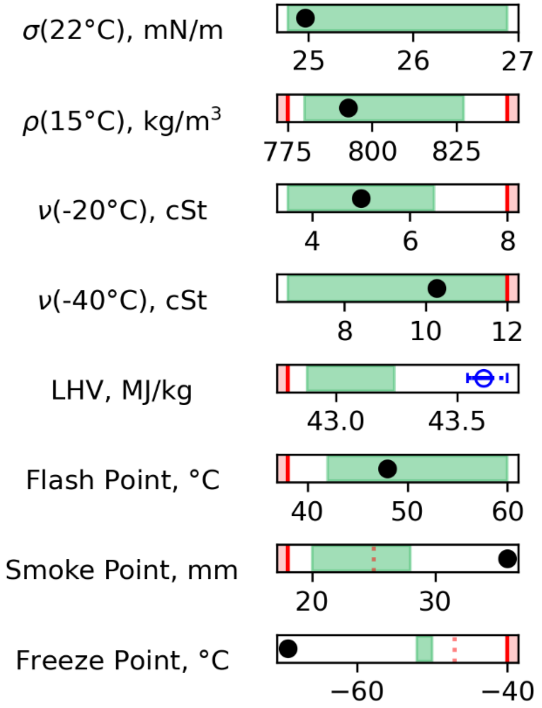
An American National Standard

Standard Specification for
Aviation Turbine Fuel Containing Synthesized Hydrocarbons[1]

This standard is issued under the fixed designation D7566; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.





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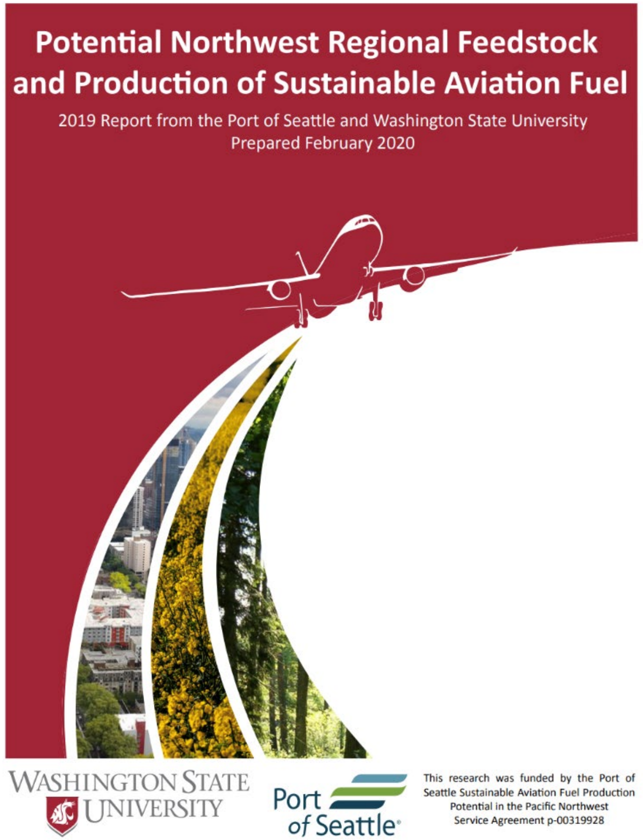
Examples of ASCENT/Volpe Support Projects



- Feedstock potential for SAF in the NW
- Water impact SAF production on water availability in Dakotas
- Second-crop oilseed production potential in SE
- C&D utilization needs in Hawaii
- Fuel characterization to refine emerging producers
- Sustainable Skies Act impact on SAF prices


ACS Sustainable Chemistry & Engineering
Research Article
pubs.acs.org/journal/ascecg

Life Cycle Water Footprint Analysis for Rapeseed Derived Jet Fuel in North Dakota

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Supporting Information

ABSTRACT: Rapeseed is considered to be a promising sources for hydroprocessed ester and fatty acid (HEFA) jet fuel production as a means to address energy security and climate change mitigation. However, concerns have been raised about its impact on water, as large-scale biofuel production may place pressure on fresh water supplies and water quality. Water footprint (WF) analysis, when combined with water-focused life cycle assessment (LCA), can be an effective system analysis tool for water sustainability. This study developed a life cycle water footprint analysis informed by inputs from multiple models for rapeseed HEFA jet fuel production in North Dakota and evaluated the environmental impacts on water utilization and water quality due to large scale HEFA jet production. The biogeochemical-based EPIC model was incorporated to simulate crop growth that influences the hydrological cycle. Systematic LCA models were built in SimaPro to conduct life cycle blue WF analysis. Results using energy allocation indicate that rapeseed derived HEFA jet fuel has a WF of 131−143 m^3 per GJ fuel over a rapeseed price range of \$470−600, including all green, blue, and gray WF components. Discussions also indicate the importance of incorporating allocation within a life cycle approach when conducting biofuel WF analysis.

KEYWORDS: *Water footprint, Jet fuel, Life cycle assessment, Rapeseed*

INTRODUCTION

Water Implications of Biofuel Production. Renewable jet fuel has become increasingly important for the aviation sector to address energy security and climate change mitigation. The U.S. Federal Aviation Administration (FAA) calls on a goal of one billion gallons of renewable jet fuel to be used in the U.S. aviation industry by 2018.[1] Meanwhile, certified renewable jet fuel from plant oils has been commercially demonstrated for aviation use.[2] To this end, the hydroprocessed ester and fatty acid (HEFA) jet fuel from oilseed plants have been gaining interest as a potential substitute for fossil jet fuel to help meet air transportation and military needs for alternative fuels. Rapeseed is considered a promising oilseed feedstock for producing HEFA jet fuel because of its high oil content and potentially attractive agro-economic benefit of replacing the fallow period in wheat/fallow rotations in multiple landscapes.[3,4] Other potential benefits include reducing wheat diseases, improving soil quality, and utilizing deep soil nitrates, thus diminishing groundwater contamination.[5−7] Certain weed problems associated with continuous cereal grain production can also be eliminated when growing rapeseed in rotation with wheat.[8]

Despite these benefits of producing HEFA jet from rapeseed, concerns have been raised about its environmental viability, water supply being one important concern.[9,10] Fresh water is a precious resource, and substantial water volume is being consumed and polluted in the agricultural, industrial, and domestic sectors.[11−13] Shifting to large scale biofuel production is likely to place additional pressures on fresh water supplies and water quality, especially as the water sector already faces

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Summary of FAST-SAF Grantee Support

- SAF supply chain analyses leveraging FAA-funded Freight and Fuel Transportation Optimization Tool (FTOT) & ASCENT Tools
  - Tailor to regional feedstocks
  - Strategic siting analysis
  - Logistical optimization
  - Resilience analysis

- Performance Assessment
  - Economic analysis
  - Potential policy support
  - Fuels characterization