

Sustainable Alternative Jet Fuel

U.S. policies & programs for enabling production and use

CAAFI - CORE-JetFuel Cooperation Workshop

Nathan Brown

Alternative Jet Fuel Project Manager

U.S. Federal Aviation Administration

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Federal Aviation
Administration



Bridging Technology's "Valley of Death"



Chart courtesy of W. Harrison, U.S. Air Force



Federal Aviation
Administration

Barriers to alternative jet fuels in the U.S.

- **Feedstock Availability**
- **Competitive cost for alternative fuel**
- **Approval of fuels for performance/safety**
- **Uncertainties in environmental impacts**
- **Investment in production infrastructure**
- **Establish supply chains**



Types of Policies & Programs

- **Public R&D investments**

- Funding and/or cost sharing of technology R&D
- Testing and analysis
- Analytical tools, planning, studies

- **Public Deployment Policies**

- Fiscal incentives (tax credits/rebates)
- Public financing (loans, loan guarantees, grants)
- Regulations (mandates, quotas)
- Government (& airline) procurement

- **Coordinating Initiatives**

- Public Private partnerships (CAAFI, Farm to Fly 2.0)



Addressing U.S. barriers

- **Increase feedstock availability**
 - R&D on Feedstocks & cost (e.g. Agriculture, Energy grants)
- **Reduce fuel costs through R&D investment**
 - Improve conversion cost (e.g. Energy, DARPA grants)
- **Reduce risks of approval process**
 - R&D support for testing of fuels (e.g. FAA, Defense, NASA)
 - Transparent process for certification/qualification
- **Reduce uncertainty on environment**
 - Improve quantification of benefits
 - Work towards converging standards for crediting

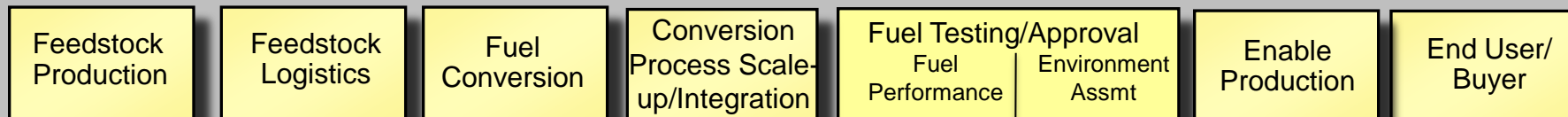


Addressing U.S. barriers

- **Increase investment in production**
 - Reduce cost & risk of production of feedstock (e.g. Agriculture BCAP, crop insurance programs)
 - Reduce cost to finance first of a kind plants (e.g. loan guarantees by Agriculture and Energy)
 - Direct investment in fuel production (e.g. Navy, Energy, Agriculture Defense Production Act)
 - Provide fuel production incentives (e.g. the U.S. Environmental Protection Agency's Renewable Fuel Standard)
 - Purchases and off-takes to create market (e.g. Department of Defense, Farm to Fleet and Airlines)
- **Establish supply chains**
 - Linking up stakeholders for supply (e.g. CAAFI & F2F2)



U.S. complementary programs create a bridge?



Agriculture NIFA Community Ag Program grants
FAA supply chain analysis

Agriculture biomass crop assistance & crop insurance programs

Energy R&D grants

Agriculture & Energy R&D grants

FAA, Defense NASA C/Q Fuel testing

FAA, Defense, NASA Enviro Analysis

Agriculture, Navy, Energy DPA

Energy R&D grants

Defense R&D grants

Agriculture, Energy biorefinery grants, loans

Defense & Airline fuel purchasing/offtake

EPA's RFS

State LCFS



Commercialization News

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Alaska Airlines

UNITED



FedEx

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GEVO
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Fulcrum
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Gulfstream And World Fuel Sign Renewable Fuels Agreement

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Jet Fuel to supply 15 United Airlines invests \$30M in Fulcrum BioEne

June 30, 2015 | Jim Lane

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June 30, 2015 | Jim Lane

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June 30, 2015 | Jim Lane

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FedEx, Southwest Airlines combine to buy entire jet fuel output of Red Rock biorefinery, through 2024

July 21, 2015 | Jim Lane

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FedEx joins Southwest Airlines to buy out Red Rock's entire 8-year jet fuel inventory — key milestone for project



>100 Million gpy by 2025



The plant is expected to produce 40% jet fuel, 40% diesel, and 20% naphtha, or 6 million gallons, 6 million and 3 million respectively.

The Southwest Airlines offtake agreement was signed last September. [More on that here.](#)

[More background on the technology](#)

[Red Rock Biofuels: The Digest's 5-Minute Guide](#)

[Red Rock Biofuels: The Digest's 8-Slide Guide](#)

In conjunction with this another major stockho sheet, these stockhol Amyris common stock convertible debt being for mandatory convers