AVIATION AND ALTERNATIVE FUELS
The Law and Policy of First, Second, and Third Generation Biofuels
Kristina Dahmann, Lara B. Fowler, and Paul M. Smith

Why Does the Law & Policy Matter?
Industry pieces are in place but where are the results?
Are there opportunities in the aviation sector?
What is the likelihood of:
• predictable industry development?
• taking the next step to commercialization?
How to address or draw upon issues related to:
• decline of ground transportation sector motor gasoline consumption, which has occurred since 2007?
• decline of coal, oil and other liquids on decline?

Transportation vs. Aviation:
Aviation is Different
Ground transport sector – reduced demand; aviation growth projected at 4.5%/yr. to 2050
Aviation customer pull (vs. technology push) due to:
• Concentration of customers – airports & military are embracing “sustainable alternative jet fuels” (SAJFs)
• No viable alternatives to liquid, high-density, “drop-in”
• Driven by desire to proactively reduce CO2 emissions
• Global aviation = 2% of all human-induced CO2 emissions and 12% of all transportation CO2 emissions (ATAG 2014).
• Int’l nature of aviation – Int’l emissions agreements (EU Emissions Trading Systems includes airlines)
• SAJF – up to 80% CO2 emissions reductions

Sustainable Alternative Jet Fuels (SAJF)
Benefits:
• Carbon emissions reductions
• Price stability
• Energy & national security
• Regional rural economic development

Government Policies:
• US military commitments to SAJF
• International nature of aviation
• International emissions agreements
(EU Emissions Trading Systems – includes airlines)

1978-2004 Law & Policy Development/
Promotion of “First Generation” Biofuels
First Generation
• Primarily food based feedstock: sugars, grains, starches
• Products: Ethanol, Biodiesel

Example law & policy supports:
• 1973 Energy Crisis → 1978 Renewable Energy Act
• 1980 Energy Security Act targeted new sources of renewable energy, provided tax exemptions and insured loans, increased an earlier fuel blend credit from $.40 to $.60 / gallon.
• 1990 Omnibus Budget Reconciliation Act marked shift from goal of industry from energy security to regional economic development.

2005 to 2014: Law & Policy Development/
Promotion of “Second & Third Gen” Biofuels
Second & Third Gen
• Non-food based stock: grasses, non-federal forest biomass, waste/residues, algae
• Products: Ethanol, biodiesel, drop in biofuels, biojet

Example law & policy supports:
• 2005 Energy Policy Act (“RFS1”) aimed to spark growth of biofuel industry and address number of challenges
• RFS1 “promotes dependable, affordable, and environmentally sound production and distribution of energy for America’s future.” (George W. Bush)
• 2007 Energy Independent & Security Act (“RFS2”) expanded RFS1
• Mandated “obligated parties” to blend certain percentages of biofuels into the U.S. transportation fuel supply

Looking Beyond the U.S.
European Commission
Biofuel Law & Policy
Shift in 2009: Exemption → obligation focus
Directives to member states:
• Reduce overall carbon footprint
• Meet 10% renewable fuel target by 2020 in transport sector
• Establish emissions trading scheme
• Require long-term policy goals

Similar challenges as the United States:
• “Initiatives to support alternative transport fuels exist at both European Union and national level but a coherent and stable overarching strategy with an investment friendly regulatory framework needs to be put in place.
• Directives in areas like aviation = direct effect on U.S.

What’s Next with U.S. Policy?
• Assessment is needed of the short-term and long-term policy impacts
• Is the RFS successful? Where do we go from here?
• First, second, third, fourth… generation biofuels...
• International aspect of aviation sector requires multinational cooperation; what does this look like?
• What are the results of local, state, and other regional approaches?
• How can policy address 2nd and 3rd generation impediments – price, supply chain, investment?

Contact:
Kristina Dahmann, Research Fellow (kdahmann@gmail.com)
Lara B. Fowler, Penn State (1bfowler@psu.edu)
Paul M. Smith, Penn State (pms6@psu.edu)

1970s
>73 Energy Crisis
>78 Energy Security Act

1980s
’84, ’86 Tax Reform Acts
’88 Alt. Motor Fuel Act

1990s
90 Omnibus Budget Recon. Act; Clean Air Act Amendment
’92 Energy Policy Act (DOE’s Clean Cities Program)
’98 Energy Cons. Reauthorization Act, Transportation Equity Act (TEA-21)

2000s
04 Jobs Creation Act
05 Energy Policy Act (RFS1)
06 Development of CAA for aviation
07 Energy Independence and Security Act (RFS2)
08 Farm Bill
09 American Recovery and Reinvestment Act (ARRA)

Current Focuses
AGRICULTURE
• Ag. Risk Protect, Act of 2008
• Farm Security and Rural Investment Act of 2008
• Energy Policy Act of 2005

FORESTRY/TIMBER
• US Forest Service research and development projects
• Biofuels R&D Enhancement Act

BIOFUEL
• Renewable Technology Office- R&D Development Partnerships
• Alternative Fuel Programs Clean Cities 

TRANSPORTATION
• - Alt. Transp. Fuel Programs Clean Cities
- Federal Aviation Admin- coordinatedGov Effort

DEFENSE
• Defense Production Act Title III

Aviation
• -Biofuel Law & Policy Development

The Renewable Fuel Standard (RFS), a federal policy implemented in 2005 to encourage the production of alternative transportation fuels, has had a significant impact on the biofuels industry. The policy was designed to promote the production of renewable energy sources for transportation, with the goal of reducing dependence on fossil fuels and mitigating greenhouse gas emissions. The RFS has been updated and expanded over time, with new standards and mandates for various sectors, including ground transportation and aviation.

In the early 2000s, the RFS was introduced as a way to address the growing environmental concerns and to diversify the energy mix. The policy aimed to mandate the use of alternative fuels in transportation, with a focus on ethanol and biodiesel production. Over time, the RFS has expanded to include other types of biofuels and has placed greater emphasis on reducing emissions and improving energy security.

The RFS has faced several challenges and criticisms, including concerns over the use of food crops for fuel production and the impact on food prices. Despite these challenges, the RFS has led to significant growth in biofuels production, with substantial investments in research and development. However, the effectiveness of the RFS in achieving its goals is still the subject of debate, with some arguing that the policy needs to be reformed to better align with climate and energy objectives.

Looking ahead, the RFS will continue to evolve, with new policies and regulations being developed to address the changing energy landscape. The focus on sustainable biofuels and the integration of advanced biofuels into the transportation sector will remain key areas of interest, as policymakers seek to balance the need for energy security with environmental sustainability.

The RFS has been a catalyst for growth in the biofuels industry, but there are still many challenges to overcome. The future of biofuels depends on continued innovation, effective policy frameworks, and a commitment to sustainable practices. With the right policies in place, biofuels have the potential to play a significant role in the transition to a low-carbon economy.