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Session: Deployment

Panel: Sustainability, Input Requirements, etc.

Question: How are regional deployment considerations different for oil, starch, sugar and cellulose based aviation fuel production systems?

General Background

U.S. Department of Energy's EERE's Biomass Program has research, development, deployment, and commercialization activities in feedstock and conversion technologies for the establishment of integrated biorefineries. Integrated biorefineries use various feedstocks and conversion processes to produce multiple products and co-products including biofuels, biopower, and/or bioproducts. The benefits of an integrated biorefinery are numerous because of the diversification of feedstocks utilized and outputs produced. There are currently several levels of sophistication with respect to biorefineries ranging from self-sustaining energy generation to excess energy production, to the production of co-products. The integration and diversification of feedstocks, processes, and products adds to biorefinery sustainability, both economically and environmentally. Further, biorefineries could be integrated into existing facilities leveraging capital assets and enhancing revenue streams. Examples can be biorefineries integrated with existing biofuels plants, pulp mills, power plants, etc. Or they can thrive in niche situations. Utilizing feedstock diversity with other biorefinery enhancements fosters deployment into a wider geographical region of the United States.

Sustainability of renewable aviation fuels, or any biofuel, has to be addressed across the complete supply chain including feedstock supply, conversion, and fuel infrastructure as well as ancillary contributors such as power, heat and waste disposal. Only when all the inputs/outputs are understood and evaluated through a complete life-cycle of the products, can a real assessment of economic, environmental, and social sustainability be made. Therefore, deployment as related to aviation biofuels must be viewed and accessed through these various perspectives.

Deployment Considerations

There appears to be general consensus in the technical feasibility of biofuels for aviation fuels, especially as validated recently in numerous test flights. The outstanding issues as common to all deployment strategies is the raw material supply, the conversion facilities, and the infrastructure for transportation, storage, and delivery. The goal of having reliable and quality biofuels is still in the developmental stages, especially as optional feedstocks and conversion processes are evaluated and tested before making large-scale investments. Deployment may still linger as more options are investigated for process dependability and product quality as well as the environmental and economic aspects. I

general there are little difference between the feedstocks and the deployment activities. Ideally as we get away from commodity food crops feedstock supply and delivery systems drive or destroy the economics.

Deployment Considerations:

- Feedstock
  - What is the supply
  - What is the cost (to the grower, for harvesting, for storage, for transportation)
- Conversion Process
  - Is it robust
  - Can it tolerate feedstock variability
  - Is there waste
  - Does it produce quality fuels consistently
  - How big does it have to be to be viable
- Fueling Infrastructure
  - Transportation costs
  - Fungibility

As we explore the considerations there is a major initial decision to be made, that is, whether we should explore large centralized facilities or smaller decentralized. Based on the regional issues with feedstock plus the costs of moving and storage, it is felt that a smaller decentralized facility would be the most efficient and effective. It has been demonstrated in practice and models that the efficiencies lost via lower economies of scale are more than compensated for with the efficiencies gained in logistics.

A further question is what we can do to lower the deployment barriers and costs. We can look at how the facility will be able to address issues other that just the production and delivery of an aviation fuel by instilling synergy we may be able to leverage resources and produce multiple outputs. We can look at other potential indirect benefits, for instance, security, autonomy, community relations, local job creation and community self reliance.

The following possible scenarios are presented to possible expand the aviation fuel vision and feed some out of the box thinking.

Scenario 1:
Build a **biofuels production facility** near both an airport/base and a regional feedstock supply.

- Advantages
  - Feedstock issues minimized
  - Off take and infrastructure issues minimized
- Disadvantages
  - May be quite costly

Scenario 2:

Build a biofuels production facility near both an airport/base and a regional feedstock supply- have a power Island large enough to **power the fuel production facility**.

- Additional Advantages
    - Energy cost lowered
- Disadvantages
    - Still costly

Scenario 3:
Build a biofuels production facility near both an airport/base and a regional feedstock supply- have a power Island large enough to power the fuel production facility **and at least partially power the base/airport.**

- Additional Advantages
    - Energy cost lowered
    - GHG savings realized
- Disadvantages
    - Getting less

Scenario 4:
Build a biofuels production facility to make enough green fuel for aviation **and diesel based ground transportation fleet** near both an airport/base and a regional feedstock supply- have a power Island large enough to power the fuel production facility and at least partially power the base/airport.

- Additional Advantages
    - Energy cost lowered further
    - More GHG savings realized

Scenario 5:
Build a biofuels production facility near both an airport/base and a regional feedstock supply to make enough green fuel for aviation and diesel based ground transportation fleet as well as **green gasoline or ethanol for the gasoline based fleet** - have a power Island large enough to power the fuel production facility and at least partially power the base/airport.

- Additional Advantages
    - Energy cost lowered further
    - More GHG savings realized

As can be seen as we employ synergies we get greener, more cost effective, more sustainable and more self sufficient.