

# NARA Strategic Analysis

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3<sup>RD</sup> Cumulative Report

April 2014 - March 2015

# STRATEGIC ANALYSIS

## Background

As NARA moves towards the goal to “facilitate the establishment of regional systems for the sustainable production of bioenergy and biobased products<sup>1</sup>” in the Pacific Northwest, we have progressed each year to refine our vision of sustainable systems that could utilize existing forest residuals towards production of alternative jet fuel and co-products. Efforts through project Year 3 were focused on (1) assessing viable systems using technological, economic, and environmental assessments of various pathways and (2) engaging stakeholders with educational and outreach programs to garner regional input of needs. Collectively, these components were used to guide processes for down selecting options for two primary pathways; an integrated biorefinery and distributed cellulosic sugar production. These options are articulated in the Year 3 NARA Cumulative Report<sup>2</sup>. With the technical pathways established, Year 4 activity has focused on establishing the foundation for the final capstone components of the NARA project to be delivered at the end of Year 5.

Specifically, these deliverables include:

- (1) demonstration of the integrated technology for production of alternative jet fuel through production of 1,000-gallons of isoparaffinic kerosene
- (2) demonstration of the scale feasibility for select co-products
- (3) final economic, environmental, and social assessments of production models to assess overall sustainability
- (4) stakeholder integration efforts around a commercial flight of the produced alternative jet fuel

## Progress Towards Capstone Deliverables

The **Feedstock, Pretreatment, Conversion, and Co-Products Teams** have all progressed to refine and scale up technologies that improve the flexibility and performance of the integrated technologies. Energy requirements, grinding specifications, and loading techniques to guide feedstock collection, processing, and transport have been thoroughly assessed and refined to reduce overall costs and environmental burdens. Severity of the SPORL mild bisulfite process has been decreased and flexibility in the bisulfite cation has been demonstrated so that the pretreatment technology can be more readily adapted to either existing pulping infrastructure or greenfield facilities. Evolution of the Gevo biocatalyst has continued, and effective growth and yield is demonstrated allowing the team to move to refining process conditions for scale deployment. Establishment of the Alcohol-to-Jet (ATJ) ASTM Alternative Jet Fuel standard, an additional key milestone not funded by USDA, has neared completion.

Collectively, this progress in the production pathway has readied us to develop the demonstration supply chain for producing 1,000-gallons of isoparaffinic kerosene (IPK) to be certified as alternative jet fuel upon passage of the ASTM ATJ standard. Towards this project milestone, we have identified and evaluated all potential tolling partners for this production. To support the evaluation of partners, we developed a detailed mass flow of our process for determining materials and equipment requirements. Representative feedstock has been harvested from Weyerhae-

user and tribal lands from around the NARA region and processed by regional stakeholder partners. A detailed draft production schedule is complete. A national flight partner has been identified and will be announced soon. However, we are still awaiting complete delineation of co-product tolling opportunities and partners. In aggregate, these efforts have prepared us to implement the production process in the remainder of Project Year 4 and 5 and complete our vision for allied demonstration efforts.

The collective **System Metrics Teams** have focused on solidifying the foundational models and data that will underpin our sustainability assessment. Key to this effort is the establishment of an ASPEN process simulation model for the integrated biorefinery envisioned. This model provides the mass and energy balance needed to compute (1) the operational and capital expenditures for the techno-economic analysis (OpEx and CapEx) and (2) the environmental burdens as determined in the life cycle assessment (LCA). In turn, the costs and impact of the feedstock requirements for the facility are computed using the NARA biomass assessment models and all of the biomass and facility employment estimates are used to quantify the holistic economic benefits using the community impact models. All of these elements are in-place to be deployed using a set of integrated production scenarios in Year 5.

The **NARA Outreach and Education Teams** have continued to build regional stakeholder capacity by involving them to assess the regional supply chain development and concepts around the distributed production of cellulosic sugar. This has resulted in established curriculum for K-12 students, increasing

1) USDA NIFA Agriculture and Food Research Initiative Competitive Grants Program. Sustainable Bioenergy – 2010 Request for Application <http://www.grants.gov/search/synopsis.do;jsessionid=RvWPRSFJ2C2gNjyTL2K0G519XXJLCBcTTHyXT4pVH67H74WDGsYh!1654183736>

2) Northwest Advanced Renewables Alliance (2014) Second Cumulative Report. Retrieved from <https://nararenewables.org/2014-report/>

visibility of undergraduate research opportunities, and record involvement of regional high schools in our Imagine Tomorrow program. Energy literacy assessments provide us a tool to assess the efficacy of these programs. Most importantly, the survey of the informed stakeholder groups is providing a clear vision that their concerns around sustainability focus on retention of soil nutrient capacity for future forest health, economic viability of the process, and interaction with rural communities. These results verify and focus our sustainability assessment.

## Future Directions

From our Year 4 efforts, it is clear that Year 5 will focus heavily on the culmination of our key capstone deliverables of technology demonstration, sustainability assessments, and stakeholder engagement. A focal point for many of our efforts will be the alternative jet fuel production and the goal of launching the first commercial flight using cellulosic-based biofuels.