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1. Executive Summary

In 2011, the Sustainable Aviation Fuels Northwest (SAFN) report, building upon the insights and knowledge of more than 40 stakeholder organizations, provided a foundation for building a robust aviation biofuels industry in the Pacific Northwest. The SAFN report details potential aviation biofuels feedstocks, market drivers, supply development targets, and more as pathways to sector development. Innovate Washington (IWA) is honored to build on this catalytic effort by bringing together the Sustainable Aviation Biofuels Work Group (Work Group) under the direction of SHB 2422, now RCW 43.333.800.¹ This update is the first of two reports to the Washington Legislature, and summarizes the first two meetings of the Work Group, the current state of the aviation biofuels industry, and the next steps for the Work Group in 2013.

The aviation biofuels sector in the Northwest shows enormous promise. Washington in particular has a diverse array of potential feedstocks, refinery capability, a fuel distribution network, and an aviation industry that leads the world in developing and utilizing aviation biofuels. The state has natural advantages at each point in the supply chain and market.

Yet despite this promise, it has been difficult for the industry to self-organize. In some industries, there is a developed market with consistent demand, and it is the job of suppliers to innovate to deliver the best product. In the aviation biofuels industry, market actors are seeking to develop supply and demand simultaneously, which requires coordination and interaction between businesses and organizations that might not otherwise connect. Jet makers must work with farmers; regulators must understand refiners; airlines and academic researchers in multiple institutions must coordinate. Despite strong interest by all these parties in developing an aviation biofuels industry, these types of interactions do not occur without sustained organizational capacity.

Innovate Washington's role in the state's innovation ecosystem is to amplify the value of the intellectual and tangible assets present in the Pacific Northwest to yield outcomes of greater scale, with more leverage and with greater speed than any one entity could achieve acting alone. Since it is focused on development of the clean energy sector, including aviation biofuels, as part of the Washington Clean Energy Partnership, coordinating the participants of the Aviation Biofuels Work Group is a natural fit.

The Aviation Biofuels Work Group was convened by Innovate Washington twice in 2012, on September 20th in Seattle, and on November 9th in both Seattle and Spokane via videoconference. Work Group participants were provided with background information including the SAFN report and the United States Department of Agriculture (USDA) FARM to FLY report.

The first meeting reconvened stakeholders, updated participants on developments in the sector, and defined the scope of the Work Group. The second meeting allowed participants to elaborate on and clarify key topics from the first meeting, generate consensus as to any recommendations² contained in this update, and identify their top priorities for advancement of the sector in 2013.

¹ Substitute House Bill 2422, Chapter 63, Laws of 2012, effective 6/7/12.

² This update, and any policy recommendation herein, represents the opinion of individual participants in the Aviation Biofuels Work Group. This update does not necessarily reflect the opinions or views of the Work Group as a whole, or of Innovate Washington and its board members.

Work Group participants emphasized the following categories of steps necessary to grow the aviation biofuels industry:

- ❑ Create visual representations to clarify a complex industry
- ❑ Establish financing models to enable sector growth
- ❑ Support consistency in federal and state policy through multiple election cycles
- ❑ Facilitate development of co-products, which are critical to industry viability
- ❑ Support ongoing research and other policies necessary to develop feedstocks
- ❑ Strive to develop public understanding and foster collaboration, which are both important to grow the industry
- ❑ Ensure sustainability of feedstocks and end biofuel products

Of these categories, Work Group participants selected creating visual representations of the industry and establishing financing models as the most important next steps. In addition, participants voiced the desire to meet more often than twice per year.

2. Introduction

One of the accomplishments of the 2012 legislative session was the advancement of initiatives targeted at enabling the state to capitalize on its natural strengths and assets in the field of aviation biofuels production.³ Innovate Washington⁴ is convening the Aviation Biofuels Work Group for a series of four meetings in 2012 and 2013 to provide focus and collaboratively develop policy recommendations to support the sustainable aviation biofuels sector in Washington.

Stakeholder participants in the Aviation Biofuels Work Group were drawn from diverse organizations (Appendix A). Participants were asked to describe their aspirations for the two-year duration of the Work Group at the first meeting. These included continuing the work of the Sustainable Aviation Fuels Northwest (SAFN)⁵ effort to accelerate the aviation biofuels industry through regional collaboration and partnerships. Work Group participants expressed their desire to support large-scale research and development programs in Washington to propel the industry, and to build markets for biofuel co-products to improve sector economics. They demonstrated interest in supply chain coalitions representing regional solutions to combine efficiency and scale with location, and reduce price. There was a stated desire to identify barriers specific to commercial aviation biofuels by creating accessible maps of the biofuel supply chain. In addition, there was emphasis on developing the policy tools and incentives to make Washington an advanced energy leader.

³ Op. cit., Substitute House Bill 2422.

⁴ [Innovate Washington](#) is the primary agency focused on growing the innovation-based economic sectors of the state.

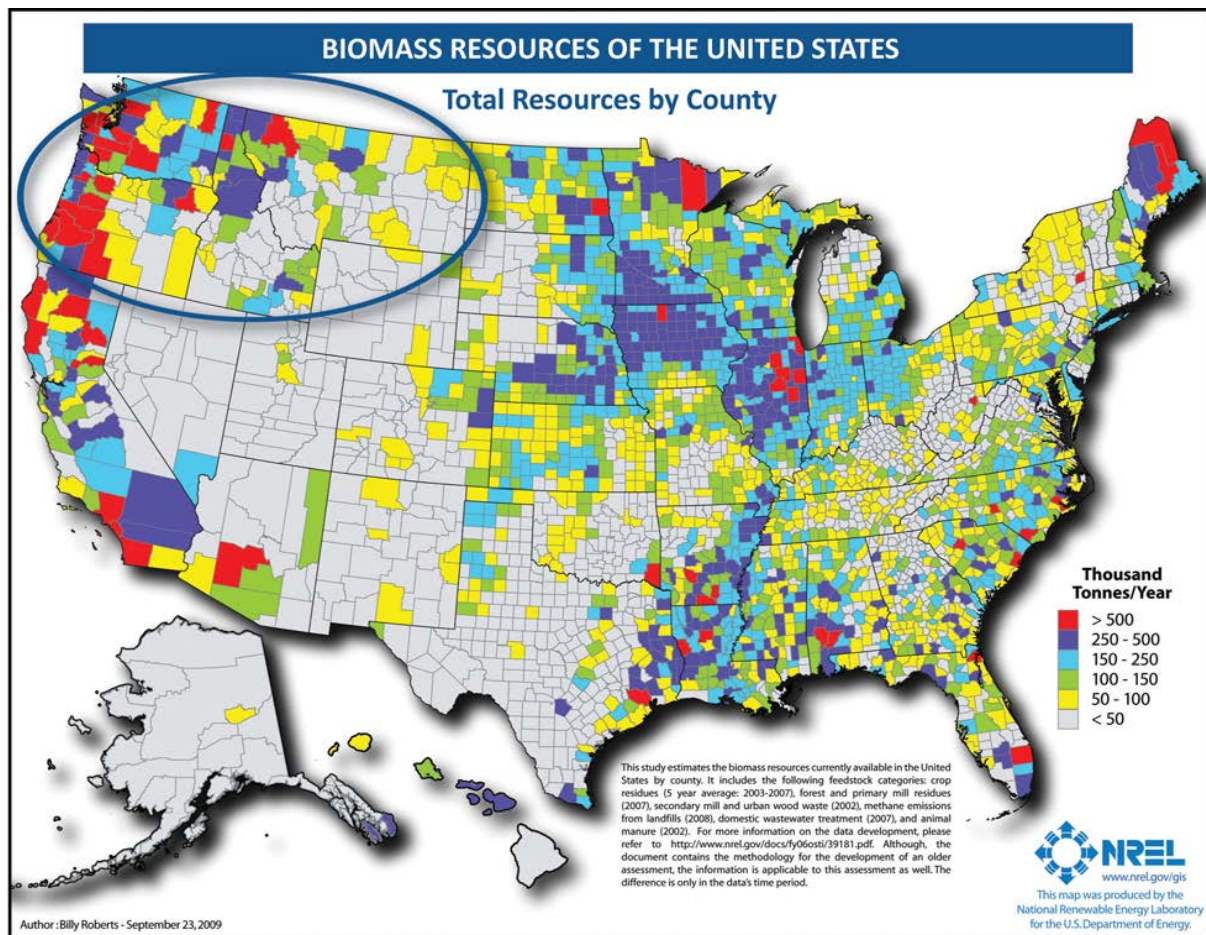
⁵ "[Sustainable Aviation Fuels Northwest Report](#)," 2011, www.safnw.org.

3. Background on Aviation Biofuels

3.1. The Pacific Northwest: A Natural Leader

Washington, and the Pacific Northwest region, has a natural advantage in innovation and leadership in aviation biofuels. The region is has an abundant supply of nearly every type of potential biofuel feedstock (Figure 1), and the capability to produce far more than its current production levels. It has policies that incent biofuel development and production, and world-class universities undertaking focused research on biofuels. It has businesses engaged in every step of the biofuels supply and distribution chain. Washington is an international hub for the aviation industry, with leaders like Boeing and Alaska Airlines that can drive demand, provide market certainty, and help shape aviation biofuels development to meet the needs of the industry.

Figure 1: Biomass Resources of the United States.



Source: Sustainable Aviation Fuels Northwest Report, 2011.⁶

⁶ "This map was produced by Billy Roberts on Sep. 23, 2009, National Renewable Energy Laboratory for the U.S. Department of Energy."

The Pacific Northwest is a large market for jet fuel; it used approximately 865 million gallons per year in 2011 for civilian and military purposes.⁷ Commercial demand is projected to reach over one billion gallons per year by 2030 (Figure 2).

Figure 2. Commercial Jet Fuel Consumption Project—2010-2030.

| COMMERCIAL JET FUEL CONSUMPTION PROJECT – 2010 - 2030 | | | | | |
|---|--|------------|-------------|-------------|------------------------------|
| Planning Year ¹ | Pacific Northwest Four State Area - Summary Report Projected Fuel Consumption (gallons) | | | | Four State Area ² |
| | Idaho | Montana | Oregon | Washington | |
| 2010 | 33,078,060 | 28,949,640 | 155,881,140 | 525,121,920 | 743,000,000 |
| 2015 | 35,804,160 | 30,638,530 | 177,072,500 | 564,318,880 | 808,000,000 |
| 2020 | 38,828,160 | 32,511,880 | 194,091,200 | 601,763,520 | 867,000,000 |
| 2025 | 42,194,520 | 34,592,230 | 212,679,700 | 643,471,360 | 933,000,000 |
| 2030 | 45,990,720 | 36,902,120 | 233,513,860 | 690,049,120 | 1,006,000,000 |

Compiled by Port of Seattle Aviation Planning Department, January 2011

1. The “Planning Year” reflects a Federal Fiscal Year (FFY) from October through September. Over a long term planning horizon, differences between the FFY and a calendar year will be insignificant.
2. Gallons shown have been rounded to the nearest million and may not add up.

Source: Sustainable Aviation Fuels Northwest Report, 2011.

This confluence of feedstock availability and potential and existing businesses active in biofuel production, supportive policy, university research, and the promotion of stable, local market demand, led to the formation of the working group of more than 40 regional stakeholders known as **Sustainable Aviation Fuels Northwest, or SAFN**. The SAFN process was driven by three primary concerns: the cost and availability of petroleum aviation fuels, national security and climate. The SAFN working group issued a report in 2011 that described the potential of aviation biofuels to create economic development, reduce our nation’s dependence on fossil fuels, and lower greenhouse gas emissions. The report set the foundation for aviation biofuels development in the Pacific Northwest and made key findings and recommendations to advance the sector, among which were:

- ❑ An aviation biofuels industry can be commercially viable in the Pacific Northwest
- ❑ Biofuel development for commercial and military aviation must receive priority attention in policy development and commercial efforts
- ❑ Four promising feedstocks were identified: oilseeds, forest residues, municipal solid wastes, and algae
- ❑ Supportive policies are critical to jump-start the industry and attract investment, accelerate industry growth, and provide long-term economic benefits
- ❑ Aviation biofuels must be developed sustainably

⁷ Op. cit. “Sustainable Aviation Fuels Northwest,” p. 37.

Beyond these top-level findings and recommendations, the SAFN group provided a list of key drivers to overcome commercialization challenges for each of the promising feedstocks it identified. The report also suggested policies that could stimulate the aviation biofuels market. These recommendations, included in the report listed in Appendix B, provided much of the basis for discussion in the first year of meetings of the Aviation Biofuels Work Group. Innovate Washington has supplemented the SAFN findings and recommendations with developments since SAFN completed its work. For example, while the SAFN report focused on forest residues as a feedstock, the Aviation Biofuels Work Group is more broadly focused on woody biomass and cellulosic biofuels, and is closely aligned with the research at our major universities on those feedstocks.

3.2. The Washington University System: Pioneering Research

Continuing Washington’s leadership role in biofuel development and innovation, the University of Washington and Washington State University have each received 40 million-dollar grants from the U.S. Department of Agriculture (USDA) to pursue biofuel-related research over five years.

The University of Washington is developing a **“System for Advanced Biofuels Production from Woody Biomass in the Pacific Northwest.”** This public-private, university-industry collaboration is moving the Pacific Northwest toward the infrastructure and supply chain necessary to produce sustainably-grown woody biomass and convert that biomass to biofuels in a cost-effective manner. The project uses hybrid poplar and other fast-growing woody biomass, focusing on optimizing yields and adapting crops for marginal lands and low-impact agriculture.

Washington State University is leading a project under the Northwest Advanced Renewables Alliance (NARA) called **“A New Vista for Green Fuels, Chemicals, and Environmentally Preferred Products.”** This project is also focused on woody biomass, though from a broader mix of feedstocks which make up forest residual waste, including Douglas-fir and Western hemlock. NARA is a regional approach that brings together research institutions, industrial businesses, the Pacific Northwest National Laboratory (PNNL), tribal partners, and the forest industry. It focuses on sustainable forestry techniques as well as conversion of forest products to biofuels.

While feedstock specific, these two research programs help provide a market push toward a bio-refinery or network of refineries, and generate valuable data and input to the Aviation Biofuels Work Group effort. Innovate Washington will continue to work closely with both programs to ensure that the Work Group has up-to-date information and is able to incorporate research outcomes into its reports. These findings will be an important part of determining a path forward for aviation biofuels, regardless of which feedstocks are ultimately most viable.

3.3. National Efforts Complement Regional Work

In July 2010, USDA, Boeing, and Airlines for America, Inc., signed a resolution to collaborate on the five-year **FARM to FLY** initiative to:

- ❑ Accelerate the availability of a commercially-viable and sustainable aviation biofuel industry in the United States
- ❑ Increase domestic energy security

- ❑ Establish regional supply chains
- ❑ Support rural development

That group, working with other national agencies and stakeholders, issued its report in January 2012. The report “documents the preparedness of the commercial and military aviation sectors to become preferred customers for biofuels, as well as the technical readiness of the aviation biofuels program, while also affirming our ‘flight plan’ to help launch an economically self-sustaining long-term aviation biofuels supply chain.”⁸ (The report can be accessed at the website listed in Appendix B.)

The FARM to FLY report asserts that the U.S. is ready and able to become a major producer and consumer of aviation biofuels. The Federal Aviation Administration (FAA) has set an aggressive target of one billion gallons per year of aviation biofuel capacity by 2018, which the Commercial Aviation Alternative Fuels Initiative[®] (CAAFI) team of aviation industry leaders has stated is possible if supply chains are developed and efforts like FARM to FLY, SAFN, and the Aviation Biofuels Work Group are successful. Much of this production could come from the Pacific Northwest. The FARM to FLY initiative has demonstrated a commitment to help realize the potential of aviation biofuels to “become an economical and environmentally-preferred alternative to petroleum-based jet fuels.”⁹ (Projections of jet fuel consumption and associated potential CO₂ emission reductions are provided in Figure 3.)

Figure 3. Global Jet Fuel Consumption and CO₂ Emissions.

Figure 10 - Projection of 2010 - 2030 jet fuel consumption of global aviation industry

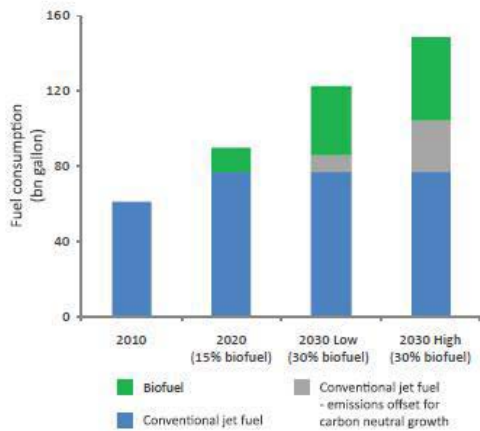
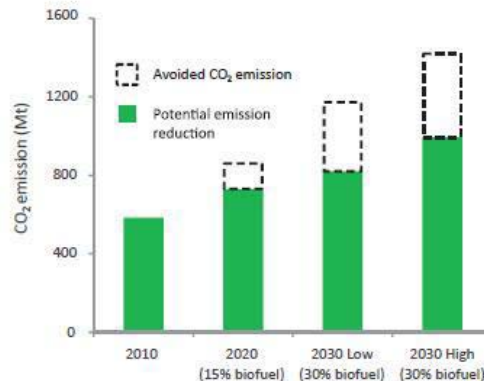


Figure 11 - Global CO₂ emission and potential emission abatement by using biofuel



Source: U.S. Department of Agriculture, “Agriculture and Aviation: Partners in Prosperity.”¹⁰

The **Midwest Aviation Sustainable Biofuels Initiative (MASBI)** is a regional stakeholder effort similar to SAFN. The MASBI working groups are seeking to “define an actionable roadmap for the development of sustainable advanced biofuels in the Midwest,” which they plan to publish in 2013.¹¹ Like the Northwest, the Midwest has assets which make it a suitable region for the aviation biofuels industry:

⁸ U.S. Department of Agriculture, “[Agriculture and Aviation: Partners in Prosperity](http://www.usda.gov/documents/usda-farm-to-fly-report-jan-2012.pdf),” January 2012, 2, <http://www.usda.gov/documents/usda-farm-to-fly-report-jan-2012.pdf>.

⁹ Op. cit. U.S. Department of Agriculture, p. 7.

¹⁰ U.S. Energy Information Administration, EQ2 Report on Aviation Biofuel.

¹¹ <http://www.masbi.org/at-a-glance/masbi-planned-outcomes>

significant agricultural resources, large quantities (approximately three billion gallons) of jet fuel consumption, a Boeing presence, research centers, and policymakers who have made advanced biofuels a priority.¹²

4. Aviation Biofuels Work Group

2012 Meetings Overview

The Aviation Biofuels Work Group was convened by Innovate Washington twice in 2012, on September 20th in Seattle, and on November 9th in both Seattle and Spokane via videoconference. Work Group participants were provided with background information including the SAFN and FARM to FLY reports.

The first meeting reconvened stakeholders, updated participants on developments in the sector, and defined the scope of the Work Group.

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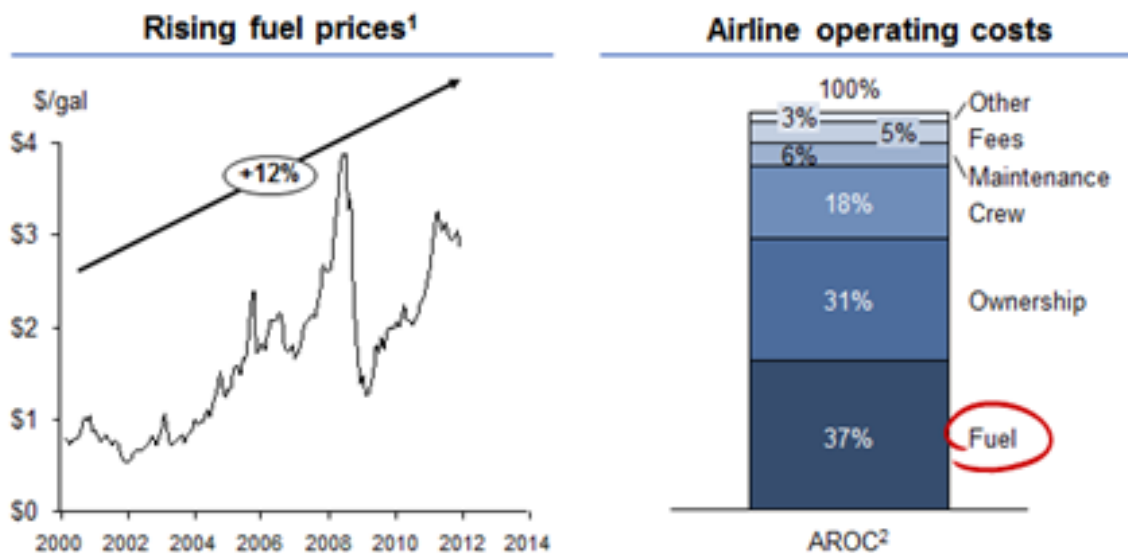
4.1. Update on Industry

At the first Work Group meeting, each participant was asked to provide an update on developments surrounding aviation biofuels from their organization's perspective.

It became clear that there is still strong demand overall to develop a stable, affordable, and readily available supply of aviation biofuels. One aviation industry representative voiced concern over the future stability of supply and cost of jet fuel (Figure 5), and referred to traditional jet fuel as "becoming an endangered species." Public sector participants were enthusiastic about the potential role for biofuels in Washington's first-ever statewide strategy for aerospace. Both public and private sector participants referenced the need for biofuels to achieve carbon reduction goals and commitments. In general, participants agreed that a quicker pace of adoption for initiatives to promote the aviation biofuels sector is necessary, for example, by modifying the existing Renewable Fuel Standard, among other policies.

¹² <http://www.masbi.org/aviation-biofuels-and-midwest/midwest-potential>

Figure 5. Fuel Largest Airline Cost and Rising.



Source: The Boeing Company.¹³

Since the SAFN group last met and issued its report, there has been significant progress on feedstock development and the technology to turn feedstocks into biofuels. Several participants reported successful collaboration on projects with Washington’s state universities, especially around the \$40 million federal grants from USDA, highlighting the need to continue to support these grant efforts. One private sector organization represented at the Work Group is collaborating with Washington’s universities on research and development projects concerning algae species and algae growth, harvest, and extraction methods. Another participant described involvement in a corporate partnership commercializing forest to fuel programs, and their organization’s support for supply chain coalitions using regional approaches rather than feedstock-specific initiatives.

Yet despite a generally positive view of the viability and potential of biofuels for aviation, participants noted that the economic slowdown, lack of access to capital, and uncertainty in the policy and regulatory environment have meant short-run challenges for the industry. One participant from the private sector stated that their biofuel business, and others like it, is diminishing. This business, a biodiesel plant that processes canola exclusively from the Pacific Northwest and Canada, faces challenges surrounding the price of feedstocks, which constitute 80% of the plant’s costs, as well as a negative public perception of biofuels. It has had difficulty raising funds from the private and public sectors, a challenge that was reiterated by other Work Group members. A different business participant is converting 92 million tons of waste per year to biogas and other fuel, and identified the cost of commercialization, uncertain public policies, and lack of capital investment as major barriers. From another perspective, improvements are needed in infrastructure and transportation of raw feedstocks.

¹³ U.S. Energy Information Administration. US Gulf Coast Jet 2. Airline Related Operating Costs based on US Majors 777-200ER fleet.

Even with these challenges, public, nonprofit, and private sector partners appear committed to helping drive the aviation biofuels industry and supporting commercial relationships. A participant from the public sector shared that there have been major developments in software applications dealing with biomass availability. Participants believe scale is a key component for driving the industry in conjunction with lowered costs, which are a function of feedstocks plus efficiency of conversion technology and demand-side factors.

Sustainability continues to be a goal of Work Group participants, many of whom were involved in the SAFN process into which sustainability figured heavily. Sustainability criteria may be applied to component parts and processes of the aviation biofuels sector, such as feedstocks, bio-refining, and bio-jet products, as well as to the industry as a whole. Both Alaska Airlines and United Airlines are members of the Sustainable Aviation Fuels Users Group (SAFUG), an international effort to support development of sustainable aviation biofuels. As members, their CEOs have signed a sustainability pledge¹⁴, providing another incentive to incorporate sustainability criteria as part of the framework for growing the industry.

4.2. Definition of Sector Success

Aviation Biofuels Work Group participants were asked to describe long-term success for the aviation biofuels sector. Their responses included that the sector will be successful when it is economically viable, supply is meeting demand, and market forces are driving the industry. Some participants noted that success could be characterized by a stable policy environment. Many interpreted success as biofuels having become a sustainable and normal part of aviation. Ultimately, they offered, success will have been realized when the discussion has shifted from feedstocks to the prosperity of biofuel companies, and when Washington and the Pacific Northwest are major players in the global marketplace. (A complete list of Work Group participants' definitions of success for the aviation biofuels sector is provided in Appendix C.)

4.3. Metrics for Success

As part of the process of defining what a successful aviation biofuels industry will look like, participants suggested metrics for success. While individual participant responses about these metrics varied considerably, the overall picture they created is one of a robust and sustainable aviation biofuels industry. (The complete list of participants' metrics is included in the definitions of success provided in Appendix C.)

The metrics participants offered ranged from tens of millions to 500 million gallons of sustainable, regionally-produced, second-generation bio-jet fuel delivered annually to regional airports and military bases.

Participants shared that aviation biofuels success can also be measured by the percentage of petroleum-based commercial and military aviation fuels that biofuels displace; one participant suggested a 20% level constitutes success. An alternative measure of success is how closely aviation biofuels track standard fuel adoption curves, providing an exponentially increasing supply for the market over time.

Additionally, it was proposed that success can be measured by the ability of the industry to significantly reduce (over 50%) greenhouse gas emissions from the aviation sector.

¹⁴ The sustainability pledge can be accessed at <http://www.safug.org/information/pledge/>.

4.4. Developing the Aviation Biofuels Sector

Aviation Biofuels Work Group participants were asked to identify the most important steps policymakers can take to promote the development of the aviation biofuels sector in Washington and the Northwest. Their responses focused on several themes.

4.4.1. Create visual representations to clarify a complex industry

Stakeholders repeatedly stated the need to have visual representations of the aviation biofuels industry and supply chain in the Northwest. Because the aviation biofuels development effort includes many players, feedstocks, research efforts, technologies, and more, visual representation would help bring clarity and focus to policy discussions and general biofuel development strategy. We refer to this visual representation as “road mapping” the sector. Road mapping can aid investors and stakeholders in representing relationships between feedstocks and infrastructure, and cataloguing tools the government has, such as bonding opportunities, funding mechanisms, and public-private partnerships. Additionally, the visual logic model represented by the road map helps supply chain participants identify gaps and unmet market opportunities.

4.4.2. Establish financing models to enable sector growth

There was broad recognition among participants of the need for assistance to establish financing and encourage capital investment for feedstocks and a bio-refinery for jet fuel in the Northwest. Low-cost, available financing would help bring down prices for aviation biofuels, reduce market risk, and break down barriers to bring the sector to commercial scale. Lack of financing is a key problem inhibiting sector growth today.

To improve sector financing, it was suggested that Congress provide direct, coordinated support for Department of Defense (DOD) procurement of biofuels at the regional and federal levels in recognition of DOD’s role as a “market maker.” Participants also recommended that the State Legislature consider implementing a program analogous to Alberta province’s industry-leading platform for diesel from tar sands technology, in which supply and demand were guaranteed by the provincial government to secure financing. A new credit-worthy off-take would also build market demand.

Work Group participants recommended that policymakers support low-interest bioenergy loans and combined purchase agreements, generally help secure commitments from customers, and increase the State’s long-term bulk purchases of biodiesel. According to participants, the Legislature should revisit tax incentives and extensions for allied producers to ensure that the existing industry is well-supported. The Business and Occupation tax incentive for biodiesel, for example, has expired.

Additionally, to enhance market conditions, participants advised that intellectual property (IP) should be developed and protected in Washington. Unlocking the right combination of feedstocks plus efficiency of conversion technology to march down the cost curve is IP that others will want, and that the State can support. Licensing technology stands to help Washington capture global market share and create additional economic value.

4.4.3. Support consistency in federal and state policy through multiple election cycles

Participants asked for clarity, consistency, and stability around federal and state policies, through multiple election cycles. Several participants noted that the State code still contains unclear and sometimes archaic definitions of biofuels that need to be revised. They also described the need to protect the Renewable Fuel Standard (RFS) at the federal level and make it enforceable at the state level. In lieu of a more effective RFS, participants offered, any policy weighting carbon emissions from liquid fuels has the potential to incentivize the biofuel industry and alter the competitive environment by better recognizing the negative externalities associated with fossil fuels.

4.4.4. Facilitate development of co-products, which are critical to industry viability

A major theme heard at the Work Group meeting was the importance of support for value-added biofuel co-products to improve sector economics. It was suggested that co-products be developed in partnership with the Washington State Department of Ecology and Washington State Department of Commerce Green Chemistry policy recommendations. The recommendations target commercialization of safe and environmentally-friendly chemicals as alternatives to harmful chemicals, as agents of environmental remediation and products which create jobs.¹⁵

4.4.5. Support ongoing research and other policies necessary to develop feedstocks

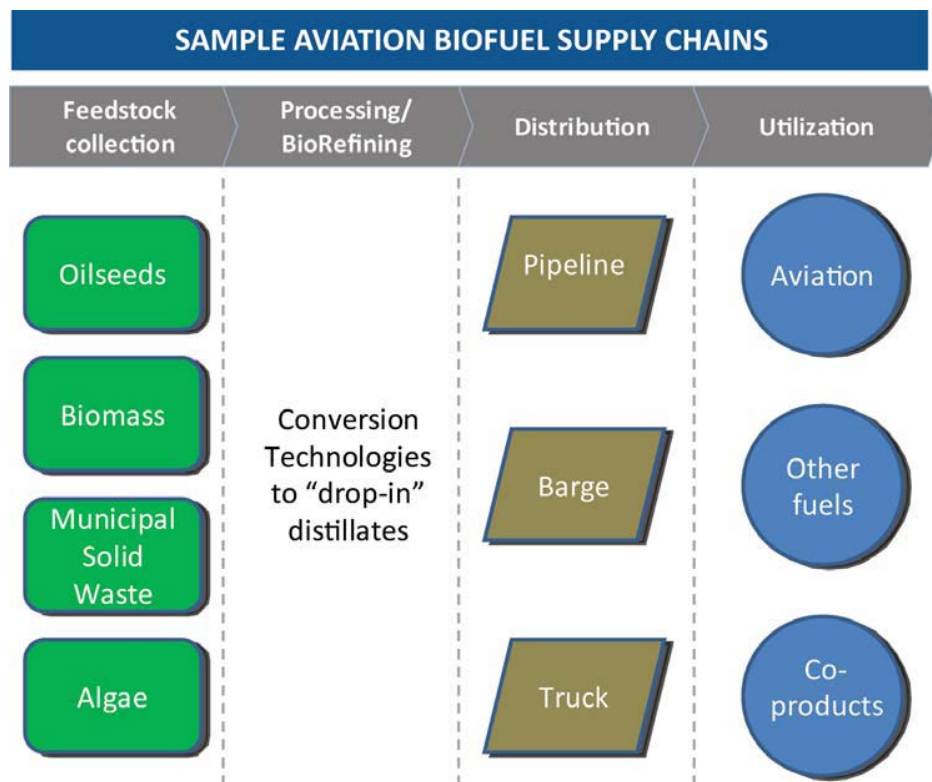
Policymakers' support for large-scale, coordinated, and sustained research and development efforts was continually identified by participants as an essential element of propelling the sector. The \$40 million USDA grants to Washington research institutions will terminate in 2013 if Congress does not renew them. Additionally, increasing available data and metrics is important to the industry.

In order to more fully leverage Washington's significant biofuel feedstock assets, including over 17,000 acres of oilseed crops, and to promote more targeted research, participants propose that the Legislature adjust and expand the feedstock definitions in the State code. Existing definitions, they feel, pick winner and loser feedstocks, stymieing sector development. For example, the biodiesel feedstock assessment used in the RFS refers to "grown" feedstocks, so, in theory, biofuels produced from waste products would not meet the standard.

Participants advise that the Legislature also take action to identify and build up missing parts of the supply chains for each of the state's various feedstocks. (Sample aviation biofuel supply chains are provided in Figure 6.) Bio-refining capacity should be addressed with the knowledge that existing bio-refineries are unwilling to process jet fuel, which has more stringent standards than other fuels, and that some feedstock-to-fuel pathways will be quicker to develop than others. There is currently no bio-refinery for jet fuel in Washington.

¹⁵ Washington State Department of Commerce and Washington State Department of Ecology. "(Draft) A Roadmap for Advancing Green Chemistry in Washington State." <https://fortress.wa.gov/ecy/publications/publications/1204009.pdf>.

Figure 6. Sample Aviation Biofuel Supply Chains.



Source: Sustainable Aviation Fuels Northwest Report, 2011.¹⁶

Participants also suggested that access be granted to disease-ridden forest lands as a source of biofuel raw material, which could create economic opportunities for rural communities. Additionally, Washington should take better advantage of its waste streams, including CO₂ and animal manure, as raw materials that could create economic opportunities. Finally, participants recommended that the State establish incentives to keep feedstocks in Washington to compete with foreign markets for supply.

4.4.6. Strive to develop public understanding and foster collaboration, which are both important to grow the industry

There was support among participants for improving public perception around biofuels with a public relations campaign that focuses on Washington as a leader in biofuels for aviation. Interest was expressed among some private sector participants in funding such a campaign, especially one linked to improved data and metrics.

Work Group participants were also overwhelmingly in favor of aggressive collaboration via supply chain coalitions and regional solutions to grow the sector. It was encouraged that Washington tap into the innovative potential of partnerships with California, Hawaii, Oregon, and others in the region.

¹⁶ The Boeing Company.

4.4.7. Ensure sustainability of feedstocks and end biofuel products

Sustainability was called out by several participants as a key to their biofuels strategy. One airline representative stated that their company applies a life-cycle sustainability analysis filter to all biofuel purchasing decisions as a part of the Sustainable Aviation Fuels Users Group (SAFUG) pledge. Tracking sustainability of products will require agreed-upon metrics and evaluation criteria, as well as detailed tracking of the supply chain. Developing these protocols will be an important task for the industry.

4.5. Priority Focus Areas

From the themes listed in Section 4.4., Aviation Biofuels Work Group participants were asked to identify two priority focus areas for the development of the aviation biofuels sector. They selected:

- 1) Road mapping the sector
- 2) Assistance establishing financing/encouraging capital investment

These two areas will become a major focus of the Work Group's efforts in 2013.

4.6. Aviation Biofuels Work Group Objectives

Over its two-year duration, the Aviation Biofuels Work Group will undertake to meet the objectives specified by the Legislature, to:

- A. "Further the development of sustainable aviation fuel as a productive industry in Washington, using as a foundation the regional assessment prepared by the collaborative known as the sustainable aviation fuels northwest;
- B. Facilitate communication and coordination among aviation biofuels stakeholders;
- C. Provide a forum for discussion and problem-solving regarding potential and current barriers related to technology development, production, distribution, supply chain development, and commercialization of aviation biofuels; and
- D. Provide recommendations to the legislature on potential legislation that will facilitate the technology development, production, distribution and commercialization of aviation biofuels."¹⁷

Refined further objectives generated by the Work Group are listed below as tasks.

4.7. Other Tasks for 2013

In addition to the two priority focus areas identified in section 4.5, specific tasks for members of the Aviation Biofuels Work Group generated during the 2012 meetings are listed below. Funding for these tasks is yet to be determined by the Work Group.

- 1) Create specific policy recommendations for supporting the industry to attract capital for creating market demand and financing of feedstocks. The Work Group will form a strategic, coordinated message about priorities to be utilized in discussions with policymakers and other stakeholders
- 2) Approach DOD to improve stakeholders' understanding of the current status of its role in relation to aviation biofuels

¹⁷ Op. cit., Substitute House Bill 2422.

- 3) Coordinate advocacy around support for federal grants and other research and development funding, and the creation of a stable regulatory and policy environment including improvements to the RFS
- 4) Build the capacity of the group to generate support for a public relations campaign about Washington as a biofuels leader and the broad potential for biofuels in aviation

Innovate Washington will continue to facilitate the meeting of this Work Group for the two meetings in 2013. In addition, following this update, a second and final report summarizing the efforts and recommendations of the Work Group will be submitted to the Legislature by December 1, 2013. However, producing the deliverables desired by the Work Group will take a well-funded effort and dedicated staff time. Innovate Washington will work with Work Group members to encourage and help them to self-organize and fund specific deliverables.

APPENDICES

Appendix A. Aviation Biofuels Work Group Appointed Participants

| Name | Title | Organization |
|----------------------------|--|--|
| Stan Barnes | Chief Executive Officer | Bioalgene |
| Angela Becker-Dippmann | Senior Policy Advisor | Pacific Northwest National Laboratory |
| Linda Beltz | Director, Technology Partnerships | Weyerhaeuser |
| Representative Andy Billig | Washington State Representative | Washington State House of Representatives |
| Senator Lisa Brown | Washington State Senator | Washington State Senate |
| Steve Camp | Owner | C Farms |
| Toni Camp | Public Relations Director | Independence Energy |
| Chris Cassidy | Renewable Energy Advisor | United States Department of Agriculture |
| Ralph Cavalieri | Associate Vice-President for Alternative Energy | Washington State University |
| Scott Dille | Associate Director of Government Relations | Washington Farm Bureau |
| Todd Ellis | Vice President of Sales and Business Development | Imperium Renewables |
| John Gardner | Dean and Vice President of Academic Affairs | Bainbridge Graduate Institute |
| Rick Gustafson | Professor of Bioresource Science and Engineering | University of Washington |
| Representative Larry Haler | Washington State Representative | Washington State House of Representatives |
| John Holladay | Manager, Biomass Sector | Pacific Northwest National Laboratory |
| Rachael Jamison | Energy and Climate Change Policy Specialist | Washington State Department of Natural Resources |
| Mary Beth Lang | Bioenergy and Special Projects Coordinator | Washington State Department of Agriculture |
| Elizabeth Leavitt | Director of Aviation Planning and Environmental Programs | Port of Seattle |
| Ross Macfarlane | Senior Advisor, Business Partnership | Climate Solutions |
| Darrin Morgan | Director, Sustainable Aviation Fuels | Boeing |
| Peter Moulton | Emerging Technologies Team Lead/Bioenergy Coordinator | Washington State Department of Commerce |
| Alex Pietsch | Director, Governor's Office of Aerospace | Office of the Governor |
| John Plaza | Founder/President/CEO | Imperium Renewables |
| Susan Robinson | Federal Public Affairs Director | Waste Management |
| Carol Sim | Environmental Affairs Director | Alaska Airlines |
| Mark Streuli | Policy Assistant to the Director | Washington State Department of Agriculture |
| Mary Verner | Chief Executive Officer | Spokane Tribal Enterprises |
| Todd Woodard | Director of Marketing/Public Relations | Spokane International Airport |

Appendix B. Background Material

- 1) The Sustainable Aviation Fuels Northwest (SAFN) report (2011) can be accessed at <http://www.safnw.com/sustainable-aviations-fuels-bibliography/>
- 2) The United States Department of Agriculture (USDA) FARM to FLY report (2012) can be accessed at <http://www.usda.gov/documents/usda-farm-to-fly-report-jan-2012.pdf>

Detailed descriptions of the USDA grants can be found on pages 26-29 of the FARM to FLY report.

- 3) The session law which created the Aviation Biofuels Work Group can be accessed at <http://apps.leg.wa.gov/documents/billdocs/2011-12/Pdf/Bills/Session%20Laws/House/2422-S.SL.pdf>

Appendix C. Participants' Definitions of Success for the Aviation Biofuels Sector

| The aviation biofuels sector will be successful when... | Focus Area #1 | Focus Area #2 | 2013 Meeting Outcomes |
|---|---|--|--|
| A commercially viable supply chain is developed that supports significant numbers of family-wage jobs in all corners of the state. | <ul style="list-style-type: none"> ▪ Mapping the industry | <ul style="list-style-type: none"> ▪ Assistance establishing financing and encouraging capital investment | <ul style="list-style-type: none"> ▪ Identify and prioritize specific initiatives / investments and develop pathways to success to advance the aviation biofuels industry in Washington |
| Aviation Biofuels, produced in a sustainable manner and produced primarily with Washington-produced feedstocks are available to end users at a price competitive with traditional jet fuel. | <ul style="list-style-type: none"> ▪ Mapping the industry ▪ Coordinated support for DOD as “market maker” ▪ Development of feedstocks ▪ Support for value-added biofuel co-products ▪ Creation of an Aviation Biofuel refinery | | <ul style="list-style-type: none"> ▪ Keeping lines of communication open among stakeholders ▪ Diving into detail in priority areas with topic specific presentation and discussion—one deep-dive topic per meeting |
| Short-term supply has a balance with current demand. Long-term, the demand will be greater than petroleum fuels and will create a stable fuel source without excess environmental damage. | <ul style="list-style-type: none"> ▪ Development of feedstocks | <ul style="list-style-type: none"> ▪ Mapping the industry | |

| The aviation biofuels sector will be successful when... | Focus Area #1 | Focus Area #2 | 2013 Meeting Outcomes |
|--|--|--|--|
| <p>There is a commercially available supply that can be readily supplied to airports and military bases through existing infrastructure. Aviation biofuel is not made in batch production but is a primary product. Price is comparable to petroleum-based fuel. Multiple feedstocks are incorporated into refining processes. Demand for co-products does not out compete production of aviation fuel. Consistent regional policies, tax credits and subsidies.</p> | <ul style="list-style-type: none"> ▪ Assistance establishing financing / encouraging capital investment | <ul style="list-style-type: none"> ▪ Coordinated support for DOD as “market maker” | |
| <p>Multiple biorefineries are operational in the Pacific Northwest utilizing multiple feedstocks. Aviation biofuel is sold at a price competitive with fossil fuels.</p> | <ul style="list-style-type: none"> ▪ Assistance establishing financing / encouraging capital investment | <ul style="list-style-type: none"> ▪ Development of feedstocks | <ul style="list-style-type: none"> ▪ Developing a strategic roadmap and financial matrix for developing the aviation biofuel industry |
| <p>The economics of the fuel can compete with petroleum: subject to greenhouse gas and other benefits “counting” in those economics. Tar sands use in the Pacific Northwest, therefore, loom large.</p> | <ul style="list-style-type: none"> ▪ RFS Improvement | <ul style="list-style-type: none"> ▪ Assistance establishing financing / encouraging capital investment | <ul style="list-style-type: none"> ▪ Policy opportunities; developing policy tools (concepts for) which can enable WA state to differentiate itself and drive these goals |
| <p>The region is producing multiple feedstocks and has the technologies necessary to cost-effectively and sustainably produce and deliver 250-500 million gallons of bio-jet annually to regional airports and military bases. The technologies developed by the region have the patents or protections necessary so that use of WA technology IP has cornered the market.</p> | <ul style="list-style-type: none"> ▪ Assistance establishing financing / encouraging capital investment | <ul style="list-style-type: none"> ▪ Coordinated support for DOD as “market maker” | <ul style="list-style-type: none"> ▪ Development of specific, time focused and phased recommendations for legislative action in WA |
| <p>When the supply of aviation biofuel meets the demand. This includes allowing for incentives to grow feedstock.</p> | <ul style="list-style-type: none"> ▪ Development of feedstocks | <ul style="list-style-type: none"> ▪ Assistance establishing financing / encouraging capital investment | <ul style="list-style-type: none"> ▪ Agreement, consensus, around goals for the industry—both short term and long term |

| The aviation biofuels sector will be successful when... | Focus Area #1 | Focus Area #2 | 2013 Meeting Outcomes |
|--|---|---|---|
| <p>The industry is able to compete with petroleum-based aviation fuels and supply the needs of regional aviation fuel consumers in a profitable and environmentally conscious manner.</p> | <ul style="list-style-type: none"> ▪ Assistance establishing financing / encouraging capital investment | <ul style="list-style-type: none"> ▪ Development of feedstocks | <ul style="list-style-type: none"> ▪ Catalyzing the aviation biofuel industry by collaboration among the group to develop financing and capital support programs for new investments across the supply chain and develop specific recommendations to support policies, R&D, and supply chain efficiencies for a variety of feedstocks |
| <p>We are achieving economic competitiveness (given consideration of economic and environmental externalities) for a working commercial-scale supply chain in the Pacific Northwest. Achievement should have the usual adoption curves with 1%, 5%, 10%...50% supply for the market over time.</p> | <ul style="list-style-type: none"> ▪ Mapping the industry (with visual representation of concept for insider and public understanding [dashboard] progress report) | <ul style="list-style-type: none"> ▪ Other: Assembly of a working supply chain from feedstocks to fuel at Seattle, Portland and military markets | <ul style="list-style-type: none"> ▪ Doing project development work on goals between sessions — whole group good for idea-exchange and reality check, but sub-committee work between meetings will be necessary to help achieve overall goal of commercialization |
| <p>Biorefiners are producing sustainable on-spec fuels that meet the needs of end users at a price that is on par with alternative sources without the need for subsidy (or on an even playing field). This will include having appropriate logistics for moving resources (i.e. beyond a few niche opportunities). Simply stated; one measure of success is when the industry is able to produce a product that is in demand or wanted by the public.</p> | <ul style="list-style-type: none"> ▪ Mapping the industry (if defined correctly) ▪ Focus on making state friendly and enabling companies and includes policy (RFS improvements) that include / support markets technology, neutrality, feedback neutrality (sustainable metrics), subsidy parity—need teeth | <ul style="list-style-type: none"> ▪ Support for R&D efforts – biproducts / feed markets included (needed at national level not only regional level) | <ul style="list-style-type: none"> ▪ Informing state legislature (and stakeholders) of a realistic map of biofuels needs for development of industry in the Northwest that correlates regional resources, current infrastructure, and market to current and future R&D state of technology and prioritized needs that will help the industry broadly rather than single or niche needs (needs to address specific needs, but not be picking winners) |

| The aviation biofuels sector will be successful when... | Focus Area #1 | Focus Area #2 | 2013 Meeting Outcomes |
|--|--|---|---|
| <p>From my perception, the aviation biofuel industry has achieved success when there are multiple fuel production facilities producing volumes of biojet that exceed 10% of region demand for jet fuel. In addition these biofuel facilities are economically and commercially successful for owners, employees and investors as well as all other aspects of the value chain (i.e. feedstock, transportation and coproducts). Lastly, this all encompasses an industry that does not require long term subsidy from government, and it means that the fuel produced has a GHG reduction of 50% or more.</p> | <ul style="list-style-type: none"> ▪ Assistance establishing financing / encouraging capital investment | <ul style="list-style-type: none"> ▪ Coordinated support for DOD as “market maker” | <ul style="list-style-type: none"> ▪ Establishing long term policy on state level to support the development of the industry with the focus areas agreed |
| <p>The discussion is no longer about feedstock; it is about the increased value of the multiple WA fortune 100 supply chain companies earnings reports on NYSE that have either developed or benefitted as a result of this work.</p> | <ul style="list-style-type: none"> ▪ Create stable policy and regulatory environment | <ul style="list-style-type: none"> ▪ Mapping the industry | <ul style="list-style-type: none"> ▪ Developing a rigorous industry map (or maps by feedstock) ▪ Staying in close collaboration between meetings ▪ Drawing a focus on creating a stable policy and regulatory environment |
| <p>Large scale supply chains are developed based on sustainable feed stocks near the user demand centers (airports). Requires: very large scale, sustainable feedstocks that do not require large water or fertilizer inputs. Allows economies of scale for conversion process to allow capital efficiency. Low cost of transportation to blending and airport use points. Allows time for the bio-based conversion of feedstocks to bio-jet to optimize to a lower cost structure in the future (vs. petroleum based jets). Feedstock and offtake agreements are favorable for capital finance.</p> | <ul style="list-style-type: none"> ▪ Mapping the industry | <ul style="list-style-type: none"> ▪ Support for R&D efforts | <ul style="list-style-type: none"> ▪ Having feedstock specific supply chain maps complete with gaps identified and actions that could specifically close those gaps in WA ▪ Favorable climate for supply chain development—market in place incentive, feedstocks ▪ Supporting R&D investments that are already in place from USDA NIFA |

| The aviation biofuels sector will be successful when... | Focus Area #1 | Focus Area #2 | 2013 Meeting Outcomes |
|--|--|--|--|
| There is functional consensus around the definition of key terms such as “sustainability.” The regional market is heading toward maturity and is competitive with state transportation options, there are multiple buyers and sellers and reasonable price fluctuation. | <ul style="list-style-type: none"> ▪ Mapping the industry | <ul style="list-style-type: none"> ▪ Coordinated support for DOD as “market maker” ▪ RFS improvement | <ul style="list-style-type: none"> ▪ Fix enforcement 5% biodiesel ▪ Develop state and federal policy for our region |
| When it is an established industry: a stable, consistent supply chain exists where the Pacific Northwest region is the feedstock source and processor home for aviation biofuels used in WA. | <ul style="list-style-type: none"> ▪ Mapping the industry (at greater resolution with dashboard—it appears that mapping the industry and supply chain for each feedstock is key to setting priorities | <ul style="list-style-type: none"> ▪ Coordinated support for DOD as “market maker” | <ul style="list-style-type: none"> ▪ Increased understanding of the supply chains for Aviation Biofuels and group discussion and recommendations |
| A sustainable affordable supply of biofuels is being provided to meet an established and consistent voluntary demand. | <ul style="list-style-type: none"> ▪ Mapping the industry | <ul style="list-style-type: none"> ▪ Coordinated support for DOD as “market maker” ▪ Identify DOD issues in order to include them in map | <ul style="list-style-type: none"> ▪ 1st meeting—visually mapping the industry and show current status and momentum (dashboard) ▪ 2nd meeting--depending upon revelations from 1st meeting |
| There are 100 million gallons of sustainable regionally produced second generation biofuels produced in the NW. This could include bringing in all the major aviation hubs (smaller airports, military, etc.) and should show significant signs for sustained growth, a model for other areas, and a major measured reduction in carbon emissions. | <ul style="list-style-type: none"> ▪ Externality carbon pricing—pressuring and pushing for legislative efforts | <ul style="list-style-type: none"> ▪ Developing feedstocks—more commercially viable | <ul style="list-style-type: none"> ▪ A proposal of some form of carbon pricing reaching critical mass in the state legislature ▪ Government support for growing and developing a diverse mix of feedstocks |
| It is commercially sustainable, environmentally and economically, without dependence on government subsidies. | <ul style="list-style-type: none"> ▪ Mapping the industry—dashboard (dynamic) | <ul style="list-style-type: none"> ▪ Coordinated support for DOD as “market maker” | |

| The aviation biofuels sector will be successful when... | Focus Area #1 | Focus Area #2 | 2013 Meeting Outcomes |
|--|---|--|---|
| <p>Biofuels replace 20% of the commercial military use of petroleum-based aviation fuel in the Northwest region. Production comes from 3-4 facilities utilizing diverse feedstocks in different regions. Markets are established for a value added product, enabling biofuels to be cost-competitive with petroleum. Sustainability concerns have beneficially added to gain public support.</p> | <ul style="list-style-type: none"> ▪ RFS improvement (product, blender, incentives, definitions, technologies) | <ul style="list-style-type: none"> ▪ Coordinated support for DOD as “market maker” | <ul style="list-style-type: none"> ▪ Map pathways from feedstocks to facilities to distribution; call out near term and long term opportunities and challenges for each pathway ▪ Comprehensive policy package for 2014! ▪ Ongoing coordination with Department of Defense |
| <p>Biorefineries that can produce 10s of millions to over 100 million gallons of jet fuel that meets regulatory standards. Fuel is produced at a cost that is competitive with petroleum. LCA of fuel has demonstrated carbon emissions that are consistent with RFS to 60% reduction in GHG emissions. Industry has demonstrated that fuel can be produced not negatively impacting regional water supply. All participants in the supply chain are profitable.</p> | <ul style="list-style-type: none"> ▪ Support for R&D efforts | <ul style="list-style-type: none"> ▪ Assistance establishing financing / encouraging capital investment | <ul style="list-style-type: none"> ▪ Definitive and ranked steps WA needs to have commercial biofuel industry. Identification of mechanism to support state R&D efforts to solve technical challenges for regional industry |
| <p>Biofuels production growth rate captures increasing % of total demand and can exceed 50% within a visible time measure.</p> | <ul style="list-style-type: none"> ▪ Assistance establishing financing / encouraging capital investment | <ul style="list-style-type: none"> ▪ Support for value-added biofuel co-products | <ul style="list-style-type: none"> ▪ Develop a specific financial assistance mechanism to help attract capital ▪ Align benefits of sustainable fuels vs. recognized externalities sufficient to redirect and capture petroleum subsidies |
| <p>Available feedstock production is supported to the point of guaranteeing future demands. Infrastructure has to be sustainable at all points in the process. Identifying the priorities for the use of biofuel. Current usage outstrips available feedstocks.</p> | <ul style="list-style-type: none"> ▪ Assistance establishing financing / encouraging capital investment | <ul style="list-style-type: none"> ▪ Support for R&D efforts | <ul style="list-style-type: none"> ▪ Identify the positives and the road blocks of the process and come up with possible solutions ▪ Network-network-network |

| The aviation biofuels sector will be successful when... | Focus Area #1 | Focus Area #2 | 2013 Meeting Outcomes |
|--|---|--|--|
| <p>Sustainable, low-carbon fuels are commercially available from a variety of feedstocks and technologies are price competitive with petroleum and nonconventional fossil fuels (e.g. coal-to-liquid or gas-to-liquid). We have adequate feedstock and refining capacity to meet regional jet fuel demand 100% from sustainable, low carbon sources. Washington companies and organizations are major players in success of global industry. Sustainable jet fuels is a key part of a thriving bio-economy for fuels, chemicals and other products that provide new revenues for farmers, forest managers and waste handlers. Public acceptance of biofuels has grown, allowing stable and predictable policy environment.</p> | <ul style="list-style-type: none"> ▪ Ensure strong administration success and adequate funding for development | <ul style="list-style-type: none"> ▪ Develop strong policy recommendations —prioritize and coalesce policy recommendations to build market demand | <ul style="list-style-type: none"> ▪ Allowing clear conversation on specific tasks ▪ Focusing on achievement of clear goals |
| <p>Oilseed growers have options each year for: who to grow for (who to sell to) and can do so in a way that optimizes agricultural practices and can grow and deliver their product in a cost-effective manner. Goal: make production normal and our oilseed growers routinely have the option to grow for this market cost-effectively.</p> | <ul style="list-style-type: none"> ▪ Mapping the industry | <ul style="list-style-type: none"> ▪ Identify actual public policy proposals and concrete steps | <ul style="list-style-type: none"> ▪ Coalescing around specific policy proposals ▪ Engaging in a coordinate PR marketing effort to make the industry “normal” in the public perception |
| <p>Demand is met by a stable supply; provided at prices that have achieved parity with stable policy accepting conventional fuels which are relying on external incentives. For this, projected feedstock and processing is assumed to be regional to help meet regional demand.</p> | <ul style="list-style-type: none"> ▪ RFS Improvement— stable policies to help drive financing | <ul style="list-style-type: none"> ▪ Mapping the industry | <ul style="list-style-type: none"> ▪ Clear direction to develop state regulations that encourage a broad range of feedstocks for use in biofuels (this will include work to harmonize definitions) ▪ Completing a map of the industry within the state |
| <p>There is a sustainable, low carbon, cost-competitive biofuel available to the commercial, military and regional end users produced here in WA state. By 2025, I would like to see up to 20-25% bioblends in the aviation fuel mix.</p> | <ul style="list-style-type: none"> ▪ RFS improvement | <ul style="list-style-type: none"> ▪ Assistance establishing financing / encouraging capital investment | <ul style="list-style-type: none"> ▪ Building broad base coalition support for improving RFS to 2013 session ▪ Long term stable policy that drives confidence in investment community |

Appendix D. Innovate Washington

About Innovate Washington

Innovate Washington is a statewide, public-private partnership that is the catalyst for economic growth in Washington's innovation economy. The organization collaborates, convenes and connects innovators and researchers with the entrepreneurial and financial capital needed to produce world-class companies and high-value jobs that will form the backbone of our region's future economy.

General Overview

Established in 2011, Innovate Washington is the primary and lead agency focused on growing the innovation-based economic sectors of the state. It is a response to the concerns expressed by the state's universities, companies, innovators, and investors to address economic growth in an environment of diminishing public funding—both state and federal. In recent years, higher education budgets have been cut significantly. Following a surge of stimulus money, federal funding for education, research and economic development is diminishing. And private capital has become much more difficult for most companies to access. As a result, innovators are finding it more difficult to access both the raw inputs of innovation (intellectual capital) and the financial capital required to grow successful businesses. At the same time, the necessity to create high-quality jobs has never been a higher priority for state and local leaders across the country. And the competition for high-quality jobs in strategic and growth industries has never been greater.

Washington has traditionally not relied on public financing (subsidies, recruitment packages, etc.) to attract business to Washington. Instead, we have sought to grow our own high paying, innovative companies. However, as the competition for jobs increases, companies in our leading sectors have run into challenges that limit their ability to expand and create jobs in Washington. Those challenges range from finding highly-educated workers, fending off recruitment efforts by other states, attracting game-changing, federally-funded competitive projects, accessing capital, and creating a policy and regulatory environment that supports the growth of innovative companies. Some sectors, such as software, have traditionally required very little support to launch and build great companies. But in other sectors, such as energy, there are significant barriers to launching innovative products and services. While many other states have showered money and expensive recruitment packages on such industries, Washington took a different approach by consolidating and re-focusing existing resources into a new public-private partnership that simply brings together entrepreneurs, researchers, financiers, and public agencies to identify and tackle the barriers to growing companies and jobs in Washington's vital economic sectors. Using a low-cost, high-leverage approach, Innovate Washington was created to be the glue in the system so that alignment and organization of current investments leads to transformational outcomes for the economy and the citizens of Washington.

Clean Energy Partnership and Aviation Biofuels

Innovate Washington is charged with implementing the recommendations of the Governor's Clean Energy Leadership Council (CELC). The organization is the home of the Clean Energy Partnership (also known as Innovate Northwest) to make the Northwest a world-class hub of advanced energy ideas, development and export. In implementing the recommendations of the CELC, Innovate Washington will leverage existing strengths in the state's clean energy sector to deliver measureable results in

collaboration with industry and higher education to achieve quality, technology-based job creation throughout Washington.

The Aviation Biofuels Work Group is a priority effort identified in the recommendations of the CELC. The Work Group also brings together parties from three of the key business sectors in Washington: clean energy, aerospace and agriculture. Working together, the Group will chart a course toward a viable, affordable, and reliable aviation biofuels industry that creates jobs for Washingtonians. The outcome will be recommendations that will facilitate the technology development, production, distribution and commercialization of aviation biofuels benefitting all three of these important economic sectors.