Port of Seattle Sustainable Aviation Fuel Strategic Plan

Background

Historically the Port of Seattle (Port) has been a leader in supporting research and development of sustainable aviation fuels (SAF), as a founding member of Sustainable Aviation Fuels Northwest (SAFN). With the support of regional partners, the Port shifted towards a market development role in 2015, and began exploring what the Port could do to support SAF infrastructure development, and build demand at Sea-Tac Airport.

The Port demonstrated its leadership in market development with the release of two reports in 2016 and 2017. The first report was done in partnership with Alaska Airlines and Boeing, and evaluated how best to integrate SAF into the airport's fueling infrastructure. The second report was done in partnership with the Rocky Mountain Institute and SkyNRG, and explored innovative airport funding mechanisms that could be used to help lower the incremental cost between SAF and conventional jet fuel. The information contained in these studies sets the foundation to help the Port of Seattle take the next step toward the goal of making SAF cost-effective and practical for airlines at Sea-Tac.

In December 2017, a Motion was passed by the Port Commission that contained specific SAF goals, and directed staff to develop a SAF Strategic Plan to meet those goals. Subsequent to the Motion, a Memorandum of Understanding (MOU) was executed in Q2 2018 between the Port and sixteen (16) airlines/airlines groups operating at Sea-Tac Airport, formalizing a commitment between the parties to work together to develop a separate MOU Committee-specific strategic plan to reach the Commission's goal.

The strategies outlined below identify where the Port or other partners may play a lead role in implementation, and where the work of the MOU Committee intersects with the broader strategy of the airport. Many of the actions and milestones within the strategies will become more detailed and developed as research is completed and options are evaluated.

State of the Industry

Since 2009, ASTM has approved five alternative jet fuel production pathways.[1] The five approved alternative jet fuel types represent four different processes associated with various feedstock types: Fischer-Tropsch Synthetic Paraffinic Kerosene (FT-SPK) which converts syngas (from biologic or

[1] http://www.caafi.org/resources/faq.html

petrochemical sources) to jet fuel components; Hydroprocessed Esters and Fatty Acids (HEFA-SPK) from plant and animal oils; Hydroprocessed Fermented Sugars to Synthetic Isoparaffins (HFS-SIP) made by microbial conversion of sugars to hydrocarbons; FT-SPK with aromatics (FT-SPK/A) from various sources of renewable biomass such as municipal solid waste, agricultural wastes and forest wastes, wood and energy crops; and Alcohol-to-Jet Synthetic Paraffinic Kerosene (ATJ-SPK) derived from isobutanol from multiple feedstocks.

More than a dozen airlines have signed 'off-take' agreements (contractual obligation for SAF volume at a specific price when it's produced) with producers, but only one of these agreements (United Airlines and AltAir Fuels) has resulted in commercial-scale, regular production.

To date (mid-2018), only one commercial SAF production facility exists in the world. This facility, owned by AltAir Fuels in Paramount, California, is a retrofitted petroleum refinery that now makes renewable diesel and renewable jet fuel from waste oils and animal tallow (HEFA-SPK pathway). While there have been several SAF demonstration flights throughout the world over the past several years, the fuel for the majority of these flights has come from 'batch' productions and not commercial-scale facilities. In total, the present-day regular production of SAF worldwide is less than 4 million gallons per year, compared with 20 billion gallons per year of petroleum jet fuel consumed in the U.S. alone.

Some 'batch' scale but semi-regular production in the world comes from Total (headquartered in France), who convert Brazilian sugarcane to jet fuel for some of Airbus' factory delivery flights from Toulouse, France to the purchasing airline's home airport.

There are several reasons why the AltAir facility in California has reached commercial scale production, while others have not. The presence of a shuttered refinery 16 miles from LAX helped reduce capital costs and permitting obstacles. The policy environment for low carbon fuels (largely supported by California's Low Carbon Fuel Standard, or LCFS) allowed the producers to capture financial benefits to bring down the price of renewable diesel (an important co-product with HEFA-based SAF production) and SAF to a lesser extent, for end users. And finally, the availability of waste oils and feedstocks near a large population center, combined with a proven fuel conversion technology, allowed the production facility to succeed. While this is not an exhaustive list of the success factors of this facility, it highlights the most critical elements, and those that are relevant to our challenges at SEA.

It is the aim of this plan to describe specific strategies Sea-Tac Airport and the Port of Seattle can implement to help create these same types of stable incentives, policies, feedstock availability, partnerships, and research and development support to help additional commercial production scale facilities come on-line. The strategies outlined in this SAF Strategic Plan reflect the most effective policies and approaches found around the world (e.g. AltAir Fuels in California, Scandinavian airports) that have helped build or support a SAF market. Specifically, these strategies are designed to work together to support an aggregated market signal and facilitate the development of a local SAF supply chain.

1.0 Goals

The goals outlined by the Commission in their December 2017 Motion are as follows:

- By 2028, 10 percent of jet fuel available at Sea-Tac will be produced locally from sustainable sources.
- By 2035, 25 percent of jet fuel available at Sea-Tac will be produced locally from sustainable sources.
- By 2050, the maximum blend currently approved for jet fuel will be produced locally from sustainable sources.

Currently, Sea-Tac Airport dispenses approximately 600 million gallons of jet fuel per year, and this amount is likely to grow to between 700 and 800 million gallons in the next decade. To put these goals in context, the 2028 goal is equivalent to approximately 75 million gallons of 'neat' or pure biojet fuel, or about fifteen to twenty times (15-20x) the current total world-wide production volume.

This volume would require at least two (2) new or co-located dedicated biofuel refineries to meet the goal. Given the pace of permitting, securing feedstock, securing capital, etc., this is considered an ambitious target, particularly if the fuel is to be produced locally.

To achieve these goals, the Port will implement four key strategies, as described in detail below.

2.0 Strategies

1. Create an airline-airport cooperative model to aggregate demand and address infrastructure needs
2. Develop and/or support specific local, state and federal policies that incentivize SAF use and in-state production
3. Obtain FAA support (approval) to use airport funds and/or grants toward SAF co-benefits
4. Enhance awareness of, and support for SAF use

These strategies are described in detail below.

2.1 Airline-Airport Cooperative Model

Purpose:

The incremental cost between SAF and petroleum Jet A is the most significant barrier to market growth and development. Estimates of SAF incremental cost do not typically include the costs to build and integrate a local supply chain and fueling infrastructure, which can be substantial. Airports in Europe

have helped send a SAF market signal by bringing these costs down through participation in partnership funds among airlines, governments, corporations, etc. A cooperative model is an agreement among an airport, airlines, and possibly other parties to aggregate funds and/or demand to send a SAF market signal.

Context:

While several airlines have signed "off-take" agreements (contractual obligation for SAF volume at a specific price when it's produced) with producers, airports in the U.S. can't play a role in direct fuel purchases or off-take agreements. Instead, airports must look for other ways to promote cost-effective access to SAF.

Some airports in Europe have turned to cooperative, or 'partnership' funding models. These partnership funds typically aggregate contributions from the airport, government, airlines, and corporations. For example, at Oslo Airport, such a collaborative fund has purchased ~ 150,000 gallons per year of neat biofuel in batches since 2016. SkyNRG, who partnered on the innovative funding study for Sea-Tac, has also helped create a Fly Green Fund for airports in Sweden. In this model, airlines such as SAS and KLM pay for the administrative costs of the fund so that contributions from corporate and individual flyers can be allocated to the premium cost for SAF and support local production projects.

This Strategic Plan defines 'cooperative model' broadly, to allow for stakeholder input in its development. Sea-Tac seeks to work with airlines to develop a cooperative model or partnership fund that meets the needs of all contributing partners (Port, airlines, corporations), provides equitable benefits, offers transparency in its structure and governance, and provides cost-effective access to sustainable fuel. The Port expects to hire consultants with expertise in fund development who understand the legal and accounting principles that would provide assurance to any fund contributors that the funding structure meets their needs.

This cooperative model is not intended to replace airlines' efforts to obtain SAF, but to aggregate demand. This effort seeks to find a system that complements existing airline efforts and provides equal access to benefits for all airlines whether they have a large or small presence at the airport.

Like other fund models, the intention is to use the bulk of the commitments and funding for fuel, but some percentage of funds could be allocated to local supply chain and infrastructure development. However, it is critical to find or develop a model that works in the U.S. context, and might not be an exact replica of European models.

Key Milestones:

- 2018: Explore airline-airport cooperative models or partnership funds from other regions (Airline-Airport MOU Committee)
- 2018-2019: Develop a "made by airlines for airlines" approach/partnership fund, and issue Request for Proposals (RFP) for consultants to develop structure (Airline-Airport MOU Committee)
- 2020: Cooperative model operational (Port staff)

- 2021: Partner commitments finalized (All Partners)
- 2021-23: Market signal leads to SAF production commitments

2.2 Policy Support

Purpose:

The Port seeks to develop and/or support local, state, or federal policies that incentivize SAF use and in-state production facilities. Importantly, the Port seeks to find ways to create a level playing field with California, such that policies in Washington create an economic equivalency with California's Low Carbon Fuel Standard and Cap and Trade regulations.

Context:

Several regional, state, national, and international-level policies can influence SAF production and cost-competitiveness. It is critical to the success of a Port strategy to understand all of these mechanisms and determine which approach is likely to be most successful in:

- Developing a stable and reliable market for SAF production in WA state
- Reducing greenhouse gas emissions
- Harmonizing cost/incentive levels with those of California and/or Oregon
- Having the support of many Port-related businesses and industries

Analysis conducted by Port staff and regional partners suggests that a Clean Fuel Standard (aka Low Carbon Fuel Standard) similar in design to California's is the most likely to meet these criteria. Therefore the milestones outlined for this strategy focus on harmonization with California's regulation. However, additional incentives to attract production facilities to the region via tax incentives or other mechanisms will also be pursued where possible.

Key Milestones:

- 2018: Build WA LCFS campaign with partners; Support tax incentives for in-state bio-refineries/SAF facilities (Port Commission & Staff)
- 2019: Support WA LCFS (with opt-in for SAF) if carbon pricing mechanism not passed in 2018; Identify production barriers and recommend further state legislative actions (Port Commission & Staff)
- 2020: Continued support for carbon pricing mechanisms equivalent to California

2.3 Approval for SAF Co-benefits Expenditures

Purpose:

Airports routinely use their revenues and are granted federal funds to support projects that reduce air pollution. Similarly, airports could use federal grants or airport revenue to pay for the "co-benefits" of SAF to help reduce the incremental cost in a way that is consistent with current federal policy. This

approach has not yet been approved by FAA. Research being conducted by FAA's Aviation Sustainability Center (ASCENT) and other research teams has demonstrated air pollutant reductions when SAF is used. Sea-Tac Airport aims to quantify these benefits in a manner that is consistent with other air pollution reduction investments, and obtain FAA approval to use airport revenue and/or federal grants towards this benefit.

Context:

Airports cannot directly pay for aircraft fuel. Among other restrictions, public dollars cannot fund a commodity used by a for-profit private firm. However, airports can purchase services that support airport performance goals such as cleanliness (custodial contracts) or clean energy (renewable energy certificates). Besides offering lower life-cycle carbon emissions, SAF usage lowers direct emissions of air pollutants (such as sulfur and particulate matter) and supports regional economic development through locally sited supply-chain elements. We term these environmental and social benefits as 'co-benefits.'

An airport could theoretically purchase these co-benefits in the same way that vendors provide services without a transfer of physical ownership. Additionally, airports are already in the business of providing services that offer air quality benefits and cost savings to airlines in the form of pre-conditioned air at the gate, or infrastructure to plug in electric ground support equipment. In order to qualify spending on co-benefits, robust science quantifying these co-benefits, and agreement by FAA, who regulate airport-qualified spending, must be established.

Key Milestones:

- 2018: Identify specific particulate matter (PM) and sulfur emission reduction co-benefit values and present to FAA (Port Staff)
- 2019: Work with FAA (with support from research teams) to gain approval to use airport revenue and/or VALE grants toward SAF co-benefits (Port Commission & Staff)
- 2020: Sea-Tac Airport contributes revenue to Partnership Fund (Port Commission)

2.4 Education & Advocacy

Purpose:

Public perception regarding new production facilities in WA is considered by SAF producers to be a barrier equal in magnitude to the imbalance of carbon policies between WA and CA. There are also many misconceptions about the volume of SAF currently in production, as well as the benefits they provide. A robust education and advocacy approach to audiences critical to SAF acceptance is necessary to increase local production.

Context:

Due to the low production and use of SAF, it is assumed general awareness of the fuel, policies, technical research, and airline adoption of SAF is relatively low. Given the complexity of developing local production facilities, an education and advocacy campaign is needed across several audiences to gain support for SAF facilities, partnership funds, or policies cited in this strategic plan. These campaigns will focus on key messages to build understanding in the following categories:

General Public:

- Basics of SAF and its benefits
- Production facility size/scale and impacts to community
- Policies needed to increase SAF use

Politicians:

- Basics of SAF and its benefits
- Impact of air travel on climate and air quality
- Policies needed to increase SAF use and create jobs

Businesses:

- Impact of business travel on climate and air quality
- Policies needed to increase SAF use and create jobs
- Benefits of SAF to business interests and sustainability reporting

Key Milestones:

- 2018: Develop specific messaging for policy maker, businesses, and general public/airport community audiences and complete the "SAF 101" slide deck in partnership with Public Affairs; For specific policy outreach, see Strategy 2.3 (Port staff)
- 2019: Identify key audiences, and opportunities to present SAF 101 information (Port staff)
- 2020: Continue to identify audiences and outreach opportunities (Port staff)

3.0 SAF Strategic Plan Timeline

The timeline below shows the schedule for each strategy and related milestones identified in Section 2.0.

Strategy	2018				2019				2020	2021	2022	2023
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4				
Airline-Airport Cooperative Model		Sign MOU	Evaluate other cooperative models in Europe and assess options for SEA	Issue RFP to develop cooperative model structure	Develop model/fund structure; Outline of model/fund structure to Commission for approval		Select 3rd party operator for model/fund		Model/fund operational. Signed commitments send market signal to producers	Longer-term commitment to develop SAF facility in-state	Producer identifies location and seeks capital	Producer continues to pursue funding and location options
State Policy Support	Present to House Transportation Committee; support any carbon legislation that provides SAF incentives		Monitor & support legislation that provides equivalent or better incentives for SAF than neighboring jurisdictions (California in particular)		Support LCFS approach; Industry Day in Olympia							
Federal Policy Support					Meet with FAA and present white paper of co-benefits	Seek FAA approval to use airport revenue toward co-benefits			Receive FAA approval to use airport revenue for SAF co-benefits			
SAF Co-benefit Quantification	Literature review	Begin development of SAF pollutant reduction co-benefits white paper		Review and finalize co-benefits white paper					Adjust co-benefit values as new science emerges			
Education & Outreach	Develop communication tools and outreach strategy for politicians, local leaders, environmental NGOs, etc			Adjust communication strategy as necessary based on policies, producers, etc	Implement communication and outreach strategy						Develop outreach strategy for communities neighboring production facility	