Why Airports?

- Important to our GHG reduction goals
- Important to our airline business partners
- Airports as “Aviation Filling Stations”
- Infrastructure adequacy?
- Important to the Sustainability of Aviation
- Strategic for regional jobs, trade
  - Aviation, Agriculture, R&D
Aviation Actions To Reduce CO₂

Carbon Neutral Growth and Reduction Timeline

Seattle-Tacoma International Airport
Airport Related CO₂ Emissions (tons)

- **Scope 1**: Facility/Stationary Sources, Mobile Fleet
- **Scope 2**: Airport Electricity Use
- **Scope 3**: Aircraft (fuel dispensed), Ground Support Equipment, Passenger Vehicles, Service Provider Vehicles

<table>
<thead>
<tr>
<th>Year</th>
<th>CO₂ Emissions (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>17,910</td>
</tr>
<tr>
<td>2050</td>
<td>4,514</td>
</tr>
</tbody>
</table>

17,910 4,566,713 4,514
## Boeing Global Biofuel Engagements

### Recent and Active Biofuel Projects

- **VA / LanzaTech collaboration**
- **COMAC collaboration**
- **Midwest Aviation Sustainable Biofuels Initiative**
- **UAE R&D Center**
- **MOU Hawaii Bioenergy**
- **North America commercial flights**
- **SAFUG¹ growth**
- **SAFUG¹**
- **Farm to Fly**
- **Project Flight Path**
- **Flight Path for Sustainable Biofuel in Brazil**
- **Flight Path**
- **Aviation Biofuel Roadmap**
- **Feedstock System Design**

### Outcomes

- ASTM & DEF STAN approval
- SAFUG¹ established
- Commercial flights from June, 2011
- Focused regional research projects
- Biofuel roadmaps published

---

## Alt-Fuels ASTM Certifications

- ASTM has certified F-T and HEFA processes
- Approvals taking 2.5-3 years each
- 4 others possible by Dec 2014
  - Alcohol to Jet-SPK and ISPK
  - HDCJ (cellulosic)
  - DSHC (Direct Sugar to HC)
North America

- SAFN and WA Biofuels Working Group- 2011
- MASBI- Midwest U.S. 2011
  - Strategic focus on aviation biofuels
  - Stable long term policy for investment
  - Renewable energy credits needed
  - Government backing
  - Regional R&D
  - Sustainability considerations key

- $100 million in R&D funded by FAA/USDA
- Demonstration Flights
  - Alaska Air –SEA/PDX /DCA
  - 2018 Hawaii demonstration?
  - United Airlines and AltAir - LAX
- Boeing Green Diesel
  - 50/50 blend of bio-diesel and jet A
  - Seeking ASTM approval
Australia

- CSIRO - 2011
  - Market Structure, Supply chains and “risk sharing” mechanisms
  - Biomass supply and new local sources
  - Refining location assessment, demonstration plants
  - Fuel Certification
- Goals to have 1st refinery by 2015, 2nd by 2020
- Airlines looking for near term opportunities (SkyNRG)
- Change on political leadership

Australia

- Australian Initiative for Sustainable Aviation Biofuels
  - Post CSIRO efforts to address obstacles
- Quantas/Shell demonstration flight and report Dec 2013
- Virgin - Eucalyptus
Asia

- Dec 2011 Thai Airways Demonstration Flight – Cooking Oil
- Singapore National Biofuel Study- results 2014
- South East Asia Sustainable Aviation Fuel Initiative (SEASAFI)
- KL Best Practice Workshops
- Case Studies Cambodia, Indonesia, Malaysia, Thailand

Middle East

- Sustainable Bioenergy Research Consortium (SBRC)
- Demonstration Project
- Research on Unique issues related to arid land and water
  - Early results- halophyte efficiency for biofuels
- Etihad Airways Demonstration Flight- Jan 2014
  - New processing technology used
Europe

- European Advanced Biofuels FlightPath - 2013 paper
- I
- A
- GreenSky London (London City Airport)
- Stockholm - Solena/Swedavia/SAS - forest residue and waste

Latin America

- FABB- Flight Path for Aviation Biofuels Brazil
- Gap assessment – feedstocks to fuels, policy
- June 2013 Recommendations
  - R&D needs
  - Incentives, policies,
  - Sustainability criteria
  - Demonstration projects
Common Challenges Identified

- Sustainability - RSB
- Lack of stable long term policies/Incentives
  - To encourage cultivation and bring feedstocks to scale
  - To build demand and finance refinery units
  - To attract investors
- Renewable Credits/RINS
- Infrastructure adequacy?
- Targeted Regional Research and Development

Airport Role in Addressing the Challenges

- Demonstrating industry leadership
- Regional Leadership and benefits to agriculture, jobs, academia, environment, sustainability
- Assess airport/regional infrastructure
- Support policies/Incentives
  - To encourage cultivation and bring feedstocks to scale
  - To build demand and finance refinery units
  - To attract investors
Thank You!

Elizabeth Leavitt

Director, Planning and Environmental
Seattle-Tacoma International Airport