  
**Northwest Advanced Renewables Alliance**  
*A new vista for Green Fuels, Chemicals, & Environmentally Preferred Products*

**Michael Wolcott**  
Regents Professor  
Associate Vice President for Research  
Office of Clean Technology

**Ralph Cavalieri**  
Project Director

Washington State University

Northwest Advanced Renewables Alliance





### Aviation Biofuels from Forest Residuals

UN - Forum on Forests  
March 21, 2017 in New York, NY



### Reagan National Airport – Washington, DC

UN - Forum on Forests  
March 21, 2017 in New York, NY



UN - Forum on Forests  
March 21, 2017 in New York, NY



# World First Commercial Cellulosic Biofuels Flight

## NARA Team

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March 21, 2017 in New York, NY



Alaska Airlines  
ANDRITZ  
Biomass ad Infinitum LLC  
Catchlight Energy  
CLH  
Cosmo Specialty Fibers Inc.  
Facing the Future  
Forest Business Network  
LLC  
Gevan Marrs LLC  
Gevo, Inc.  
ICM

Montana State University  
National Center for Genome Research  
National Renewable Energy Laboratory  
Oregon State University  
Penn State University  
Salish Kootenai College  
South Hampton Resources Inc.  
Steadfast Management Inc.  
Thomas Spink Inc.  
University of Idaho  
University of Minnesota  
University of Montana  
University of Utah  
University of Washington

University of Wisconsin-  
Extension  
USDA Forest Products  
Laboratory  
USDA Forest Service  
Washington State  
University  
Western Washington  
University  
Greenwood Resources  
Weyerhaeuser



Northwest Advanced Renewables Alliance



**International Civil Aviation Organization** UN - Forum on Forests  
March 21, 2017 in New York, NY



**ON BOARD**  
A SUSTAINABLE FUTURE

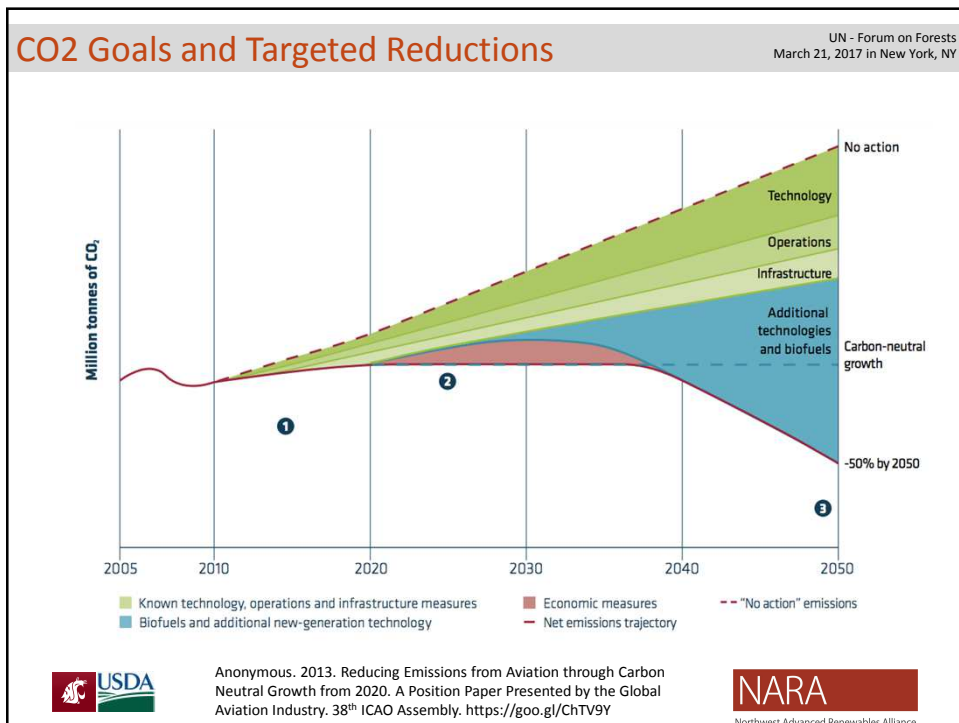






2016 ENVIRONMENTAL REPORT





## Commitment Being Implemented – ICAO CAEP

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We believe that our commitments to work in partnership with governments, other industries and civil society will deliver an efficient aviation sector, fit to meet the needs and provide the services required by the world economy. We strongly encourage others to join us in this endeavour.

Signed on Thursday 22 March 2012, at Geneva, Switzerland by:

 Angelo Geronzi Director General	 Paul Bonner Chairman of the Executive Committee	 Tony Tyler Director General and CEO
 Morton C. Rickay Chair	 Thomas Enders President and CEO	 Jim Albaugh President and CEO
 Filippo Bergami Chief Executive Officer	 Guy Hachey President and COO Bombardier Aerospace	 Tim Peets On Peets President and CEO
 Paulo Cesar de Souza Filho President Commercial Aviation	 David Joyce President and CEO GE Aviation	 Tim Muloney President and CEO Honeywell Aerospace
 John Sauer President Pratt & Whitney Canada	 Eric Schab President - Civil Large Engines Programme	 Paul Steyer Executive Director

  
AIR TRANSPORT ACTION GROUP

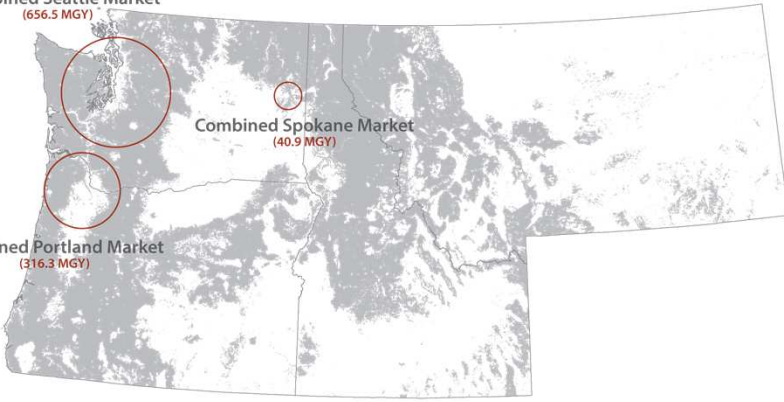
[www.atag.org](http://www.atag.org)





  
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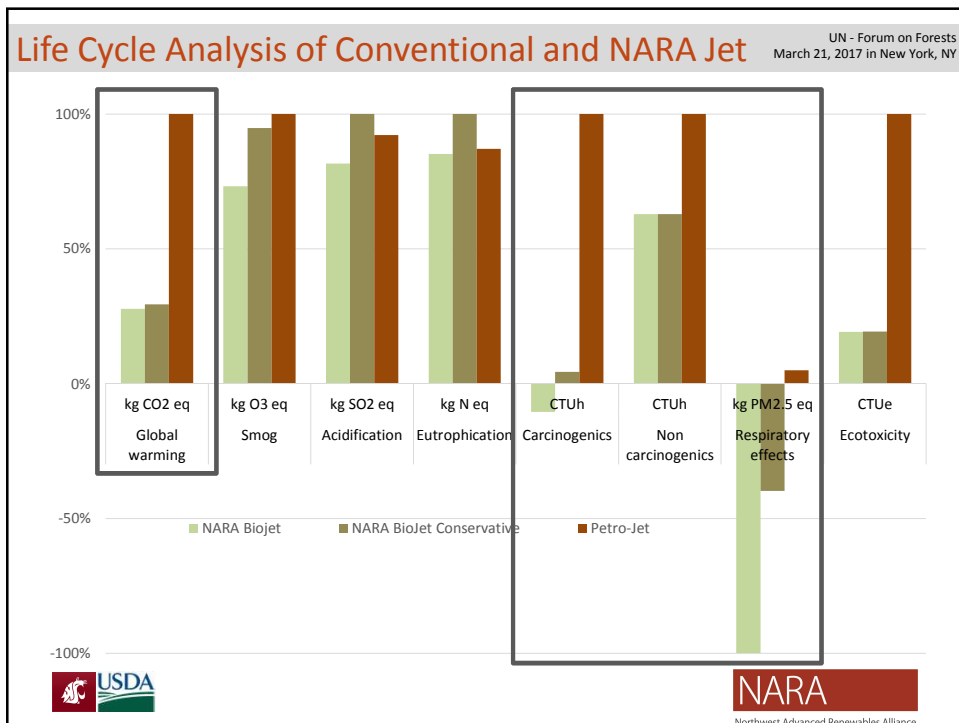
## Aviation Market Centers

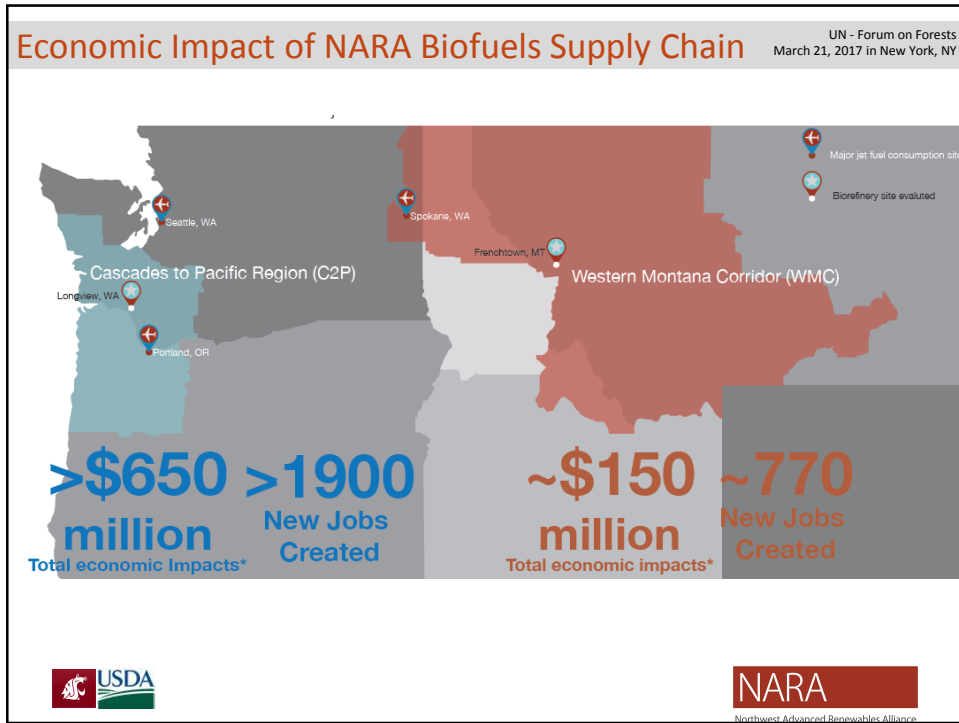
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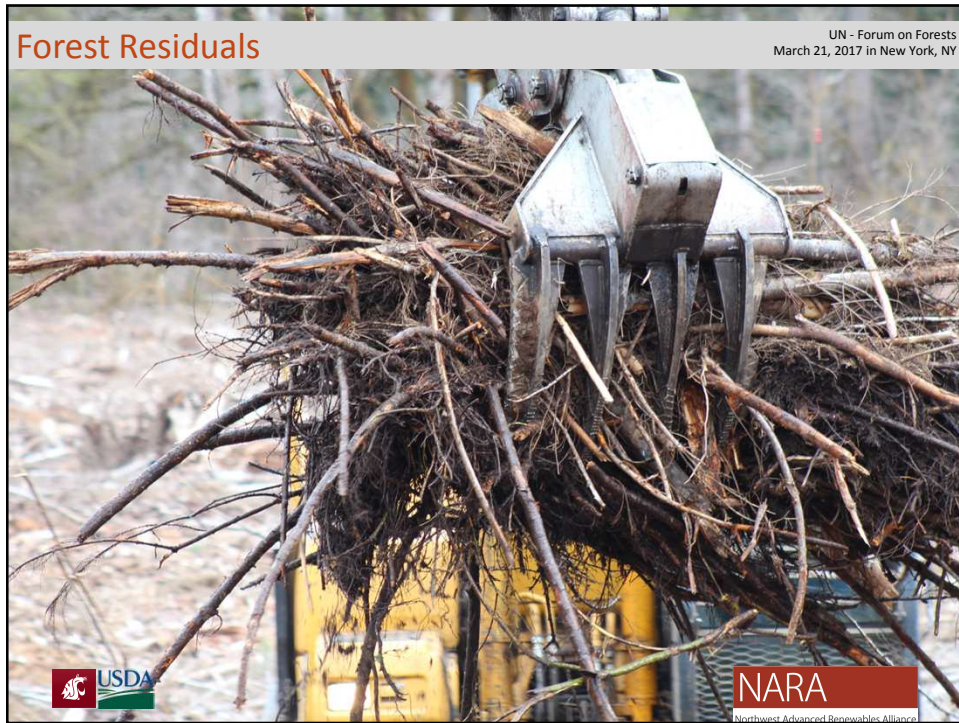


  
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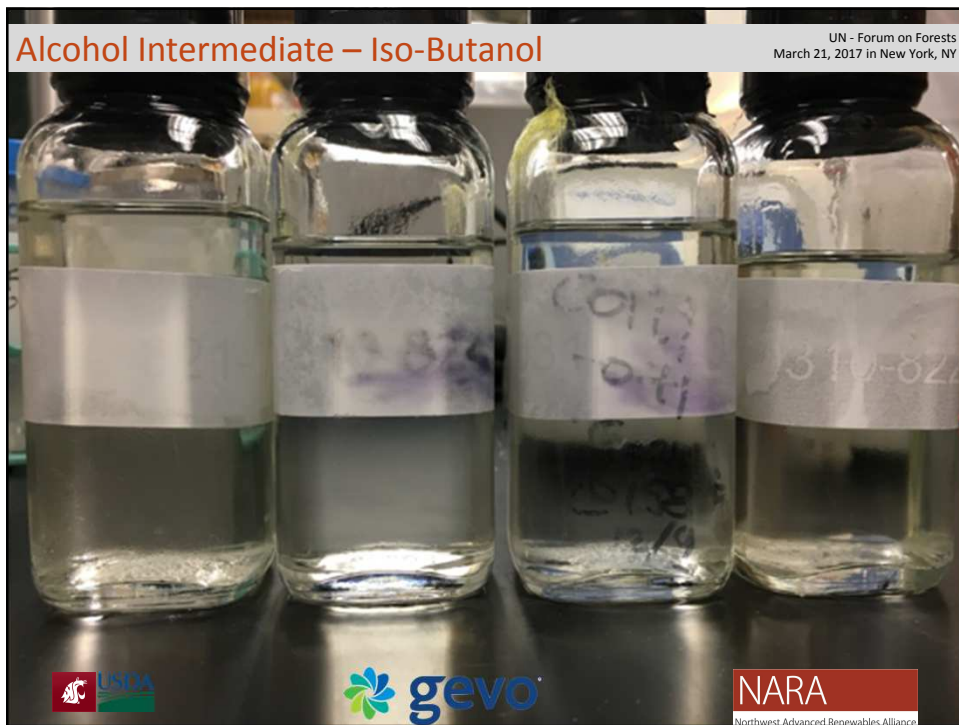
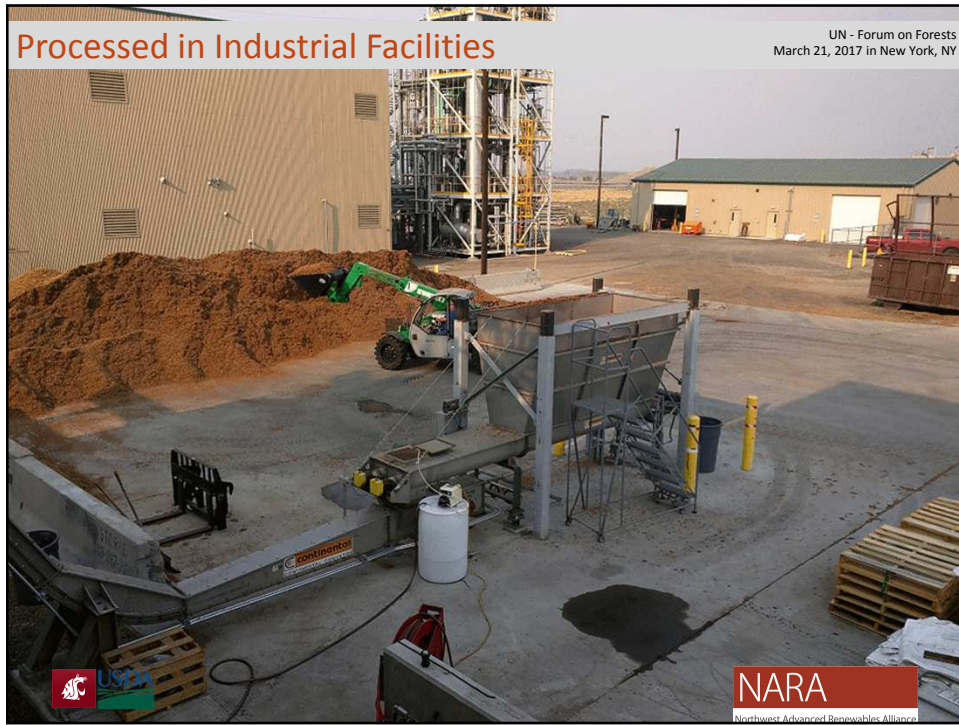












## Alcohol to Jet – Iso-Paraffinic Kerosene

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## Fuel Certification and Flight

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Alter Jet - ASTM D7566  
Blending  
Conv Jet – ASTM D1655  
Distribution to Wing  
Commercial Demonstration  
Flight

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## Developing a Technology Supply Chain

**Feedstock**  
 Weyerhaeuser  
 Confederated Salish & Kootenai Tribes  
 Muckleshoot Tribe  
 Cosmo Spec Fiber  
 Lane Forest Products

**Pretreatment**  
 Andritz  
 ZeaChem

**Fermentation/Separation**  
 ICM  
 Whitefox

**Alcohol to Jet**  
 South Hampton Refining  
 Epic  
 Swiss Port  
 Alaska Airlines

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31,674	K12 Students
845	Professional Teachers
171	Undergraduate Students
159	Graduate Students
60	Lesson Plans
16	Education Publications

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## EDUCATION STATISTICS

SPEAK FOR THEMSELVES

## Moving from Invention to Commercial Reality

- Forest Residue Collection and Preparation
- Envisioning Integrated Facilities and Siting
- SPORL / MBS Pretreatment
- Alcohol to Jet

Demonstrating Feasibility with Technology Partners

Educating Citizens, Industry, Policy Makers

Advancing Supply Chain Development

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# THE ROLE OF NARA



## Spur Action in the Private Sector





## Muckleshoot Tribe - Washington

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**Louie Ungaro**  
Tribal Council Member

**MUCKLESHOOT**



## THANK YOU

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