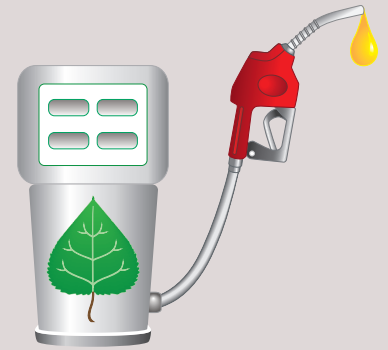




# Advanced **Hardwood Biofuels Northwest**

## Let's Talk About **AHB DROP-IN BIOFUELS**

Drop-In biofuels are liquid transportation fuels made from plant material. These fuels are chemically identical to petroleum-derived gasoline, diesel, and jet fuel. Drop-in biofuels could be used in the same engines and be stored in the same fuel supply infrastructure as fossil fuels.

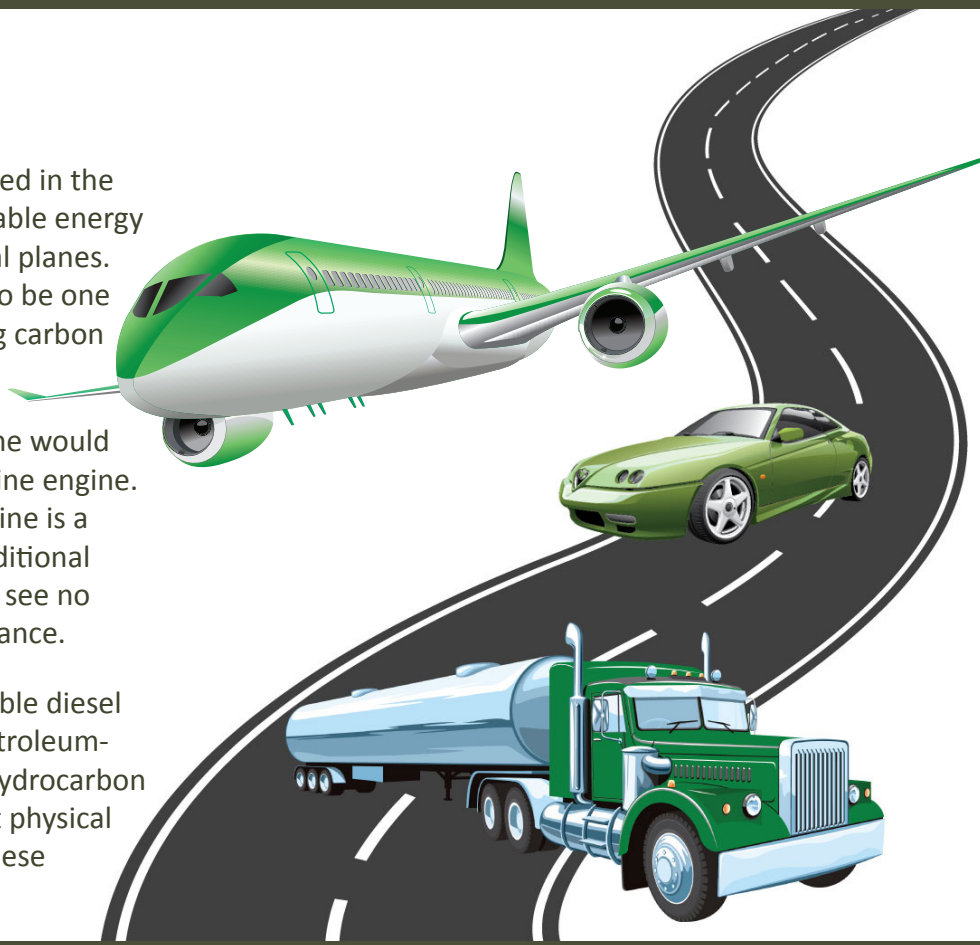


### ROAD READY FUELS

**Bio-Jet Fuel:** Drop-in biofuels are needed in the aviation sector where other forms of renewable energy are inefficient for powering large commercial planes. The aviation industry considers bio-jet fuel to be one of the more promising solutions for reducing carbon emissions.

**Biogasoline:** As a drop-in fuel, biogasoline would be certified to run in any conventional gasoline engine. Unlike ethanol, which is an alcohol, biogasoline is a hydrocarbon with properties that match traditional gas made from petroleum. Fuel users would see no notable difference in their vehicle's performance.

**Renewable Diesel:** Chemically, renewable diesel is a hydrocarbon and is no different from petroleum-based diesel. In contrast, biodiesel is not a hydrocarbon because it contains oxygen and has different physical properties than hydrocarbon diesel fuels. These differences can affect engine performance.



**Hydrocarbon fuels** are energy-rich organic compounds made only of hydrogen and carbon. Most of the transportation fuels we use today are hydrocarbon fossil fuels, which are not renewable and contribute excess carbon to the atmosphere. Instead, hydrocarbon fuels can be made from renewable biomass (plant material). In the conversion process, sugars are extracted from the biomass, fermented, and then reacted with hydrogen in a series of steps to produce renewable drop-in biofuels. Drop-in biofuels have significantly fewer carbon emissions compared to fossil fuels and they will work in vehicles already in use.

# DROP-IN BIOFUELS FOR THE PACIFIC NORTHWEST

Due to concerns about petroleum supplies and the emission of greenhouse gases into the atmosphere, conversion of biomass to fuels is becoming the focus of research and development efforts across the United States. In the Pacific Northwest, AHB is researching a drop-in biofuel supply chain where hybrid poplar trees grown as a dedicated bioenergy crop are converted to a suite of renewable chemicals and fuels.

Bio-jet fuel is thought to have the greatest market potential of poplar biofuels because of the fuel's high-energy content. As a drop-in biofuel, bio-jet fuel would consist of the same hydrocarbon molecules that are in petroleum-based jet fuel. While other renewable energy alternatives may be suitable to power car and trucks, such as electricity produced by wind and solar, airplanes will continue to require energy-dense, liquid hydrocarbon fuels.



The aviation industry is working to develop sustainable and economically viable bio-jet fuels. Photo credit: Alaska Airlines.

## AHB'S DROP-IN OBJECTIVE

The main objective of AHB is to research and develop renewable drop-in biofuels for the PNW. However, along the conversion pathway to drop-in biofuels other commodity chemicals and fuels are created. The most economically promising include acetic acid and cellulosic ethanol. These products can help a biorefinery be financially stable while it works towards scaling up to drop-in biofuels that are not yet economically competitive with fossil fuels. AHB's industry partner, ZeaChem is looking to produce these bioproducts in the short-term while working towards the production of drop-in biofuels that are economically competitive.

## Timeline for Drop-in Biofuel Research and Development in the Pacific Northwest

