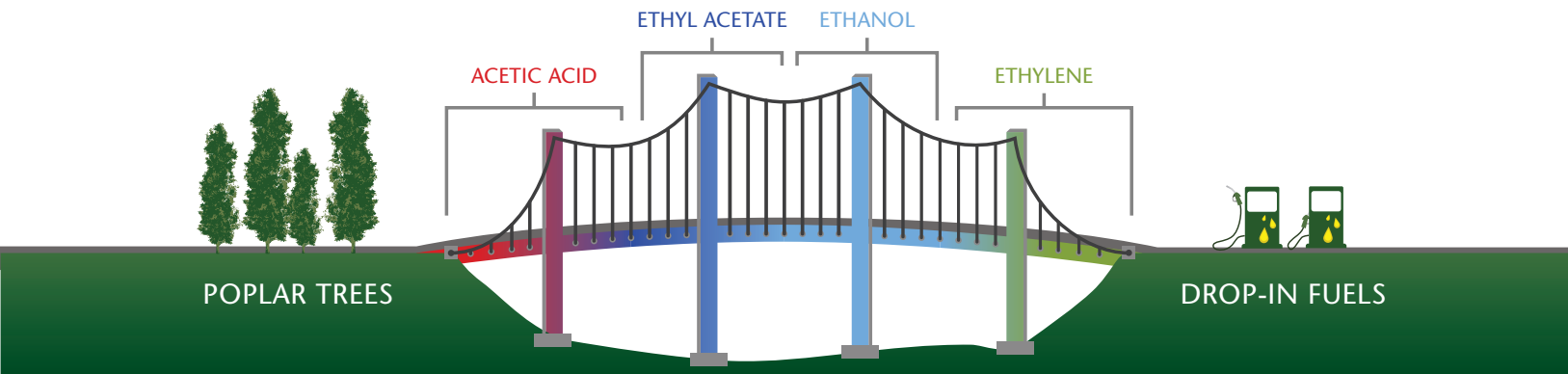


# Advanced **Hardwood Biofuels Northwest**

## Building the Bridge to Biofuels

April 2015



### ABOUT THE BRIDGE

Advanced Hardwood Biofuels Northwest (AHB), a consortium of university and industry partners, is developing renewable biofuels and bio-based chemicals from fast growing poplar trees.

Along the conversion pathway from poplar wood chips to drop-in fuels such as gasoline, diesel, and jet fuel, intermediate chemicals are produced. Each of these chemicals builds off of the previous, forming a metaphorical "bridge to biofuels." Acetic acid, ethyl acetate, ethanol, and ethylene (all building blocks of hydrocarbon fuels) can be sold on their own or can continue in the conversion pathway to become drop-in biofuels.

This "bridge to biofuels" allows biorefineries to scale up production as the market grows. Facilities can start with acetic acid or ethanol then add on additional units eventually producing drop-in biofuels.

The volatility of fuel prices creates a large financial risk for biorefineries. Chemicals, on the other hand, tend to have more stable prices and higher economic returns than fuels. By co-producing biochemicals and biofuels, the biorefineries are more resilient and can compete better in the marketplace.

### ACETIC ACID

Acetic acid is the foundation of the conversion process. It is used to make de-icing salts, wood glue, and synthetic fabrics. Most acetic acid is currently made from petroleum. Our industry partner, Zechem, has technology to produce acetic acid with excellent process yields and has plans to manufacture this important commodity chemical at its biorefinery in Boardman, OR. Unit operations can then be added downstream of acetic acid production to manufacture other high value chemicals and drop-in fuels.

### ETHYL ACETATE

Ethyl acetate is an environmentally friendly solvent used to remove nail polish, and decaffeinate coffee and tea.

### ETHANOL

Cellulosic ethanol is the simplest biofuel to make. It has a lower life cycle carbon intensity and requires much less fossil fuel to produce than corn ethanol. Cellulosic ethanol will be the other product initially manufactured by ZeaChem in Boardman, OR.

### ETHYLENE

The last section of the biofuels bridge is ethylene gas, which is a versatile chemical that is the backbone of the plastics we use every day.

### DROP-IN FUEL

Finally, ethylene gas molecules are linked together in short chains to build the larger hydrocarbon molecules required for fuels. In this way, drop-in biofuels virtually identical to petroleum derived gasoline, diesel fuel, and jet fuel can be made.

Rick Gustafson, University of Washington | (206) 543-2790 or pulp@uw.edu



United States Department of Agriculture  
National Institute of Food and Agriculture

[hardwoodbiofuels.org](http://hardwoodbiofuels.org)

This project is supported by an Agriculture and Food Research Initiative Competitive Grant no. 2011-68005-30407 from the USDA National Institute of Food and Agriculture (NIFA).