

Good morning. I am Chuck Red, Vice President of Fuels Development at ARA. ARA is a science and technology company with 1000 employee owners. ARA has conducted renewable fuel development since 2006.

The goal of my testimony today is to give you a snapshot of the future of second generation renewable fuels, what lies around the corner, and to discuss the role that the RFS plays in second generation renewable fuel development, commercialization, and industry growth.

Ethanol and methyl ester biodiesel are considered first generation alternative fuels. First generation fuels are characterized by small reductions in Green House Gas (GHG) emissions compared to petroleum fuels and are typically blended at low rates with petroleum.

ARA has focused our research, development and commercialization efforts on second generation alternative fuels. Our feedstocks are fats, oils, and greases. These feedstocks can be from waste sources such as brown grease from water treatment or grease traps, yellow grease/used cooking oil, and animal fats. Other sources of feedstocks include algae and industrial/non-food crop oils. Two promising non-food crop oils are Carinata, which is being commercialized by Agrisoma biosciences and Pongamia, which is being commercialized by Terviva. Crop oils such as Carinata can provide additional revenue for American farmers by growing it outside of food growing cycles.

We are teamed with Chevron Lummus Global, a fifty-fifty joint venture between Chevron and CBI Lummus, on the commercialization and licensing of our conversion process. This process is known as Biofuels ISOCONVERSION. Our process uses high temperature/high pressure, supercritical water to quickly convert fats, oils, and greases into a renewable crude oil. This oil, when hydrotreated, is a pure hydrocarbon with the same chemistry as petroleum, but without sulfur, nitrogen, or other impurities that produce atmospheric pollutants when combusted. Our process makes a 100% replacement for petroleum crude. Jet fuel and diesel fuel made with our technology meet all petroleum specifications, without blending. In 2012, National Research Council (NRC Canada) flew the first ever 100% biofuels flight that met all petroleum standards, using our jet fuel which we call Readijet. Readijet is a fuel that meets petroleum jet fuel standards, without blending. Our Readijet and Readidiesel fuels have been tested by numerous engine manufacturers including GE, Rolls Royce, Pratt and Whitney, and Honeywell. Our Readijet produces over 50% less emissions and black carbon than petroleum jet fuel while reducing lifetime greenhouse gas emissions by over 80%. In jet engine tests, Readijet was more efficient than its petroleum counterpart, requiring 1.5% less fuel to produce the same thrust.

Readijet and Readidiesel fuels are being certified as 100% drop-in fuels by the US Navy. In May, we delivered over 50,000 gallons of fuel for certification to the US Navy. We will deliver an additional 90,000 gallons of fuel to the US Navy in FY16.

ARA has cleared some of the toughest hurdles, and I am very proud of our team and thankful for all of the support that we have received from our many testing and feedstock partners. We are working at a 100 barrel per day scale with Blue Sun Energy, one of our licensees, at their

facility in St Joseph, MO. Taking new technology to commercial scale is perhaps the most challenging task of all. ARA and CLG now have four commercial licensees of our Biofuels ISOCONVERSION technology. Two have begun front end engineering and design. Each of our licensees is counting on the Renewable Fuels Standard as a risk reducer as they invest tens of millions of dollars to produce 100% drop-in ReadiDiesel, ReadiJet fuel, and other high value by-products, at scale.

Commercializing second generation renewable fuels is an important step in reducing US dependence on imported oil, through lower greenhouse gas emission domestic alternatives. Our technology is one of a number of pathways that can access waste feedstocks, producing fuels that have the promise of being cost competitive with petroleum. Two of our licensees, Aemetis and Blue Sun Energy, are currently operating plants producing first generation alternative fuels. They are the entrepreneurs that took the risk and successfully scaled up first generation alternative fuels. The Renewable Fuels Standard played an important role in providing support for the scaling of ethanol and biodiesel and for providing momentum for technology companies like ARA and Chevron Lummus Global to see a future for low greenhouse gas emission fuel solutions. Our momentum continues as we develop compelling solutions for production of these fuels that are cost competitive with petroleum, take advantage of waste and industrial oil feedstocks, and reduce greenhouse house emissions.

The Renewable Fuel Standard has been the main tool of US biofuels policy. It can continue to play that role in scaling second generation renewable fuels and feedstocks by continuing to increase volumetric obligations and by providing consistent policy which spurs investment in second generation fuel production facilities. We encourage Congress to continue to provide support for the Renewable Fuels Standard as it contributes to the investment in production and distribution of domestic, low-carbon, advanced biofuels.