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Good Morning, Chairmen Weber and Loudermilk and members of the Energy and Oversight Subcommittees

It is a pleasure to be here this afternoon to discuss the Renewable Fuel Standard, E15 and its particular impact on the recreational boating community. My name is Tim Reid, and I am the Director of Engine Design and Development at Mercury Marine, a division of the Brunswick Corporation, located in Fond du Lac, Wisconsin. Mercury Marine has been a manufacturer of recreational marine engines continuously since 1939, and currently makes and sells more engines than any other marine engine manufacturer in the world. I am here today to discuss the Renewable Fuel Standard, and E15 Fuels on behalf of the National Marine Manufacturers Association, which represents over 1500 boat builders, marine engine, and marine accessory manufacturers.

The vast majority of current production marine engines are open-loop with no capability to correct for oxygenated fuels. This is especially true for the in-use legacy fleet which is recognized to be 40 years old. The key point to remember when considering ethanol blending, is its effect as an oxygenator. On a typical marine engine, this additional oxygen makes the fuel burn hotter, and the higher temperatures can reduce the strength of the metallic components. Run quality issues can also occur when the engine operates leaner than its combustion system limits. In addition, ethanol can cause compatibility issues with materials in the fuel systems because of the chemical interaction.

A study conducted by DOE, NREL and Volvo Penta showed that the 4.3L sterndrive engine, when durability tested on E15, exhibited emissions degradation beyond its certifications limit. In addition, throughout its testing the engine exhibited poor starting characteristics during both hot restart and cold-start conditions.

While I discuss the findings of another E15 study, I'd like to show you a few photos of the engine components after endurance testing to illustrate the results.

A similar study conducted by DOE, NREL, and Mercury Marine was completed to investigate emissions, performance and durability of running a 15% ethanol blend on outboard marine engines during 300 hours of wide open throttle (WOT) endurance testing—a typical marine engine durability test. Three separate engine families were evaluated. A 9.9 HP carbureted four-stroke engine and a 300 HP supercharged electronic fuel injected (EFI) four-stroke engine represented engines currently in production. A 200 HP electronic fuel injected (EFI) two-stroke engine was chosen to represent the legacy products still in widespread use today.

Only one engine tested on E15 completed 300 hours without failure. Test results showed poor run quality, including misfires at the end of the test causing an increase in exhaust emissions. In addition, there were increased carbon deposits in the engine on the underside of the pistons and on the ends of the connecting rods clearly exhibiting higher operating temperatures. Additionally, deterioration of the fuel pump gasket was evident, likely due to material compatibility issues with the fuel blend. This deterioration of the gasket could lead to fuel pump failure, disabling the engine.

The other two engines tested on E15 catastrophically failed prior to completing the endurance test. One engine failed a rod bearing and the other failed 3 exhaust valves. Critical engine components like pistons and connecting rods again documented increased temperatures due to running on E15.

E15 does not only deteriorate the engine but also puts the boat fuel system at risk. While studies have been conducted on E15 in engines, marine fuel tanks and fuel lines were never tested, or certified, for use in anything over E10. Prior to 1990, they were not even certified for E10. Deteriorated fuel lines inside boat hulls could lead to fuel leakage and a greater risk for fire or explosion. Marine fuel systems, prior to 2012, were completely open vented, so E15 would dramatically increase evaporative emissions as ethanol increases fuel volatility, especially if the RVP waiver is allowed. E15 creates a higher probability of phase separation with water in the fuel tank resulting in a greater chance of disabling the boat engines and stranding a boater out on the open water.

NMMA and the marine industry are not opposed to all ethanol fuel blends. We feel however, that the RFS is a deeply flawed legislative mandate which is leading this country in a direction that will significantly harm not only marine engines, but other non-road engines and automobiles, and in turn the consumers of these products. The overwhelming majority of non-road engines, from chainsaws to weed trimmers to lawn mowers, operate similarly to recreational marine engines with open loop fuel systems including a carburetor that is set at the factory and designed to be—and required by EPA to be—tamper proof.

When the fuel changes in the marketplace and additional oxygenates are added—such as by going from E10 gasoline to E15—engines run hotter, causing serious durability issues and increased emissions either in the form of increased Nitrogen Oxides or increased hydrocarbons. The absurdity of it all is, by using higher ethanol blends to achieve the mandates of the RFS, we are actually increasing emissions and lowering efficiency. Driven by a mandate rather than sound science, EPA has allowed E15 to be sold in the marketplace even with documented studies showing engine failures.

NMMA is not anti-ethanol, but simply opposed to fuel blends that will destroy our engines. For the past five years, NMMA, Mercury Marine, Honda, and the United States Coast Guard, along with the US Department of Energy, Argonne National Laboratories, and BRP/Evinrude have been proactively working to evaluate a better alternative to ethanol, both as an oxygenate and a biofuel. Isobutanol has an energy content closer to that of gasoline, making it more compatible with existing engines and fuel systems. Isobutanol, is considered an advanced biofuel in the RFS and can be produced from many different types of biomass feedstock, including corn. NMMA has conducted tests on a variety of marine engines and vessels using 16.1% isobutanol by volume, which has similar oxygen content to E10, avoiding the negative properties of E15 identified above. The results of our documented and published research thus far indicate that isobutanol at 16.1% by volume yields very similar engine emissions, durability, power and performance as E10.

As an engineer intimately aware of the negative effects of high ethanol fuel, I can say the move towards E15 and possibly even higher blends, to achieve the 36 billion gallon requirement of the RFS is flawed.

Rather than continue on a biofuel path that does nothing for lowering emissions and harms our engines, I believe we must freeze the ethanol content of gasoline at its current level of 10% by volume and look towards alternative energy sources that make sense for the engines which must run on them.

Unless and until Congress acts on the RFS, EPA will continue to implement the deeply flawed RFS without regard to its ramification on engines or consumers. This is a nonsensical path that creates a fuel supply incompatible with engine technology which destroys engines, increases emissions, and puts boat fuel systems in jeopardy.

NMMA supports Congressman Goodlatte's bill, H.R. 704, and believes it takes the appropriate steps to amend the Renewable Fuel Standard by freezing ethanol at E10 and makes other needed changes to assess our biofuel needs. I strongly urge members of this committee to take a serious look at the RFS and move steadfast in reforming this ill-advised mandate.

I appreciate the opportunity to come before this committee today and am happy to answer any additional questions.