Discussion Paper

Proposed Alternative Diesel Fuel Regulation "Biodiesel Use" Provisions

Introduction

Biodiesel is a renewable diesel fuel substitute that is mostly produced in the United States. It is frequently produced from waste feedstocks such as use cooking oil, brown grease and animal tallow. Chemically, biodiesel is a mixture of fatty acid alkyl esters, distinct from conventional diesel and renewable diesel which are hydrocarbons. Its use has grown significantly in the last ten years, and it is expected to continue to grow as the current federal Renewable Fuel Standard (RFS2) and the Low Carbon Fuel Standard (LCFS) incentivize fuel options with greenhouse gas (GHG) benefits. The proposed Alternative Diesel Fuel (ADF) regulation is intended to provide a viable pathway for emerging diesel fuel substitutes and to manage and minimize any potential environmental and public health impacts associated with diesel fuel substitutes while realizing their associated benefits.

This discussion paper focuses solely on the biodiesel provisions within the proposed ADF regulation. It summarizes staff's recent analysis of the emissions associated with biodiesel use and how that analysis affects staff's proposal for biodiesel mitigation.

In general, this biodiesel use proposal is expected to:

- Result in local and area-wide air quality benefits, compared to existing fuel use
- Preserve anticipated benefits from existing fuels policies
- Support progress under the State Implementation Plan (SIP)
- Promote low GHG fuels
- Provide a practical approach to NOx control while sustaining the current benefits of the biodiesel industry
- Result in a simplified and enforceable approach
- Work synergistically with mobile source control measures

Biodiesel Blend Emissions from ARB Testing and Scientific Literature

Based on staff's analysis of the available scientific data, the following table summarizes the emissions impacts stemming from biodiesel use by feedstock. The table excludes New Technology Diesel Engines (NTDEs), light-duty vehicles, and medium-duty vehicles which have not shown NOx impacts at these blend levels. Specifically, NTDEs (2010 and newer model year heavy-duty diesel engines) do not show higher NOx emissions with biodiesel blends up to B20 when compared to the same engines using conventional diesel fuel.

Emissions Impacts of Biodiesel Blends Compared to CARB Diesel*

Blend Level	Saturation Level[1]	NOx	PM
B5	Low	1%	-6%
	High	-1%**	
B10	Low	2%	-10%
	High	0**	
B20	Low	4%	-18%

* Data representative of heavy-duty non-NTDEs only; NTDEs not expected to increase NOx emissions

**Not statistically significant

Staff's understanding of biodiesel emissions informs both the calculations of excess NOx emissions and PM reductions, as well as staff's proposed regulatory NOx mitigation triggers.

Alternative Diesel Fuel Regulation Proposal for Biodiesel Provisions

The preliminary ADF proposal released in August, as part of the Standardized Regulatory Impact Assessment process, focused on a B1 significance threshold for soy-based biodiesel and B5 for animal-based biodiesel. The proposal, based on available engine data, individual mitigation for biodiesel sold above those levels. That initial proposal utilized a simple regulatory structure for the economic analysis, but did not consider the positive impacts of NTDEs and renewable diesel on the need for mitigation. Staff has further analyzed these offsetting effects and refined its biodiesel proposal as outlined below.

To develop a proposal that considers the range of factors in the commercial market which affect NOx emissions from diesel engines, staff has evaluated the impact of NTDEs, which do not show increased NOx with biodiesel use, as well as the reductions of NOx associated with renewable diesel, which is increasing in use in California in response to the low carbon fuel standard. Staff's analysis was designed to determine a biodiesel significance threshold for NOx, or a blend level below which it is expected there are no increases in environmental NOx. Staff's analysis suggests that existing trends regarding use of NTDEs and renewable diesel supports a significance threshold of B5 for low saturation biodiesel, and B10 for high saturation biodiesel.

For biodiesel blends below the significance level, we term them as a "safe harbor" blend level because considering the presence of NTDE engines and renewable diesel fuels in the market, their use would not have a net impact to NOx emissions in the environment,

[1] Note: we are proposing to move from feedstock determination of soy or animal derived to a more easily enforceable and implementable metric of low saturation (i.e., derived from soy oil feedstocks, Cetane Number (CN) < 56) and high saturation (i.e., derived from animal tallow feedstocks, CN ≥ 56).

thereby negating the need for a per gallon mitigation for use of biodiesel blends up to the safe harbor blend level. In addition, per gallon mitigation would be required for use of blends higher than B5 low-saturation or B10 high-saturation. Staff has also received comments that potential negative air quality impacts associated with biodiesel are only related to summer-time ozone, and therefore a higher B10 fuel for all biodiesel blendstocks should be considered during the low ozone season.

The net effect of the proposal is to reduce NOx impacts from biodiesel, even assuming increased biodiesel volumes over the subsequent years. Impacts under the proposal are less than the current impacts and will continue to decrease over time. ARB believes this proposal provides the maximum feasible level of mitigation while still achieving the important greenhouse gas, particulate matter, and volatile organic compound reductions of biodiesel.

See Appendix A for the detailed proposal.

Emission Impacts from Staff Proposal:

The volume of reported biodiesel used in California in 2013 was 59 million gallons which equates to 1.7 percent (i.e., B1.7) relative to total CARB diesel use in today's market. The emissions impacts associated with this level of biodiesel in California are approximately 1.3 tons per day of NOx increase and 0.37 tons per day of PM decrease, statewide. These impacts are factoring in the impacts of NTDEs (31% of diesel use in 2013) and renewable diesel (100 million gallons in 2013).

The LCFS, as well as the federal RFS2, will incentivize additional biodiesel and renewable diesel growth in the coming years. The emission impacts due to biodiesel are related directly to the amount of biodiesel used but inversely related to the number of NTDE vehicles using that biodiesel. Even as biodiesel use increases over time, any incremental NOx emissions will be less due to the increased number of NTDEs on the road. Renewable diesel use will further reduce NOx emissions, partially offsetting NOx emissions attributable to biodiesel use.

The staff has determined that in parallel with the growth of NTDEs and renewable diesel, biodiesel volumes can increase to B5 with no additional NOx emissions impacts. The increase in biodiesel use, however, will have increased GHG and PM benefits. B5 is also an appropriate value for two practical reasons: 1) the current ASTM D975 diesel fuel specification allows up to 5 percent biodiesel, and 2) the existing fuels distribution infrastructure can accommodate up to a B5 blend with CARB diesel. In subsequent years, any NOx emission impact associated with biodiesel will be less than any such impact that is now occurring, and will continue to be further reduced mainly as NTDEs continue to expand in the fleet. Staff's proposal ensures biodiesel use does not accelerate in a manner that will increase unmitigated NOx emissions. The proposal will result in continued reductions in NOx emissions until such time as the near-universal presence of NTDEs allow essentially unrestricted biodiesel use free of incremental NOx impacts.

Biodiesel blends reduce PM emissions and the associated health risk. This proposal maintains a viable biodiesel industry to continue these emission reductions and health benefits.

Impact on Ambient Air Quality

Biodiesel is not expected to have an impact on the 0.08 ppm federal 8-hr ozone standard attainment deadline in 2023 due to the nearly universal use of NTDEs expected at that time. In addition, while both NOx and PM contribute to ambient PM, biodiesel is expected to provide a net benefit in meeting federal PM ambient air quality standards due to the significant reductions of directly-emitted PM.

Appendix A

Proposed ADF Biodiesel Use Provisions

- Recognize biodiesel made from soy feedstocks as low saturation (i.e., B100 with cetane <56) and biodiesel made from animal feedstocks as high saturation (i.e., B100 with cetane ≥56).

- Establish significance thresholds of B5 for low saturation biodiesel, and B10 for high saturation biodiesel to ensure NOx impacts associated with biodiesel use do not increase and steadily decrease. Allow "Safe Harbor" blending below the significance threshold without the need for additional NOx mitigation.

- Increase Safe Harbor to B10 for all biodiesel blendstocks throughout the State in Low Ozone Season (November to April).

- Provide exemptions to NOx mitigation requirements for:
    - Light and medium duty vehicles (under 14,500 pounds GVWR).
    - New Technology Diesel Engines for biodiesel blends up to B20

- Implementation Dates
    - January 1, 2016 – Establish reporting requirements
    - January 1, 2018 – Impose mandatory NOx mitigation for blends above Safe Harbor. Staff believes the two-year lead-in is needed to provide industry time to invest in necessary infrastructure (for additive handling and mixing capability), certification of potential new mitigation options, or changes to business practices to focus on exempt fleets
    - NOx mitigation sunsets when the NTDE fleet penetration accounts for 90 percent of all statewide vehicle miles travelled, which is expected to occur at the end of 2022.