

**Memorandum**

July 21, 2009

To: Travel Management Subcommittee

From: Erin Morrow, COG/DTP

Subject: Impacts of Proposed Renewable Fuel Standard on Criteria Pollutant Emissions

On May 26, 2009, EPA issued a notice of proposed rulemaking for “Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standards Program”. EPA is required by the Clean Air Act (CAA) to “promulgate regulations implementing changes to the Renewable Fuel Standard program.” The existing Renewable Fuel Standard Program (RFS1) “was originally adopted by EPA to implement the provisions of the Energy Policy Act of 2005.” According to USDA renewable fuel is defined as fuel grade ethanol and bio-diesel, and biomass is defined as “plant-derived material”.

The proposed Renewable Fuel Standard (RFS2) is defined by the Energy Independence and Security Act of 2007 (EISA). RFS2 “mandates the use of 36 billion gallons of renewable fuel annually by 2022” with 16 billion of those gallons being cellulosic biofuel. This is a significant increase from the current use of 6.9 billion gallons of biofuel use in 2008, and change in focus compared to the RFS1 mandate of 7.5 billion gallons of renewable fuel use by 2012, which was estimated to include 6.7 billion gallons of ethanol, and the Annual Energy Outlook 2007 (AEO2007) projection of 13.2 billion gallons of ethanol in 2022. RFS2 contains three subcategories of renewable fuels, advanced biofuel (fuel obtained from recently lifeless biologic material), cellulosic biofuel (fuel produced from cellulose which is much of the mass of plants), and biomass-based diesel (i.e., diesel from plant derived oil), which have their own minimum requirements. Tables 1 and 2 show the renewable fuel requirements by volume and percentage, respectively. It is important to note that not all alternative fuels (CNG, LPG) are renewable fuels.

**Table 1: Renewable Fuel Volume Requirements for RFS2**

TABLE II.A.1-1—RENEWABLE FUEL VOLUME REQUIREMENTS FOR RFS2  
 [Billion gallons]

	Cellulosic biofuel requirement	Biomass-based diesel requirement	Advanced biofuel requirement	Total renewable fuel requirement
2009	n/a	0.5	0.6	11.1
2010	0.1	0.65	0.95	12.95
2011	0.25	0.80	1.35	13.95
2012	0.5	1.0	2.0	15.2
2013	1.0	<sup>a</sup>	2.75	16.55
2014	1.75	<sup>a</sup>	3.75	18.15
2015	3.0	<sup>a</sup>	5.5	20.5
2016	4.25	<sup>a</sup>	7.25	22.25
2017	5.5	<sup>a</sup>	9.0	24.0
2018	7.0	<sup>a</sup>	11.0	26.0
2019	8.5	<sup>a</sup>	13.0	28.0
2020	10.5	<sup>a</sup>	15.0	30.0
2021	13.5	<sup>a</sup>	18.0	33.0
2022	16.0	<sup>a</sup>	21.0	36.0
2023+	<sup>b</sup>	<sup>b</sup>	<sup>b</sup>	<sup>b</sup>

<sup>a</sup> To be determined by EPA through a future rulemaking, but no less than 1.0 billion gallons.  
<sup>b</sup> To be determined by EPA through a future rulemaking.

**Table 2: Renewable Fuel Percentage Requirements for RFS2**

TABLE III.E.1.c-1—PROJECTED STANDARDS UNDER RFS2  
[percent]

	Cellulosic biofuel	Biomass-based diesel	Advanced biofuel	Renewable fuel
2011	0.15	0.49	0.83	8.60
2012	0.31	0.61	1.22	9.31
2013	0.61	0.61 <sup>a</sup>	1.68	10.09
2014	1.07	0.61 <sup>a</sup>	2.28	11.05
2015	1.83	0.61 <sup>a</sup>	3.35	12.48
2016	2.58	0.61 <sup>a</sup>	4.40	13.49
2017	3.34	0.61 <sup>a</sup>	5.46	14.56
2018	4.25	0.61 <sup>a</sup>	6.68	15.80
2019	5.19	0.61 <sup>a</sup>	7.95	17.11
2020	6.47	0.62 <sup>a</sup>	9.25	18.50
2021	8.40	0.62 <sup>a</sup>	11.21	20.54
2022	10.07	0.63 <sup>a</sup>	13.21	22.65

<sup>a</sup> These projected standards represent the minimum volume of 1.0 billion gallons required by EISA. The actual volume used to set the standard would be determined by EPA through a future rulemaking.

The analysis for the impact of RFS2 was calculated using a lifecycle analysis, also known as a well-to-wheels analysis, for each fuel type because much of the focus of the proposed rulemaking is on the effect of renewable fuels production and usage on greenhouse gas (GHG) emissions. EISA sets required thresholds for lifecycle GHG reductions from a 2005 gasoline or diesel baseline shown in Table 3.

**Table 3: Required Lifecycle GHG Thresholds**

TABLE III.B.2-1—REQUIRED LIFECYCLE GHG THRESHOLDS  
[Percent reduction from a 2005 gasoline or diesel baseline]

Renewable fuel	20
Advanced biofuel	50
Biomass-based diesel	50
Cellulosic biofuel	60

The RFS2 program is predicted to significantly reduce GHG emissions based on lifecycle analysis; however, according to EPA, “the increased use of renewable fuels would also impact criteria pollutant emissions such as volatile organic compounds (VOC) and nitrogen oxides (NOx) expected to increase and other pollutants such as carbon monoxide (CO) and benzene expected to decrease.”

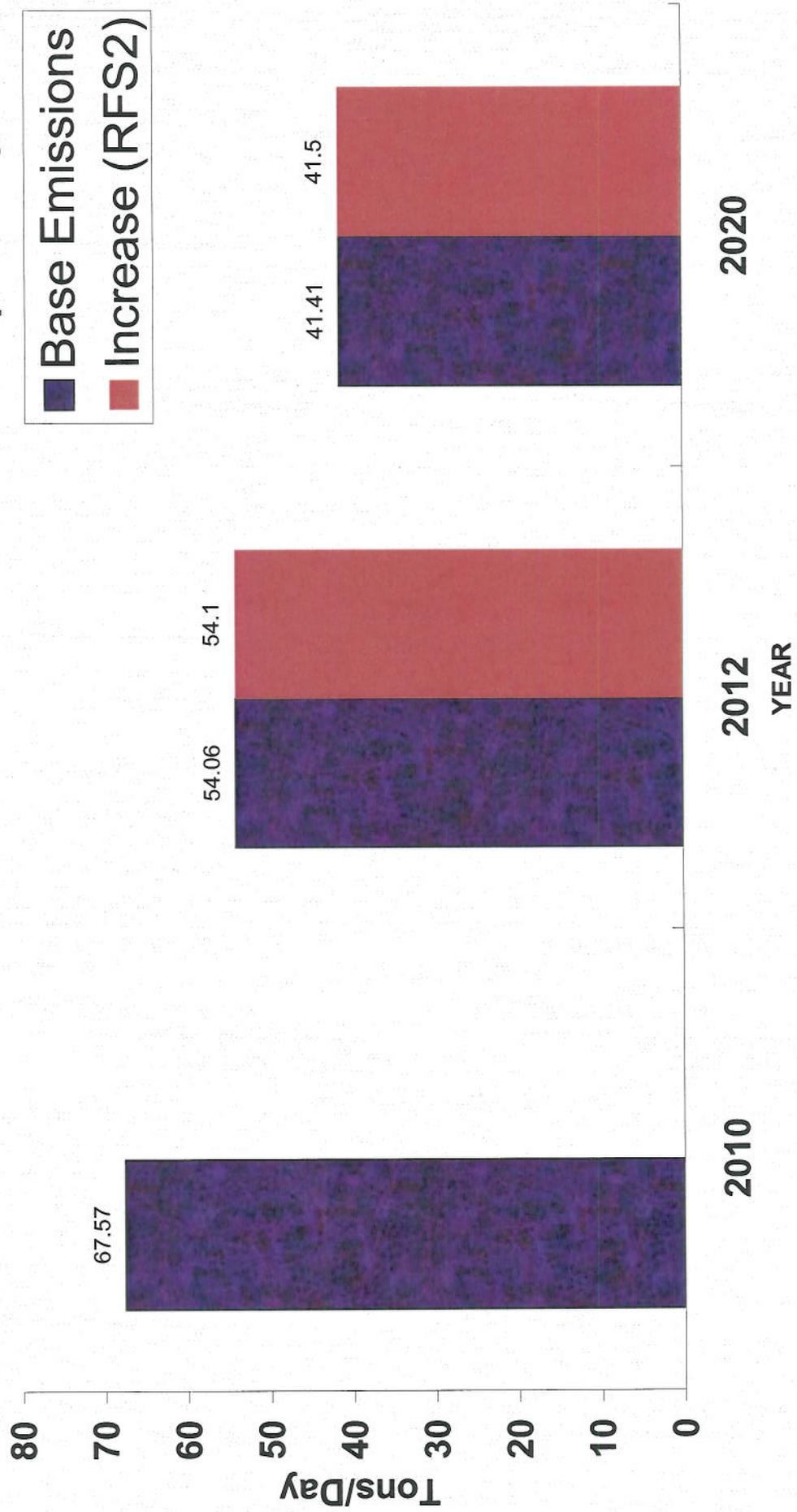
EPA has provided emissions projections for the year 2022 comparing RFS2 to the RFS1 mandate. In order to calculate tailpipe and evaporative emissions for on and off road vehicles “sources have been estimated by incorporating ‘per vehicle’ fuel effects from recent research into mobile source emission inventory estimation methods.” In addition to exhaust emissions, the vehicle and equipment emission impacts of the fuel program include evaporative emissions from cars and trucks, off-road emissions, and portable fuel containers.

The effects of RFS2 on nationwide emissions may or may not be a good indicator of how emissions will be impacted in the Washington, DC region. Compared to the RFS1 mandate, in 2022, national annual NOx emissions will increase between 0.5% and 1.1% and HC emissions will increase 0.2% to 0.15% based on the “less sensitive” and “more sensitive” scenarios, respectively. For total lifecycle emissions, which include fuel production and distribution, national annual NOx emissions will increase between 2.5% and 3% and HC emissions will increase 0.6%. The “less sensitive” and “more sensitive” scenarios refer to the “sensitivity of car and truck emissions to both E10 and E85 blends.” EPA is continuing to study the impacts of ethanol fuel on the more sensitive later model vehicles and will “plan to consider in updating our final rule analysis.”

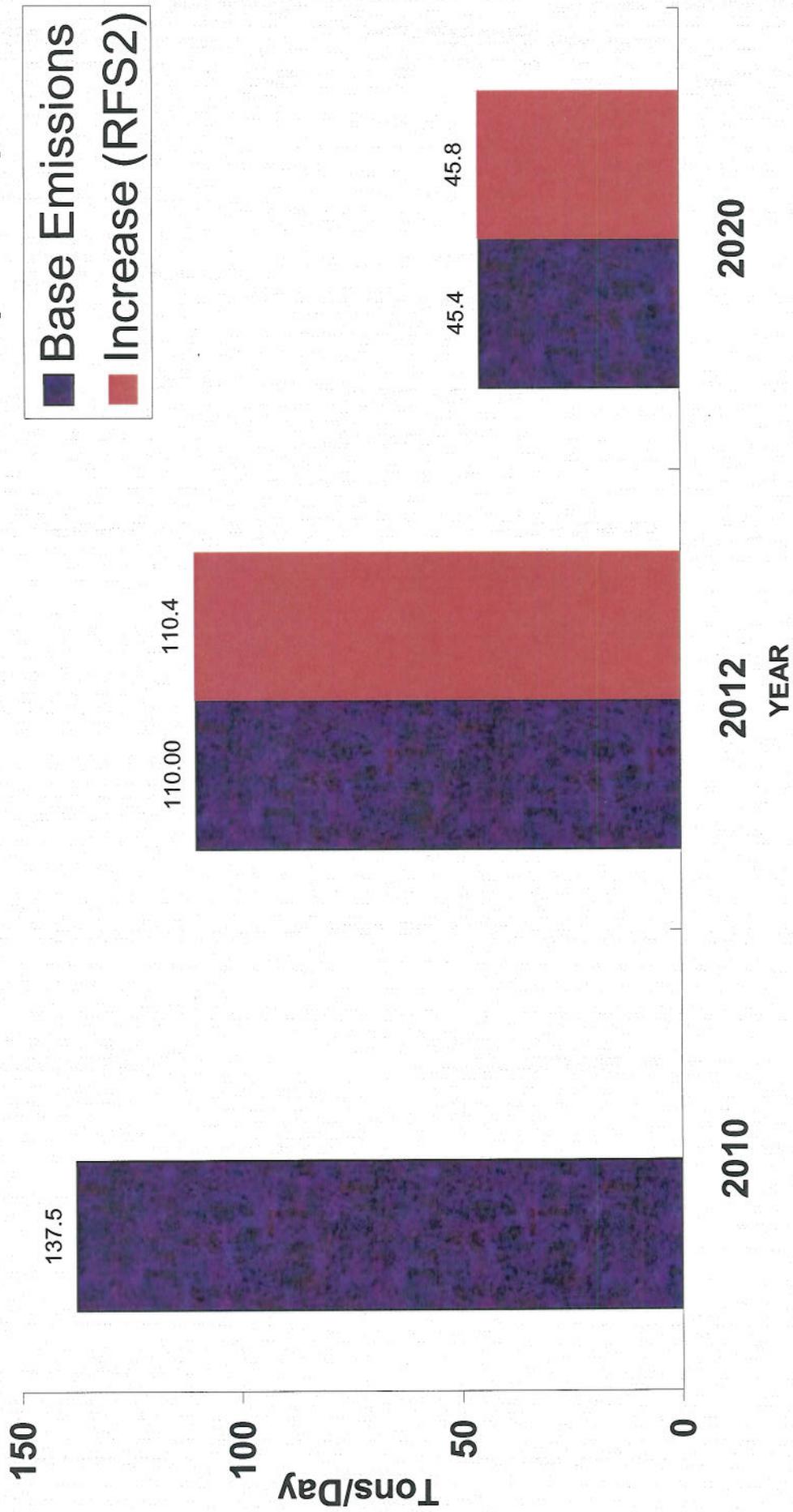
Attached are three charts showing the impacts of alternative fuels in the region on VOC, NOx, and GHG if we assume the ‘national average’ impacts occur in the Washington region. The 1<sup>st</sup> and 2<sup>nd</sup> chart reflect the results of applying the upper end, emissions increase percentages to our existing VOC and NOx inventory forecasts. The 3<sup>rd</sup> chart is taken from data prepared under the TPB scenario task force’s “What Would It Take” scenario.

Attachments

# Mobile Source VOC Emissions for the 8-Hour Ozone Nonattainment Area 2009 CLRPP and FY 2010-2015 TIP with Renewable Fuel Standard 2 (RFS2)



# Mobile Source NOx Emissions for the 8-Hour Ozone Nonattainment Area 2009 CLRPP and FY 2010-2015 TIP with Renewable Fuel Standard 2 (RFS2)

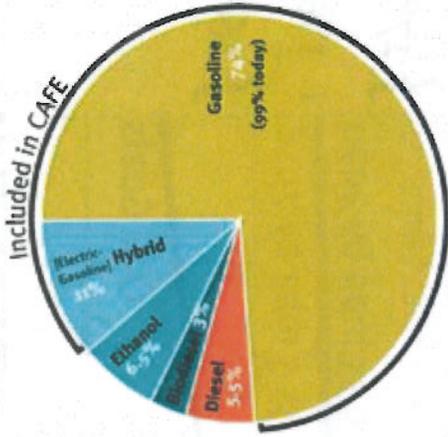


# Achieving the Goal

40% reduction in mobile CO<sub>2</sub> emissions below 2005 levels by 2030

<b>Fuel Efficiency</b> Beyond CAFE standards	<b>Fuel Carbon Intensity</b> Alternative fuels (biofuels, hydrogen, electricity)	<b>Travel Efficiency</b> Reduce VMT through changes in land use, travel behavior, prices Reduce congestion Improve operational efficiency
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## Alternative Fuels



2030

Source: US DOE, EIA, Annual Energy Outlook (AEO) 2008

