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Asunto: Comentarios sobre el Anteproyecto PROY-NOM-016-CRE-2016
Datos adjuntos: PROY-NOM-016-CRE-2016 Executed Valero Comments Spanish Version.pdf; PROY-NOM-016-CRE-2016 Executed Valero Comments English Version.pdf

Señores y Señoras:

Adjunto encuentre nuestros comentarios con Anexos, en Español e Inglés, respeto al Anteproyecto de la Normal Oficial Mexicana PROY-NOM-016-CRE-2016, Especificaciones de Calidad de los Petrolíferos para emitir en el portal de la Comisión de Mejora Regulatoria. Por favor avise si algo mas es necesario para finalizar estos documentos. Porfavor confirme que estos documentos conformen al expediente No. 65/0025/280416. Agradecemos la oportunidad de ofrecer nuestro punto de vista y estamos a sus órdenes para ampliar nuestros comentarios en caso requerido.

Ladies & Gentlemen:

Attached please find our comments with attachments, in Spanish and English, with respect to the Draft Mexican Official Standard PROY-NOM-016-CRE-2016, Qualify Specifications of Petroleum Products for submission to the Committee of the Energy Regulatory Commission of the CRE. Please advise if anything else is required to finalize this submission. Please confirm that these documents will be added to File No. 65/0025/2804160. We appreciate the opportunity to offer our point of view and we remain available to elaborate on our comments should it be requested.

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COMISIÓN FEDERAL
DE MEJORA REGULATORIA
CONTROL DE GESTIÓN
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VALERO™

7 de julio de 2016

Dr. Alejandro Breña de la Rosa
Secretario Técnico
Comité Consultivo Nacional de Normalización de Hidrocarburos, Petrolíferos y Petroquímicos
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Asunto: Comentarios sobre el Proyecto de Norma Oficial Mexicana PROY-NOM-016-CRE-2016, *Especificaciones de Calidad de los Petrolíferos*

Estimado Dr. Breña de la Rosa:

Valero Marketing and Supply Company de México, S.A. de C.V. ("Valero") se complace en haber participado con la Comisión Reguladora de Energía ("CRE") en el tema del Proyecto de la Norma Oficial Mexicana que regula las especificaciones de calidad de los productos petrolíferos ("Proyecto de NOM"), y agradece la oportunidad de presentar sus opiniones con el fin de asistir a la CRE en su mandato de promover un desarrollo eficiente de la industria energética en México, promoviendo la competencia para el suministro de productos en el mercado de combustibles en México, supervisando la fiabilidad, estabilidad y seguridad de dicho suministro, y al mismo tiempo proteger los intereses de los consumidores.

Valero Marketing and Supply Company de México es la subsidiaria mexicana de Valero Energy Corporation ("Valero Energy") recientemente constituida la cual a través de sus diversas subsidiarias es el mayor refinador de petróleo independiente del mundo y un comercializador internacional de combustibles para equipo de transporte y productos petroquímicos. Las 15 refinerías de petróleo de Valero Energy (propiedad de y operadas por subsidiarias de Valero Energy) tienen una capacidad combinada de aproximadamente 3 millones de barriles por día, y Valero Energy cuenta con la mayor capacidad de cualquier refinería en la región del Golfo de Mexico. Como tal, Valero siente que mantiene una posición única para contribuir a la política de diversificación de suministro de petróleo de México al contribuir un suministro seguro, estable y tasable de petróleo a México, y al mismo tiempo aprovechar las oportunidades de negocios presentadas por la reforma energética integral de dicho país. Con esto en mente, Valero por medio del presente respetuosamente presenta estos comentarios y sugerencias a las normas propuestas por la CRE establecidas en el Diario Oficial de la Federación el 12 de mayo de 2016.

(1) Especificaciones de la gasolina

A. Armonización de las especificaciones de oxigenados en el Golfo de Mexico

Un objetivo principal de los comentarios de Valero es el enfatizar que se puede crear una mayor competencia para el suministro de gasolina en el mercado mexicano mediante la armonización de las especificaciones de la gasolina a las actualmente existentes para la mayoría del mercado de la gasolina en los Estados Unidos de América.

En relación al contenido de oxigenados, en los Estados Unidos de América cerca del 100% de la gasolina se mezcla con 10% de etanol. Como resultado, los componentes base de la gasolina regular y premium (es decir, el componente de petróleo sin oxigenar – comúnmente referido como Combustible Mezclado Convencional para la Mezcla de Oxigenados ("CBOB", por sus siglas en inglés: *Conventional Blendstock for Oxygenate Blending*") y Combustible Mezclado Premium para la Mezcla de Oxigenados ("PBOB", por sus siglas en inglés: *Premium Blendstock for Oxygenate Blending*)) son ampliamente comercializados y se encuentran disponibles en todo el mercado del Golfo de Mexico. En base a su experiencia Valero considera que una de las formas más viables de suministrar la gasolina producida en los Estados Unidos de América en el norte de México sería enviando los componentes CBOB y PBOB por separado a las terminales ubicadas al norte de la Ciudad de México que también pudieran recibir el etanol por ferrocarril. Entonces, como en los Estados Unidos de América, el etanol podría ser mezclado en proporción al volumen del 10% en los camiones de reparto en dichas terminales.

Aunque nuestras refinerías del Golfo de Mexico, incluyendo todas las refinerías de Valero Energy, son capaces de producir la calidad de la gasolina necesaria para el mercado mexicano tal y como se establece en el Proyecto de la NOM, el requisito para producir un componente para mezcla especializado y la falta de infraestructura logística dedicada a la mezcla y entrega de la gasolina con un contenido de etanol diferente al que más prevalece en los Estados Unidos de América podría reducir la oferta disponible, lo que consecuentemente puede reducir la competencia y resultar en un aumento de la volatilidad de los precios.

La especificación mexicana actual, mencionada en la Tabla 6 del Proyecto de NOM, *Especificaciones adicionales de gasolina por región*, tiene un máximo de 2.7% de masa de oxígeno, que es equivalente a ~7.5% de volumen de etanol. Valero propondría la modificación de esta especificación para permitir una mezcla de hasta un volumen de 10% de etanol (4.0% de masa de oxígeno máximo), el mismo que en las normas y especificaciones de la Agencia de Protección Ambiental ("EPA", por sus siglas en inglés: *Environmental Protection Agency*). Valero indica que las especificaciones actuales de la gasolina de los Estados Unidos de América requieren un volumen del 10% de mezcla de etanol, lo que tiene un promedio de 3.5% de masa de oxígeno, pero la EPA permite hasta 4.0% de masa de oxígeno para permitir la variación en la densidad de la gasolina base.

La CRE ha expresado preocupación en que el permitir mezclas de oxígeno mas altas podría resultar en un aumento en el ozono troposférico y ha solicitado que Valero proporcione cualquier información de su conocimiento para mitigar dichas preocupaciones. En respuesta, Valero señala un estudio de la EPA que analizó los efectos de una mezcla de etanol de 10% en las emisiones de escape.[1] El estudio concluye que si bien puede haber un ligero aumento en las emisiones de hidrocarburos sin metano ("NMHC", por sus siglas en inglés: *Non-Methane Hydrocarbons*") y óxidos de nitrógeno ("NOx, por sus siglas en inglés: *Nitrogen Oxides*"), en dicho nivel de mezcla una mezcla de etanol de 10% ("E10") no tuvo un efecto "estadísticamente significativo" en las emisiones de NMHC o NOx en relación a la gasolina que no contiene etanol ("E0").[2]

Valero también señala que la especificación de azufre en la gasolina de los Estados Unidos de América se reducirá a un promedio de máximo 10 partes por millón ("ppm") cuando los requerimientos de Nivel 3 de la EPA entren en vigor a partir del 2017, en comparación con la especificación de azufre propuesta en el Proyecto de NOM de 30 ppm en promedio y 80 ppm como máximo. Cuando ocurra esta transición en los Estados Unidos de América y las refinerías de los Estados Unidos de América estén sujetas a esta nueva especificación de menos azufre, se espera que la mayoría de las exportaciones de gasolina a México también (debido a las limitaciones de eficiencia e infraestructura) cumplan con esta especificación de menor azufre. Esta reducción en el contenido de azufre tendrá beneficios significativos en relación a la reducción de emisiones con respecto al ligero y estadísticamente no significativo aumento en las emisiones que pudieran resultar por mezclar 10% en comparación con 7.5% en volumen de etanol en la gasolina.

B. Ventajas de la Armonización

Mayor disponibilidad de productos – En el curso normal de operaciones, las refinerías y el sistema de procesos de distribución de los Estados Unidos de América no necesariamente están configurados para consistentemente manejar múltiples grados de gasolina (es decir, CBOB y PBOB para mezclarse con un contenido menor de etanol al estándar de los Estados Unidos de América), ya que los tanques segregados y la infraestructura de distribución están limitados. Al incrementar el % del contenido de oxígeno para permitir un volumen de etanol del 10%, los grados comunes y fungibles de gasolina de los Estados Unidos de América cumplirán con las especificaciones mexicanas. A este fin, la gasolina mexicana no sería una "gasolina boutique" o con grado de especializad no fungible, por lo que más productos estarían disponibles para su importación al mercado mexicano.

Mas competencia – Si se armonizan las especificaciones, todas nuestras refinerías del Golfo de Mexico serían capaces de cumplir con el grado mexicano. Esto evitaría una situación como la que existe actualmente en el mercado de California, donde el Consejo de Recursos del Aire de California ("CARB", por sus siglas en inglés: *California Air Resources Board*) ha ordenado una mezcla específica de gasolina ("gasolina CARB") para California. No todas nuestras refinerías del Golfo de Mexico pueden producir gasolina CARB, que es una de las razones por la que enviar volúmenes de gasolina adicionales a California cuando hay escasez y que toma tiempo, es costoso, y por lo tanto incrementar los volúmenes en dicho estado puede verse limitado.

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[1] Administración de Protección Ambiental de los Estados Unidos de América, Resumen de los Hallazgos Recientes para Efectos de Combustible de una Mezcla de Etanol del 10% en Emisiones de Escape de Carga Ligera, Expediente EPA-HQ-OAR-2005-0161 (29 de enero de 2010), incluido como *Anexo 1*.

[2] *Id.* 2.

Precio de importación del producto menor / menos volatilidad de los precios – En general, los grados fungibles comunes de gasolina son menos costosos que los combustibles boutique o grados de especialidad. Históricamente se le ha dado al etanol un precio menor al de la gasolina a base de petróleo. El etanol es también una fuente económica de octano. Los combustibles boutique o grados de especialidad, tales como la gasolina CARB, históricamente han sido tasados con un precio superior a los grados de gasolina convencionales y a menudo, tal y como se explicó anteriormente, estos grados de especialidad experimentan picos en los precios cuando hay una interrupción o ligera escasez en la producción.

La CRE ha mencionado que sería particularmente útil si Valero pudiera cuantificar el impacto en el precio por mantener los estándares máximos de oxigenados actualmente propuestos contra su revisión para permitir la mezcla de hasta un 10% de contenido de etanol. Valero ha evaluado el impacto específico en el precio para producir una mezcla de gasolina para el mercado mexicano con el fin de cumplir con el 2.7% de masa (7.5% en volumen) del requerimiento máximo de oxigenados. Utilizando el mercado del Golfo de Mexico como punto de referencia, Valero anticipa que su costo incremental para producir dicha mezcla para su venta en México sería de aproximadamente 3 centavos de dólar por galón ("cpg") (es decir, el precio base del Golfo de Mexico + 3 cpg), antes de que los costos de transportación sean tomados en consideración. Sobre una base total, esto se traduce en un incremento de $46 millones por cada 100,000 barriles de gasolina importados a México, costos que en última instancia se transmitirían al consumidor mexicano. Valero señala que esta estimación de costos se basa en los costos actuales de sustitución de octano. Cuando nuestras refinerías del Golfo de Mexico estén obligadas (de conformidad con los requisitos de Nivel 3) a reducir el contenido de azufre de la gasolina de la media actual de 30 ppm a 10 ppm, muchas refinerías de los Estados Unidos de América lo llevarán a cabo mediante el tratamiento adicional de los componentes de gasolina en sus unidades de craqueo catalítico fluido ("FCCU", por sus siglas en inglés: *Fluid Catalytic Cracking Units*), lo que reducirá los niveles de octano de dichos componentes de gasolina tratados. Para compensar estos bajos niveles de octano, las refinerías de los Estados Unidos de América tendrán que encontrar una fuente alternativa de corrientes potenciadoras de octano – una de las fuentes de suministro es la corriente de gasolina de la unidad de reforma, la cual aunque aumenta los niveles de octano, también aumenta el contenido aromático de la gasolina. Tener la habilidad de mezclar etanol en un 10% en lugar de en una proporción del 7.5% resultará en in incremento del nivel de octano de aproximadamente 1.5, lo que compensaría la escasez de octano y/o aumento aromático.

En caso de que la CRE en última instancia determine que una mezcla de etanol del 10% no es factible para todo el país, Valero sugeriría que la CRE considere permitir una mezcla de etanol del 10% para las áreas geográficas fuera de la Ciudad de México, esto con el fin de fomentar la competencia y mantener precios bajos para los consumidores en dichas áreas.

(2) Aclaración sobre los Procedimientos de Control de Calidad / Requisitos

Por cada componente CBOB y PBOB enviado a México, si se siguen los procedimientos actuales, dos certificados de calidad estarían disponibles (1) el primero incluiría los resultados de las pruebas para el componente CBOB o PBOB no mezclado ("limpio") y especificaría la Presión de Vapor Reid ("RVP", por sus siglas en inglés: *Reid Vapor Pressure*), el azufre, benceno, aromáticos y otras especificaciones ASTM mas comunes de dichos componentes (*ver* Anexo 2, que incluye una muestra de los resultados de las pruebas para el CBOB sin mezclar), y (2) el segundo incluiría resultados de pruebas adicionales para los productos mezclados con la inclusión de un volumen de 10% de etanol, para asegurarse de que la gasolina mezclada con etanol en el rack cumpla con las especificaciones reglamentarias y comerciales (*ver* Anexo 3, que incluye una muestra de los resultados de la prueba para el mismo CBOB mezclado con 3.64% de masa de oxígeno o 9.78% de volumen de etanol).

En el Proyecto de NOM propuesto no está claro cómo se controlará la calidad del CBOB/PBOB o cómo se clasificará al ser importado a México (es decir, como gasolina sin terminar?). Valero solicitaría aclaraciones adicionales sobre este punto, incluyendo específicamente como se monitoreará la calidad en toda la cadena de suministro.

Valero ha revisado las observaciones al Proyecto de NOM presentadas por Chevron Products Company ("Chevron") en el sitio web de la Comisión Federal de Mejora Regulatoria ("COFERMER") y recibidas por la CRE el 26 de mayo de 2016. Valero comparte las observaciones de Chevron con respecto a los requisitos de control de calidad y las expectativas en la cadena de suministro, particularmente la recomendación de Chevron de que se lleve a cabo una prueba completa y exhaustiva al inicio o instrucción a la cadena de suministro (como se acredita con el certificado de calidad), pero que dichas pruebas rigurosas no sea un requisito en cada paso en el proceso de la cadena de suministro. En su lugar, para garantizar el continuo cumplimiento de las especificaciones, las pruebas al azar o en base a las desviaciones evidenciadas deberían ser predeterminadas. Valero además establece que este método de verificación es similar en concepto a los requisitos de certificación de la EPA en los Estados Unidos de América, donde todo el producto ingresando al sistema es certificado, pero en los demás procesos no se requieren las certificaciones integrales adicionales (sólo comprobar parámetros clave).

(3) Procedimientos de Pruebas y Especificaciones del Combustible Diesel

A. Especificación del Cetano

El Índice de Cetano es el método ampliamente aceptado para determinar el nivel de Cetano en el combustible diesel en los Estados Unidos de América. El Proyecto de NOM (Tabla 7) actual parece *también* requerir que el número de Cetano sea determinado mediante el uso de un Motor de Cetano. El requerir el uso de un Motor de Cetano puede ser problemático debido a la falta de disponibilidad de motores en los Estados Unidos de América. Valero solicita que el Proyecto de NOM sea revisado para aclarar que el uso del método del Índice de Cetano es un método aceptable para determinar los niveles de Cetano y el método de Motor de Cetano es únicamente requerido cuando se utilizan mejoradores de Cetano.

B. Especificación para el Contenido de Compuestos Aromáticos

La especificación para el combustible diesel producido en los Estados Unidos de América (excepto California) requiere un contenido máximo total de compuestos aromáticos del 35% (o un índice de cetano mínimo de 40). Por las mismas razones que justifican la armonización de las especificaciones de la gasolina (es decir, disponibilidad del producto, mayor competencia y menores precios de importación), Valero sugiere que el contenido máximo de compuestos aromáticos para el diesel sea modificado a un 35% en lugar de 30%.

La CRE ha expresado su interés en entender el impacto específico en los precios al requerir un menor contenido aromático para el diesel, así como el revisar cualquier información en posesión de Valero mostrando que un mayor contenido aromático no tiene un efecto adverso en las emisiones de ozono. Valero ha analizado los costos asociados con la producción de diesel con un contenido aromático inferior al de la especificación actual en los Estados Unidos de América y considera que el cumplir con la especificación de un 30% de compuestos aromáticos resultaría en costos adicionales de aproximadamente .75 cpg o $31,500 por cada 100,000 barriles de diesel importado a México.

En relación a los efectos de emisión atribuibles a las propiedades de combustible sin azufre (tales como el contenido de componentes aromáticos), Valero señala los comentarios de la EPA publicados como parte del proceso de reglamentación de dicha agencia para los requisitos de azufre en el combustible diesel.[3] Específicamente, la EPA determinó que:

> "La propiedades del combustible sin azufre a menudo promocionadas como buenos candidatos para reducir las emisiones de los motores de carga pesada son el índice de cetano y el contenido de componentes aromáticos. De acuerdo a las correlaciones entre las propiedades del combustible y las emisiones que se han presentado en los diversos documentos publicados, los efectos son bastante pequeños. Hemos estimado que un aumento en el índice de cetano de 44 a 50 reduciría las emisiones de NOx y PM en alrededor 1 por ciento para la flota en uso en el año calendario 2004. Del mismo modo, una reducción en el contenido total de componentes aromáticos del 34 por ciento del volumen al 20 porciento del volumen reduciría las emisiones de NOx y PM en alrededor 3 porciento. Esperamos que los cambios en otras propiedades del combustible para reducir las emisiones no sean mayores que estos efectos. Estas reducciones son insignificantes en comparación con los beneficios de emisión proyectados como resultado de la propuesta de hoy [*es decir, establecer nuevos requisitos para dispositivos de control de emisiones catalíticas*], lo que se lograría a un costo de refinación considerable. Como resultado, en este momento no consideramos que es conveniente exigir cambios a propiedades de combustible de diesel sin azufre como medio para producir reducciones en las emisiones de salida de los motores."[4]

Los comentarios de la EPA señalan que los esfuerzos para controlar las emisiones de los combustibles diesel se deben centrar en la tecnología de las emisiones de escape del fabricante de motores junto con los estándares más bajos de azufre (para garantizar que el mayor contenido de azufre no dañe dichos dispositivos de control de emisiones catalíticas) en lugar de intentar reducir el contenido de compuestos aromáticos. El requerir una reducción en el contenido aromático del estándar actual en los Estados Unidos de América del 35% al 30%, probablemente tendría (tal y como lo indicó la EPA) un impacto "insignificante" en la reducción de emisiones y resultaría en un mayor costo para el mercado mexicano. En su lugar, la reducción del contenido de azufre (o

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[3] Agencia de Protección Ambiental, Control de Contaminación Ambiental de Nuevos Vehículos de Motor: Estándares Propuestos para Motores de Carga Pesada y Vehículos y Requerimientos de Control de Azufre de Combustible Diesel; Reglas Propuestas, Capítulo 65 del Registro Federal 35430 (2 de junio de 2000), incluido como *Anexo 4*. La Regla Final se publicó en el Capítulo 66 del Registro Federal 5002 (18 de enero de 2001).
[4] *Id.* 35,520.

alinearlo a los estándares de los Estados Unidos de América) sería más rentable y una forma más dramática de reducir las emisiones del combustible diesel.

(4) Método para la Prueba de Presión de Vapor

Finalmente, Valero también quisiera comentar sobre el método propuesto en el Proyecto de NOM para determinar la especificación de la presión de vapor de la gasolina. Mientras que la Sección 6.3 b) del Proyecto de NOM indica que la ASTM D5191 puede ser utilizada "según corresponda", Valero solicitaría que la Nota 2 de la Tabla 1 sea modificada para específicamente también referenciar la ASTM D5191, para que no exista confusión en que pueda también ser utilizada como un método alternativo para determinar la presión de vapor de la gasolina y las mezclas de gasolina-oxigenados.

Una vez más Valero agradece la oportunidad de comentar sobre el Proyecto de NOM y agradecer a la CRE por considerar nuestros puntos de vista. Si tiene alguna pregunta sobre nuestros comentarios o si desean discutir mas a detalle este asunto, favor de contactarme al (001) (210) 345-3117 y le podemos proporcionar información adicional o aclarar nuestros comentarios.

Atentamente,

John Braeutigam

John Braeutigam
Vice Presidente
Desarrollo de Estrategia y Reguladora
Valero Companies

Anexo 1

MEMORÁNDUM

PARA: Docket EPA-HQ-OAR-2005-0161

DE: Aron Butler, asistente del director para los asuntos de ingeniería, OAR/OTAQ/ASD

ASUNTO: Resumen de los resultados recientes de los efectos del combustible de una mezcla de 10% etanol en un trabajo ligero de emisiones de escape

FECHA: 29 de enero de 2010

Antecedentes

El artículo 1506 de la Ley de Política Energética *(EPA por sus siglas en inglés)* del 2005 requiere que EPA produzca un modelo de los efectos de combustible actualizado representando la flota de gasolina de trabajo ligero, incluyendo determinación de los impactos de las emisiones de un creciente uso del consumo de combustible renovable. Conforme a esta meta, con apoyo del Departamento de la Secretaría de Energía de Eficiencia de Energía y Energía Renovable, se ha llevado a cabo un estudio para examinar los efectos de cinco propiedades del combustible (etanol, aromáticos, presión de vapor y dos parámetros de destilación: T50 y T90) en emisiones de escape de vehículos de trabajo ligero que cumplen con las últimas regulaciones de emisiones federales (conocidas como programa de Segundo Nivel *(Tier 2)*. La fase inicial fue una estudio piloto de los efectos del etanol, que se hizo usando una gasolina convencional típica (0% etanol, o E0) y una mezcla típica de 10% de etanol (E10) entre Mayo de 2008 y Enero de 2009.

Este memo aborda específicamente los efectos de E10 relativos a E0 en emisiones de hidrocarbonos (como NMHC) y óxidos de nitrógenos (NOx) como lo sugiere el estudio piloto. Estudios previos han sugerido que las mezclas de E10 producían un comportamiento diferente de emisiones para estos contaminantes en vehículos con tecnología nueva vs tecnología más antigua.. 1 Datos de este estudio piloto proporcionan más evidencia, la cual creemos que es suficiente para guiar las decisiones relacionadas con la modelización de inventarios. 2 Otros contaminantes que no están cubiertos por esté memo (como el CO y los tóxicos del aire) están siendo modelados asumiendo un comportamiento similar para vehículos nuevos y viejos, consistentes con la información reciente [12]

El estudio completo de los efectos del combustible, que involucra a 31 combustibles, se espera esté completo para mediados del 2010, y sus resultados pueden revocar los hallazgos descritos aquí. El comportamiento de la emisión de otros contaminantes que no se abordan aquí, serán descritos en reportes relacionados con el estudio completo, y en acciones normativas subsecuentes que utilicen aquellos resultados.

Métodos

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[1] Para una discusión más detallada de fuentes de información de emisiones, ver la Sección 3.1 de RFS1 RIA, EPA-420-R-07-004, disponible en http://www.epa.gov/otaq/renewablefuels/420r07004chap3.pdf.

[2] Para una discusión más detallada de modelización de inventario para la normativa final, ver la Sección 3.1 de RFS2 RIA, EPA-420-R-10-006, disponible en http://www.epa.gov/otaq/renewablefuels/.

La prueba de emisiones utilizó 19 vehículos, cubriendo una mezcla de carros de pasajeros y camiones ligeros, que representan vehículos con altos volúmenes de ventas. La flota de vehículos prueba se muestra en la Tabla 1. Dos combustibles prueba fueron producidos incluyendo etanol por volumen 0% y 10%, con otras propiedades, siendo

Similar a lo que se puede encontrar generalmente en estaciones de servicio comerciales. Estas propiedades de combustible se muestran en la Tabla 2.

Los vehículos fueron probados a una temperatura de 75°F y 50°F utilizando el ciclo de prueba LA92, probando cada combustible dos veces (dos repeticiones). Los combustibles fueron probados en orden ascendente del nivel de mezcla de etanol. En la Figura 1 se muestra un rastro de velocidad contra tiempo del ciclo de prueba LA92. Las tres fases del ciclo de prueba están designadas para permitir separación de las emisiones de arranque (cuando el motor y el catalizador están relativamente fríos) de una conducción completamente calentado (cuando la operación de los controles de emisión se han estabilizado). Para propósitos de estimación de inventarios de emisión, generalmente las fases están ponderadas para formar un factor e emisión único compuesto (en gramos por milla) para representar patrones de conducción promedio.

Resultados

La información resultante de las emisiones fueron analizadas utilizando un enfoque de modelo mixto, con el parámetro de efecto fijo conforme al etanol Las medidas de las emisiones fueron transformadas utilizando el logaritmo natural antes de introducirlo al modelo, el cual es una práctica estándar en análisis de este tipo de información para mitigar asuntos con la variabilidad y sesgo de la información. Los resultados que se muestran en la Tabla 3 indican que una mezcla de etanol del 10% (E10) no tuvo un efecto estadístico significante (en un nivel de p= 0.05) en NHMC o en emisiones NOx relacionados con gasolina que no contiene etanol (E0) en cualquiera de las temperaturas de prueba. El valor p se refiere al nivel significante de la comparación estadística. En la mayoría de los estudios científicos de fenómenos físicos, un resultado (como la diferencia entre dos tratamientos) es aceptado como verdadero o válido únicamente si el nivel de significación es p= 0.05 o menor, sugiriendo una seguridad relativa de aceptar un resultado que puede haber ocurrido por casualidad. Debido a que ninguna de las comparaciones de emisiones evaluadas aquí tuvieron valores-p en 0.05 o menor, interpretamos que esto significa que no hay diferencia en emisiones entre los combustibles E0 y E10.

La figura 3 describe la información después de que se eliminan los valores atípicos, con una media calculada y con intervalos de 95% de confianza. El intervalo de confianza describe el rango en el que significado verdadero de todas aquellas emisiones, disminuirían con 95% de probabilidad, lo que nos indica la precisión del valor medio calculado mostrado.

Tabla 1. Resumen de la flota de vehículos de prueba.

PRODUCTOR	MARCA	MODELO (todos los modelos del	MOTOR
Chrysler	Dodge	Caliber	2.4L I4
Chrysler	Dodge/Chrysler	Caravan/Town&Country	3.3L V6
Chrysler	Jeep	Liberty	3.7L V6
Ford	Ford	Focus	2.0L I4
Ford	Ford	500/Taurus/Freestyle	3.0L V6
Ford	Ford	F150	5.4L V6
Ford	Ford/Mercury	Explorer/Mountaineer	4.0L V6
GM	Buick/GMC/Saturn	Enclave/Acadia/Outlook	3.6L V6
GM	Chevrolet	Cobalt/HHR	2.4L I4
GM	Chevrolet	Impala	3.5L V6
GM	Chevrolet/GMC	Avalanche/Silverado	5.3L V8
Honda	Honda	Civic	1.8L I4
Honda	Honda	Accord	2.4L I4
Honda	Honda	Odyssey	3.5L V6
Nissan	Nissan	Altima	2.5L I4
Toyota	Toyota	Corolla	1.8L I4
Toyota	Toyota	Camry	2.4L I4
Toyota	Toyota	Sienna	3.3L V6
Toyota	Toyota	Tundra	4.0L V6

Tabla 2. Resumen de las propiedades del combustible de prueba.

Parámetro	Unidades	Método	Combustible de prueba	
			E0	E10
Etanol	vol %	D5599	<0.1	9.35
T50	°F	D86	215	209
T90	°F	D86	324	319
RVP	psi	D5191	9.17	9.05
Aromáticos	vol %	D1319	29.3	22.9
Olefinas	vol %	D1319	6.4	5.7
Benceno	vol %	D3606	0.48	0.49
Azufre	ppm	D5453	23	23
RON	-	D2699	93.4	93.7
MON	-	D2700	83.5	84.9
(R+M)/2	-	-	88.5	89.3

Tabla 3. Resumen del Análisis Estadístico de las Pruebas de Emisiones.

Emisión	Temperatura de Prueba (gdo. F)	Diferencia en Porcentaje (E10 vs. E0)	Valor* P-
NOx (resultado del compuesto)	50	-12.87	0.64
NOx (resultado del compuesto)	75	-7.59	0.94
NMHC (resultado del compuesto)	50	-3.93	0.97
NMHC (resultado del compuesto)	75	-12.96	0.09

El valor *P- se refiere al nivel significante de la comparación estadística. En la mayoría de los estudios de fenómenos físicos, un resultado es aceptado como verdadero o válido únicamente si el nivel de significación es p= 0.05 o menor, sugiriendo una seguridad relativa de aceptar un resultado que puede haber ocurrido por casualidad. Interpretamos que esto significa que no se encontraron diferencias significantes, y por lo tanto, no hay diferencia de emisión entre los combustibles E0 y E10.

Figura 1. Ciclo de Prueba LA92

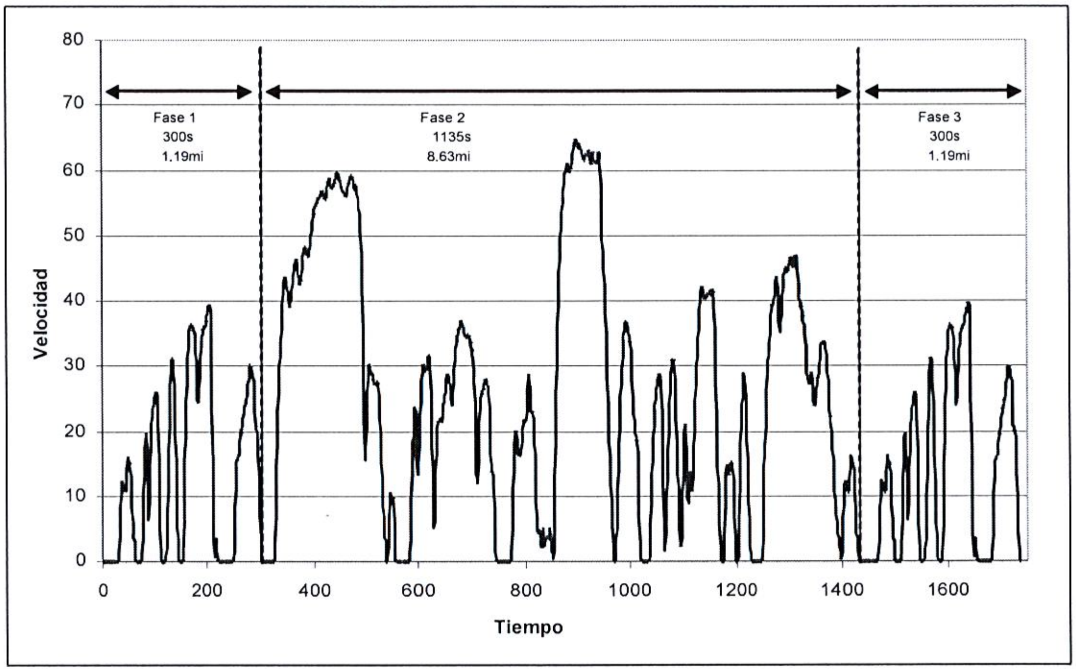


Figura 2. La media del compuesto NMHC (Puntos Azules) e Intervalos del 95% de Confianza (Líneas Verticales) después de la eliminación de los valores atípicos.

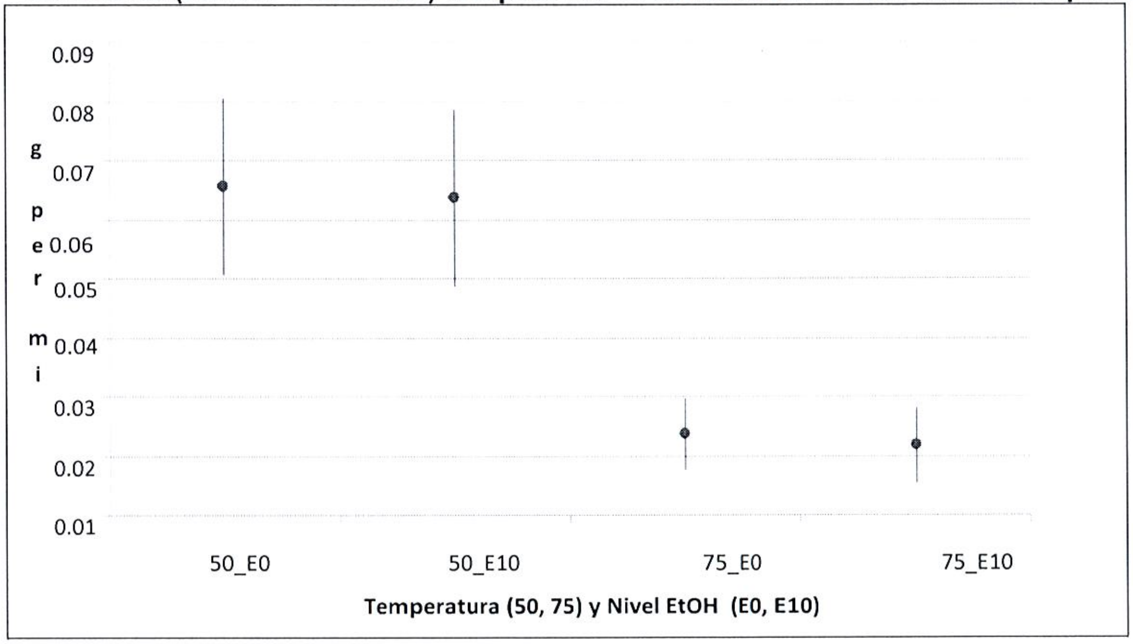
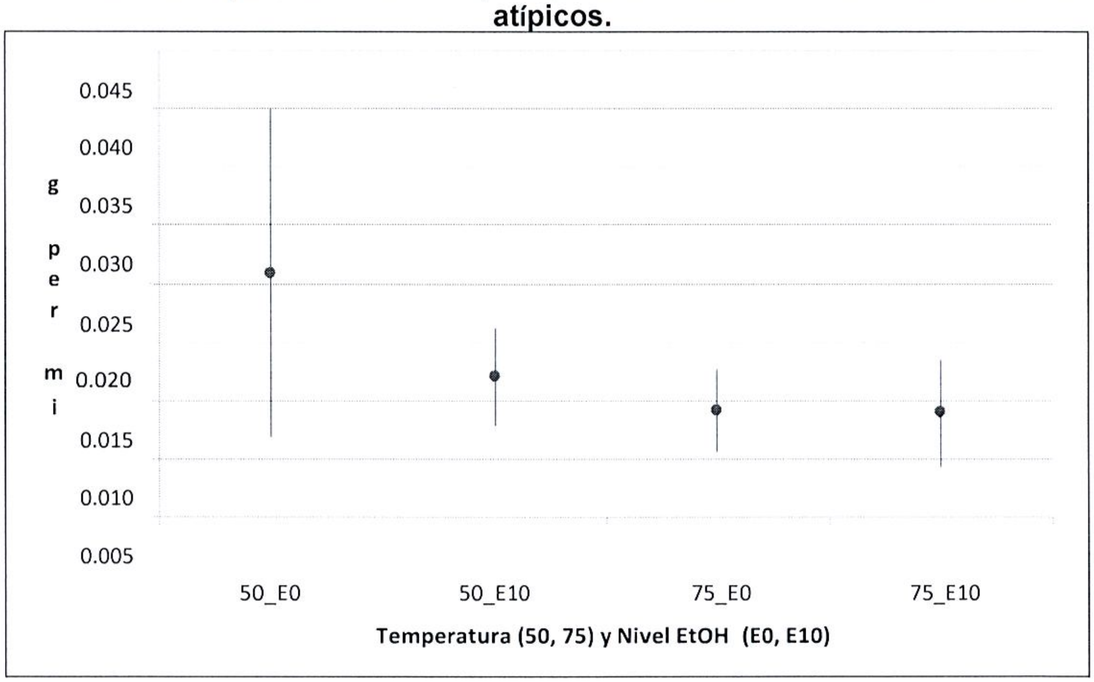


Figura 3. La media del compuesto NOx (Puntos Azules) e Intervalos del 95% de Confianza (Líneas Verticales) después de la eliminación de los valores atípicos.



Anexo 2

Anexo 2

Inspección para CBOB UNL 9.0 *sin mezclar*

Lote de Refinería	160200
Número de versión	
Fecha de la muestra	30/5/2016
Número de la muestra	1751204
Número del tanque	TK2111 Final
Fecha C de A	31/5/2016 3:29 PM
Número C de A	144909

	Resultado de la prueba	Min	Max
Benceno, D-3606, Vol.%	0.46		3.80
Destilación, D-86			
Sobre punto, F	86		
Punto final, F	394		430
10%	125		158
50%	208	170	250
90%	322		374
E200	47.1		
E300	84.7		
Gravedad, API, D4052	60.2		
Olefinas, D6550	6.25		
Estabilidad de Oxigenación, D525	>240	240	
Wt% Oxigenados, D5599			
Metanol	0.00		0.00
Etanol	0.00		0.00
MTBE	0.00		0.00
ETBE	0.00		0.00
TAME	0.00		0.00
t-Butanol	0.00		0.00
Total Oxigenados Wt%	0.00		0.00
Oxígeno Wt%	0.00		0.00
Total Oxigenados Vol.%	0.00		0.00
Calificación de la Prueba de Oxidación, D665	A		B+
Azufre, D2622, Wt%	0.0008		0.0080
Relación Vapor/Líquido, D5188, F	140		
RVP, D5191	8.8		9.0
Total Aromáticos, D5769	27.6		

El inhibidor de corrosión se inyecta a una velocidad mínima de:
1.3 lb/1000 bbls para la gasolina

2.6 lb/1000 bbls para el diesel
según el producto se bombea de la refinería

Anexo 3

Anexo 3

Inspección para CBOB UNL 9.0

Lote de Refinería	160200
Número de versión	
Fecha de la muestra	30/5/2016
Número de la muestra	1751204
Número del tanque	TK2111 Final
Fecha C de A	31/5/2016 3:29 PM
Número C de A	144911

	Resultado de la prueba	Min	Max
Apariencia	Brt/Clr		Libre Wtr
Benceno, D-3606, Vol.%	0.40		3.80
Color, Visual	Sin teñir	Sin teñir	Sin teñir
Tira de cobre, D-130			
122F, 3 horas, Calificación	1a		1b
Destilación, D-86			
Sobre punto, F	88		
Punto final, F	389		430
10%	121		158
50%	163	150	250
90%	316		374
E200	55.2		
E300	86.1		
Índice de manejabilidad	1009		1250
Goma existente, D-381 g/100 ml	1.0		4.0
Gravedad, API	59.1		
Olefinas, D6550	6.0		
Plomo, D3237, G/gal	L0.01		0.01
Octano			
Motor, D2700	82.9	82.0	
Investigación, D2699	91.4		
(RON + MON)/2	87.2	87.0	
Wt% Oxigenados, D5599			
Metanol	0.00		
Etanol	10.47		
MTBE	0.00		
ETBE	0.00		
TAME	0.00		
t-Butanol	0.00		
Total Oxigenados Wt%	10.47		
Oxígeno Wt%	3.64		
Total Oxigenados Vol.%	9.78		
Fósforo, D3231, G/Gal	L0.003		
Azufre, Mercaptano, UOP163, Wt%	0.000		0.002
Azufre, D2622, Wt%	0.0007		0.0080
Relación Vapor/Líquido, D5188, F	127	122	
RVP, D5191	9.7		10.0
Total Aromáticos, D-5769	24.8		
Tira de plata, IP227	0	0	1

El inhibidor de corrosión se inyecta a una velocidad mínima de:
1.3 lb/1000 bbls para la gasolina 2.6 lb/1000 bbls para el diesel según el producto se bombea de la refinería

Anexo 4

NATIONAL ARCHIVES AND RECORDS ADMINISTRATION
1985

Federal Register

Friday,
June 2, 2000

Part II

Environmental Protection Agency

40 CFR Parts 69, 80, and 86

Control of Air Pollution From New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards; Highway Diesel Fuel Sulfur Control Requirements; Proposed Rules

The 50 ppm sulfur cap would therefore result in projected NO_X and PM emission reductions in 2020 of 540,000 and 17,000 tons per year, respectively, compared to 2.0 million and 83,000 tons per year for a 15 ppm cap. It should be noted that virtually none of the PM reduction comes from a reduction in the soot component of PM.

The cost of meeting a 50 ppm sulfur cap at the refinery would be substantially less costly than meeting the proposed cap of 15 ppm. In some cases, refiners may be able to meet a 50 ppm cap with only relatively minor capital investment of a few million dollars for a new hydrogen sulfide scrubbing unit and a PSA unit to increase hydrogen purity. New, high activity catalyst would also replace today's catalyst. In other cases, refiners would also have to add a second reactor. Finally, some refiners would require essentially the same two-stage hydrotreating unit that would be required to meet the proposed 15 ppm standard. In all cases, hydrogen consumption would be somewhat less than that required to meet the proposed 15 ppm standard.

Refiners who would be capable of meeting a 50 ppm cap with only minor capital investment would likely be those not blending any LCO into their diesel fuel, or those having substantial excess hydrotreating capacity in their current unit. We estimate that about 15 percent of on-highway diesel fuel production would fall into this category. Refiners blending some LCO into their diesel fuel (e.g., 15 percent or less), or with somewhat greater levels of LCO but also having significant excess current hydrotreating capacity, would likely be capable of meeting a 50 ppm cap with an additional reactor. We estimate that about 35 percent of on-highway diesel fuel production would fall into this category. Finally, about 50 percent of on-highway diesel fuel production would likely require a two-stage hydrotreating unit due to their higher LCO fraction or lack of excess current hydrotreating capacity. Overall, we project that the average cost of meeting the 50 ppm standard at the refinery would be about 2.3 cents per gallon, about 1.7 cents per gallon less than the corresponding cost for fuel meeting a 15 ppm sulfur cap.

It would be slightly less expensive to distribute the 50 ppm sulfur fuel than the15 ppm sulfur fuel. The pipeline interface between highway diesel fuel and higher sulfur products that must be sold with the higher sulfur product to ensure quality of the highway diesel fuel could be reduced. We estimate the cost savings per gallon of diesel fuel to be about 0.01 cents.

The overall cost of a program with a 50 ppm sulfur cap with a 30 ppm average is comprised of the hardware cost of lean NO_X catalyst technology, the cost increase in producing and distributing the fuel, and the cost of the projected 4% fuel economy loss. This corresponds to a net $35.4 billion 30-year NPV cost, compared to $37.7 billion for the 15 ppm sulfur cap proposal. Considering the PM and NO_X emissions benefits, the resulting aggregate cost effectiveness is projected to be $3600 per ton of NO_X+NMHC and $56,700 per ton of PM (including the SO_2 credit). These compare to $1500 per ton of NO_X+NMHC and $1900 per ton of PM for the 15 ppm sulfur cap proposal. The large difference in PM cost effectiveness is primarily due to the fuel economy penalty and the fact that none of the fuel cost could be allocated to hydrocarbon control, because of the lack of a hydrocarbon benefit.

Table VI.B–5 summarizes key emissions and cost impacts of a program adopting the sulfur levels analyzed. Note that, although the analysis finds that a 15 ppm average/25 ppm cap standard has potential to be adequate for enabling high-efficiency exhaust emissions controls, this finding involves a significantly higher level of uncertainty than the proposed 15 ppm sulfur cap, because it is based on the assumption that exhaust emission control designs could be focused on the average fuel sulfur levels. We believe that the possibility of some in-use fuel at near-cap levels would necessitate designing to accommodate this level, and they contend that this would not allow the high-efficiency technology to be enabled. If so, the technology enablement for this case would likely be similar to that for the 50 ppm cap case. The analysis results show that the 50 ppm cap case does not enable high-efficiency exhaust control technology at all.

TABLE VI.B–5.—SUMMARY OF EMISSIONS AND COST IMPACTS AT DIFFERENT FUEL SULFUR LEVELS

Sulfur level	2020 emission reductions (thousand tons/year)		Cost impacts			
	NO_X	PM	Vehicle [c]	Fuel consumption (percent)	Fuel (¢/gal)	Aggregate 30-yr NPV ($ billion)
5 ppm cap	2,020	86	$1,133	−1	[d] 6.0–7.3	[d] 47.1
15 ppm cap	2,020	83	1,133	0	4.4	37.7
25 ppm cap w/15 ppm average [a]	2,020	79	1,133	1	3.4	34.5
50 ppm cap w/30 ppm average [b]	538	17	603	4	2.7	35.4

[a] Note that this sulfur level involves significant increased uncertainty with respect to technology enablement. Manufacturers have commented that the possibility of some in-use fuel at or near the 25 ppm cap level would necessitate designing to accommodate this level, thus precluding high-efficiency technology enablement, and making technology for this case similar to that for the 50 ppm cap case.

[b] This sulfur level is not expected to enable high-efficiency exhaust control technology.

[c] Costs of added hardware combined with lifetime maintenance cost impacts; figures shown for comparison purposes are long-term costs for heavy heavy-duty vehicles.

[d] Fuel cost based on industry analyses of refinery and distribution costs; costs could range much higher depending on fuel segregation measures required.

We welcome comments on all aspects of these analyses for alternative fuel sulfur standards, including the technology enablement assessments, vehicle and fuel costs, emissions reductions, and cost effectiveness.

4. What Other Fuel Properties Were Considered for Highway Diesel Fuel?

In addition to changes in highway diesel fuel sulfur content, we also considered changes to other fuel properties such as cetane number, aromatics, density, or distillation. Each of these fuel properties has the potential to affect the combustion chemistry within the engine, and so aid in reducing emissions of regulated pollutants. Indeed, some manufacturers have made public statements to the effect that an idealized highway diesel fuel is necessary in order to optimize the efficiency of the next generation of heavy-duty diesel vehicles.

The focus of the fuel changes we are proposing today is to enable diesel engines to meet much more stringent emission standards. As described earlier in this section, we believe that diesel engines can meet much more stringent emission standards using advanced exhaust emission control systems, but the performance of these systems is dramatically reduced by sulfur. Thus, we have determined that sulfur in diesel fuel would need to be lowered. It does not appear that other fuel properties have the same sort of effect on advanced exhaust emission controls, and as a result we do not believe that changes in fuel properties other than sulfur are necessary in order for heavy-duty engines to reach the low emission levels offered by the advanced exhaust emission controls discussed above. In fact, after conducting a research study on this topic, industry members concluded that, "If in the future, fuel sulfur levels are significantly reduced in order to enable efficient exhaust emission controls, then it should be recognized that the exhaust emission control device becomes the primary driver on tailpipe emissions and that all other fuel properties will have only minor or secondary effects on the tailpipe emissions."[161]

Emission reductions can also be achieved through changes in diesel fuel properties as a direct means for reducing engine-out emissions. In this approach, it is not the exhaust emission control which is being "enabled," but rather the combustion process itself which is being optimized. This approach has the advantage that the effects are fleet-wide and immediate upon introduction of the new fuel, whereas new engine standards do not produce significant emission reductions until the fleet turns over. However, regulated changes in diesel fuel properties may produce emission reductions that disappear over time, if compliance test fuel is changed concurrently with the changes to in-use fuel (to assure that such fuel remains representative of in-use fuels). Manufacturers will redesign their new engines to take advantage of any benefit a cleaner fuel provides, resulting in engines still meeting the same emission standards in-use. Consequently, it would only be those engines sold before the compliance test fuel changes that would be likely to produce emission benefits, and as these engines drop out of the fleet, so also would the benefit of changes to diesel fuel.

Even so, it is useful to consider what emission reductions are achievable through changes to non-sulfur diesel fuel properties. The non-sulfur fuel properties most often touted as good candidates for producing emission reductions from heavy-duty engines are cetane number and aromatics content. According to correlations between these fuel properties and emissions that have been presented in various published documents, the effects are rather small. We have estimated that an increase in cetane number from 44 to 50 would reduce both NO_X and PM emissions by about 1 percent for the in-use fleet in calender year 2004.[162] Likewise a reduction in total aromatics content from 34 volume percent to 20 volume percent would reduce both NO_X and PM emissions by about 3 percent. We expect changes in other fuel properties to produce emission reductions that are no greater than these effects. These reductions are insignificant in comparison to the emission benefits projected to result from today's proposal, and would come at a considerable refining cost. As a result, at this time we do not believe that it is appropriate to require changes to non-sulfur diesel fuel properties as a means for producing reductions in engine-out emissions. There may, however, be performance or engine design optimization benefits associated with non-sulfur changes to diesel fuel that could justify their cost. Therefore we welcome cross-industry collaboration on voluntary diesel fuel improvements beyond the sulfur reduction proposed in this notice, and we continue to solicit information on the impact of non-sulfur fuel changes on exhaust emission control, engine-out emissions, and engine design and performance.

C. Should Any States or Territories Be Excluded From This Rule?

1. What Are the Anticipated Impacts of Using High-Sulfur Fuel in New and Emerging Diesel Engine Technologies if Areas Are Excluded From This Rule?

Section III discusses the technological feasibility of the emission standards being proposed today and the critical need to have sulfur levels reduced to 15 ppm for the technology to achieve these emission standards. The implications to be drawn from section III with regard to exemptions from the sulfur standards for States and Territories is fairly straightforward. If vehicles and engines employing these technologies to achieve the proposed emission standards will be operated in these states or territories, then low-sulfur diesel fuel must be available for their use.

Some have suggested allowing persons in Alaska to remove emission control equipment to enhance the viability of using high-sulfur fuel. In addressing this issue, we note that, under the Clean Air Act, it is prohibited in all 50 states to remove emission control equipment from an engine, unless that equipment is damaged or not properly functioning, and then is replaced with equivalent properly functioning equipment.

2. Alaska

a. Why is Alaska Unique?

There are important nationwide environmental and public health benefits that can be achieved with cleaner diesel engines and fuel, particularly from reduced particulate emissions, nitrogen oxides, and air toxics (as further discussed in section II). Therefore, it is also important to implement this program in Alaska. Any 2007 and later model year diesel vehicles in Alaska would have to be fueled with low sulfur highway diesel, or risk potential damage to the aftertreatment technologies or even the engines themselves. Although the engine standards proposed today do not have different technology and cost implications for Alaska as compared to the rest of the country, the low sulfur fuel program would have different implications (described below). Therefore, in evaluating the best approach for implementing the low sulfur fuel program, it is important to consider the extremely unique factors in Alaska.

Section 211(i)(4) provides that the states of Alaska and Hawaii may seek an exemption from the 500 ppm sulfur standard in the same manner as provided in section 325 of the Clean Air Act. Section 325 provides that upon request of Guam, American Samoa, the Virgin Islands, or the Commonwealth of the Northern Mariana Islands, EPA may exempt any person or source, or class of persons or sources, in that territory from any requirement of the CAA, with some specific exceptions. The requested exemption could be granted if EPA determines that compliance with such requirement is not feasible or is unreasonable due to unique geographical, meteorological, or economic factors of the territory, or other local factors as EPA considers significant.

Unlike the rest of the nation, Alaska is currently exempt from the 500 ppm

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[161] Lee, et al., SAE 982649.

[162] "Exhaust emissions as a function of fuel properties for diesel-powered heavy-duty engines," memorandum from David Korotney to EPA Air Docket A–99–06, September 13, 1999.

July 7, 2016

Dr. Alejandro Breña de la Rosa
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National Consultative Committee for Standardization of Hydrocarbons, Refined Products and Petrochemicals
Energy Regulatory Commission
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Via email: Cofemer@cofemer.gob.mx; abrena@cre.gob.mx; alara@cre.gob.mx; jlopez@cre.gob.mx; mmehle@cre.gob.mx

Re: Comments on the Draft Mexican Official Standard PROY-NOM-016-CRE-2016, *Quality Specifications of Refined Products*

Dear Dr. Breña de la Rosa:

Valero Marketing and Supply Company de México, S.A. de C.V. ("Valero") is pleased to have engaged with the Energy Regulatory Commission ("CRÉ") on the topic of the Draft Mexican Official Standard governing quality specifications of petroleum products ("Draft NOM") and welcomes the opportunity to present its views in order to assist the CRÉ with its mandate of promoting an efficient development of the Mexican energy industry, fostering competition for the supply of product into the Mexican fuel market, and overseeing the reliability, stability and security of such supply, while protecting the interests of consumers.

Valero Marketing and Supply Company de México is the newly formed Mexican subsidiary of Valero Energy Corporation ("Valero Energy") who, through its various subsidiaries, is the world's largest independent petroleum refiner and an international marketer of transportation fuels and petrochemical products. Valero Energy's 15 petroleum refineries (owned and operated by Valero Energy subsidiaries) have a combined throughput capacity of approximately 3 million barrels per day, and Valero Energy has the largest capacity of any refiner in the U.S. Gulf Coast region. As such, Valero feels it is uniquely positioned to contribute to Mexico's policy of diversifying its fuel supply by contributing a secure, stable and ratable petroleum supply to Mexico, while taking advantage of the business opportunities brought by that country's comprehensive energy reform. With this in mind, Valero hereby respectfully submits these comments and suggestions to the CRÉ's proposed standards set forth in the Official Journal of the Federation on May 12, 2016.

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(1) Gasoline Specifications

A. Harmonization of Oxygenate Specifications between U.S. Gulf Coast and Mexico

A main objective of Valero's comments is to highlight that more competition may be created for the supply of gasoline to the Mexican market by harmonizing gasoline specifications to those which currently exists for the majority of the U.S. gasoline market.

Regarding oxygenate content, in the U.S. close to 100% of gasoline is blended with 10% ethanol. As a result, the base components of both regular and premium gasoline (that is, the petroleum component without oxygenate – commonly referred to as Conventional Blendstock for Oxygenate Blending ("CBOB") and Premium Blendstock for Oxygenate Blending ("PBOB")) are widely traded and available throughout the U.S. Gulf Coast market. Based on Valero's experience, it believes one of the most feasible ways of supplying U.S-produced gasoline into northern Mexico would be to ship the CBOB and PBOB components separately to terminals located north of Mexico City that could also receive ethanol by rail. Then, like in the U.S., the ethanol could be ratio-blended at 10% volume into the delivery trucks at such terminal(s).

Although U.S. Gulf Coast refineries, including all of Valero Energy's refineries, are able to produce the gasoline quality required for the Mexican market as articulated in the Draft NOM, the requirement to produce a specialized blendstock component and the lack of dedicated logistics infrastructure for blending and delivering gasoline with a different ethanol content than that most prevalent in the U.S. may work to reduce available supply, which can consequently reduce competition and lead to an increase in price volatility.

The current Mexican specification, articulated in the Draft NOM Table 6, *Additional Specifications of Gasolines by Region*, has a maximum of 2.7% weight oxygen, which is equivalent to ~7.5% volume of ethanol. Valero would propose modification of this specification to allow a blend of up to a 10% volume of ethanol (4.0% weight oxygen maximum), the same as the U.S. Environmental Protection Agency ("EPA") regulations and specifications. Valero notes that U.S. gasoline specifications currently call for 10% volume of ethanol blend which averages to 3.5% weight of oxygen, but the U.S. EPA allows up to 4.0% weight of oxygen to allow for variation in the base gasoline density.

The CRÉ has expressed concern that allowing higher oxygen blends may result in an increase of ground-level ozone and has requested that Valero provide any information it is aware of that would mitigate such concerns. In response, Valero points to an EPA study that analyzed the effects of a 10% ethanol blend on exhaust emissions.[1] That study finds that while there may be a slight increase in emissions of non-methane hydrocarbons ("NMHC") and nitrogen oxides ("NOx") at such a blend level, a 10% ethanol blend ("E10") did not have a "statistically

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[1] U.S. Environmental Protection Administration, Summary of Recent Findings for Fuel Effects of a 10% Ethanol Blend on Light Duty Exhaust Emissions, Docket EPA-HQ-OAR-2005-0161(January 29, 2010), included as *Exhibit 1*.

significant" effect on NHMC or NOx emissions relative to gasoline containing no ethanol ("E0").[2]

Valero also notes that the U.S. specification for sulfur in gasoline will be reduced to an average of maximum of 10 parts per million ("ppm") when the EPA Tier 3 requirements come into effect starting in 2017, compared with the sulfur specification proposed in the Draft NOM of 30 ppm average and 80 ppm maximum. When this transition occurs in the U.S. and U.S. refiners are subject to this new lower sulfur specification, it is expected that most gasoline exports to Mexico will also (due to efficiency and infrastructure constraints) meet this lower sulfur specification. This reduction in sulfur content will have more significant benefits when it comes to reducing emissions than the slight, statistically non-significant increase in emissions that may result from blending 10% versus 7.5% volume ethanol into gasoline.

B. Advantages of Harmonization

Increased product availability – In the normal course of operations, U.S. refineries and the downstream distribution system are not necessarily configured to consistently handle multiple gasoline grades (*i.e.*, CBOB and PBOB for blending with a lower final ethanol content than the U.S. standard), as segregated tankage and distribution infrastructure is limited. By increasing the % of oxygen content to allow for a 10% volume of ethanol, the common, fungible U.S. gasoline grades will meet the Mexican specifications. Mexican gasoline would no longer be viewed as a "boutique fuel" or non-fungible specialty grade and more product would be available for import into the Mexican market.

More competition – If specifications are harmonized, all U.S. Gulf Coast refineries would be able to make the Mexican grade. This would avoid a situation like the one that currently exists in the California market, where the California Air Resources Board ("CARB") has mandated a specific blend of gasoline ("CARB gasoline") for California. Not all U.S. Gulf Coast refineries can make CARB gasoline, which is one of the reasons that getting additional volumes of gasoline to California when there is a supply shortage takes time, is costly, and incremental volumes into that state can therefore be limited.

Lower product import price / less price volatility – In general, common fungible gasoline grades are less expensive than boutique fuels or specialty grades. Historically, ethanol has been priced below petroleum based gasoline. Ethanol is also an economic source of octane. Boutique fuels or specialty grades, such as CARB gasoline have historically been priced above conventional gasoline grades and often, as explained above, these specialty grades experience price spikes when there is a disruption or slight shortage in production.

The CRÉ has commented that it would be particularly helpful if Valero could quantify the price impact of maintaining the currently proposed maximum oxygenate standards versus revising them to permit a blend of up to 10% ethanol content. Valero has evaluated what the specific price impact would be to Valero to produce a gasoline blendstock for the Mexican market to meet a 2.7% mass (7.5% volume) maximum oxygenate requirement. Using the U.S. Gulf Coast market as a benchmark, Valero anticipates that its incremental cost for producing

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[2] *Id.* At 2.

such a gasoline blendstock for sale into Mexico would be approximately 3 U.S. cents per gallon ("cpg") (*i.e.*, U.S. Gulf Coast base price + 3 cpg), before transportation costs are taken into account. On an aggregate basis, this translates into a $46 million increase for every 100,000 barrels of gasoline imported into Mexico, which costs will ultimately be passed on to the Mexican consumer. Valero notes that this cost estimate is based on current octane replacement costs. When U.S. refiners are required (pursuant to Tier 3 requirements) to reduce the sulfur content of gasoline from the current average of 30 ppm to 10 ppm, many U.S. refiners will do so by further treating their gasoline components at their fluid catalytic cracking units ("FCCU"), which will reduce the octane levels of such treated gasoline components. To compensate for these lowered octane levels, U.S. refiners will have to find alternate supply of higher octane enhancing streams – one such source of supply is the gasoline stream from the reformer unit, which, while increasing octane levels, also increases the aromatic content of gasoline. Having the ability to blend ethanol at a 10% instead of a 7.5% ratio will result in an octane level increase of approximately 1.5, which would compensate for the octane shortage and/or aromatic increase.

In the event the CRÉ ultimately determines that a 10% ethanol blend is not feasible for the entire country, Valero would suggest that the CRÉ nonetheless consider allowing a 10% ethanol blend for geographical areas outside of Mexico City to encourage competition and keep costs lower for consumers in those areas.

(2) Clarification on Quality Control Procedures / Requirements

For each CBOB and PBOB component shipped to Mexico, if current procedures are followed, two certificates of quality would be available (1) the first would include test results for the unblended ("neat") CBOB or PBOB component, and would specify the Reid Vapor Pressure ("RVP"), sulfur, benzene, aromatics and other common ASTM specifications of such components (*see* Exhibit 2, which contains a sample of test results for an unblended CBOB), and (2) the second would have additional test results for the blended product with the inclusion of 10% volume of ethanol, to make sure that the gasoline blended with ethanol at the rack will meet regulatory and commercial specifications (*see* Exhibit 3, which contains a sample of test results for the same CBOB, blended with 3.64% weight oxygen or 9.78% volume ethanol).

In the proposed Draft NOM, it is not clear how the quality of the CBOB/PBOB will be controlled or how it will be classified when imported to Mexico (*e.g.*, as unfinished gasoline?). Valero would request additional clarification on this point, including specifically how the quality will be monitored throughout the supply chain.

Valero has reviewed the comments to the Draft NOM submitted Federal Commission on Regulatory Improvement ("COFEMER") website by Chevron Products Company ("Chevron") and received by the CRÉ on May 26, 2016. Valero endorses Chevron's comments regarding quality control requirements and expectations in the supply chain, particularly Chevron's recommendation that full and robust testing be done at origin or introduction into the supply chain (as evidenced by a certificate of quality) but that such rigorous testing not be a requirement at each step in the downstream portion of the supply chain. Instead, to ensure continued adherence to specifications, random testing or testing based on evidenced deviations should be the default. Valero would further point out that this method of verification is similar in concept to the U.S. EPA's certification requirements, where all product going into the system is certified, but downstream, additional comprehensive certifications are not required (just checks on key parameters).

(3) Diesel Fuel Testing Procedures and Specifications

A. Specification for Cetane

The most widely acceptable method of determining the Cetane level of diesel fuel in the U.S. is to use the Cetane Index. The current Draft NOM (Table 7) appears to *also* require that the Cetane number be determined by utilizing a Cetane Engine. Requiring the use of a Cetane Engine can be problematic because of the lack of availability of engines in the U.S. Valero requests that the Draft NOM be revised to clarify that use of the Cetane Index method is an acceptable method for determining Cetane levels and the Cetane Engine method is only required when Cetane improvers are used.

B. Specification for Aromatic Content

The specification for diesel fuel produced in the U.S. (except California) requires a maximum total aromatic content of 35% (or a minimum cetane index of 40). For the same reasons that justify harmonization of gasoline specifications (*i.e.*, product availability, increased competition and lower import prices), Valero suggests that the maximum aromatic content for diesel be revised to 35% instead of 30%.

The CRÉ has expressed interest in understanding the specific price impact of requiring a lower aromatic content for diesel, as well as reviewing any information Valero has showing that increased aromatic content does not have an adverse effect on ozone emissions. Valero has analyzed the costs associated with producing diesel with a lower aromatic content than the current U.S. specification and believes that meeting the 30% aromatic specification would result in additional costs of approximately .75 cpg or $31,500 for every 100,000 barrels of diesel imported into Mexico.

Regarding the emission effects contributable to non-sulfur fuel properties (such as aromatic content), Valero points to EPA comments published as part of that agency's rulemaking process for diesel fuel sulfur requirements.[3] Specifically, the EPA determined that:

> "The non-sulfur fuel properties most often touted as good candidates for producing emission reductions from heavy-duty engines are cetane number and aromatics content. According to correlations between these fuel properties and emissions that have been presented in various published documents, the effects are rather small. We have estimated that an increase in cetane number from 44 to 50 would reduce both NOx and PM emissions by about 1 percent for the in-use fleet in calender year 2004. Likewise a reduction in total aromatics content from 34 volume percent to 20 volume percent would reduce both NOx and PM emissions by about 3 percent. We expect changes in other fuel

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[3] Environmental Protection Agency, Control of Air Pollution From New Motor Vehicles: Proposed Heavy-Duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements; Proposed Rules, 65 Fed. Reg. 35,430 (June 2, 2000), included as *Exhibit 4*. The Final Rule was published at 66 Fed. Reg. 5002 (Jan. 18, 2001).

> properties to produce emission reductions that are no greater than these effects. These reductions are insignificant in comparison to the emission benefits projected to result from today's proposal [*i.e., setting new requirements for catalytic emission control devices*], and would come at a considerable refining cost. As a result, at this time we do not believe that it is appropriate to require changes to nonsulfur diesel fuel properties as a means for producing reductions in engine-out emissions."[4]

The EPA's comments underscore that efforts to control emissions of diesel fuel should focus on engine manufacturer's exhaust emission technology coupled with lower sulfur standards (to ensure that the higher sulfur content does not damage such catalytic exhaust emission control devices) rather than attempting to reduce aromatic content. Requiring a reduction in aromatic content from the current U.S. standard of 35% to 30% would likely have (as the EPA stated) "insignificant" emission reductions but would conversely come at an increased cost to the Mexican market. Instead, reducing sulfur content (or aligning it with the U.S. standards) would be a more cost-efficient and dramatic means of reducing diesel fuel emissions.

(4) Method for Vapor Pressure Testing

Finally, Valero would also like to comment on the proposed method in the Draft NOM for determining the vapor pressure specification for gasoline. While Section 6.3 b) of the Draft NOM indicates that ASTM D5191 may be used, "as applicable," Valero would request that Note 2 of Table 1 be modified to specifically also reference ASTM D5191 so that there is no confusion that it may also be used as an alternative method to determine the vapor pressure for gasoline and gasoline-oxygenate blends.

Again, Valero appreciates the opportunity to comment on the Draft NOM and would like to thank the CRÉ for considering our views. If you have any questions about our comments or wish to discuss this matter further, please contact me at (001) (210) 345-3117 and we can provide additional information or further clarify our comments.

Sincerely,

John Braeutigam

John Braeutigam
Vice President
Strategic and Regulatory Development
Valero Companies

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[4] *Id.* at 35,520.

Exhibit 1

MEMORANDUM

TO: Docket EPA-HQ-OAR-2005-0161

FROM: Aron Butler, staff engineer, OAR/OTAQ/ASD

SUBJECT: Summary of recent findings for fuel effects of a 10% ethanol blend on light duty exhaust emissions

DATE: January 29, 2010

Background

Section 1506 of the Energy Policy Act of 2005 requires EPA to produce an updated fuel effects model representing the 2007 light-duty gasoline fleet, including determination of the emissions impacts of increased renewable fuel use. Pursuant to this goal, our office, with support from the Department of Energy Office of Energy Efficiency and Renewable Energy, has undertaken a study to examine the effects of five fuel properties (ethanol, aromatics, vapor pressure, and two distillation parameters: T50 and T90) on exhaust emissions from light-duty vehicles meeting the latest federal emission regulations (known as the Tier 2 program). The initial phase was a pilot study of the effects of ethanol, done using a typical base conventional gasoline (0% ethanol, or E0) and a typical 10% ethanol blend (E10) between May 2008 and January 2009.

This memo specifically addresses effects of E10 relative to E0 on emissions of hydrocarbons (as NMHC) and nitrogen oxides (NOx) as suggested by the pilot study. Previous studies had suggested E10 blends produced different emission behavior for these pollutants in newer vs. older technology vehicles.[1] Data from this pilot study provides further such evidence, which we feel is sufficient to guide decisions related to inventory modeling.[2] Other pollutants not covered by this memo (such as CO and air toxics) are being modeled assuming similar behavior for newer and older vehicles, consistent with recent data.[1,2]

The full fuel effects study, involving 31 fuels, is expected to be completed by mid-2010, and its results may supersede the findings described here. Emission behavior of other pollutants not covered here will be described in reports related to the full study, and in subsequent rulemaking actions that use those results.

Methods

The emissions testing used 19 vehicles covering a mix of passenger cars and light trucks, representing vehicles with high sales volumes. The test vehicle fleet is shown in Table 1. Two test fuels were produced containing 0% and 10% ethanol by volume, with other properties being

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[1] For more detailed discussion of emissions data sources, see Section 3.1 of the RFS1 RIA, EPA-420-R-07-004, available at http://www.epa.gov/otaq/renewablefuels/420r07004chap3.pdf.

[2] For more detailed discussion of inventory modeling for the final rulemaking, see Section 3.1 of the RFS2 RIA, EPA-420-R-10-006, available at http://www.epa.gov/otaq/renewablefuels/.

similar to what would typically be found at commercial filling stations. These fuel properties are given in Table 2.

The vehicles were tested at 75°F and 50°F using the LA92 test cycle, with each fuel being tested twice (two replicates). Fuels were tested in ascending order of ethanol blend level. A speed versus time trace of the LA92 test cycle is shown in Figure 1. The three phases of the test cycle are designed to allow separation of start-up emissions (when the engine and catalyst are relatively cold) from fully-warmed-up driving (when operation of emission controls has stabilized). For purposes of estimating emission inventories, the phases are typically weighted together to form a single, composite emission factor (in grams per mile) to represent average driving patterns.

Results

The resulting emissions data were analyzed using a mixed model approach, with the fixed effect parameter being ethanol content. Emission measurements were transformed using the natural logarithm before input into the model, which is a standard practice in analysis of this type of data in order to mitigate issues with data variability and skew. Results shown in Table 3 indicate that a 10% ethanol blend (E10) did not have a statistically significant effect (at a $p = 0.05$ level) on NMHC or NOx emissions relative to gasoline containing no ethanol (E0) at either test temperature. The p-value refers to the significance level of the statistical comparison. In most scientific studies of physical phenomena, a result (such as a difference between two treatments) is accepted as true or valid only if the significance level is $p = 0.05$ or less, suggesting relative safety from accepting a result which may have occurred only by chance. Since none of the emission comparisons evaluated here had p-values at 0.05 or below, we interpret this to mean there is no difference in emissions between the E0 and E10 fuels.

Figure 3 depicts the data after removal of outliers, with calculated means and 95% confidence intervals. The confidence interval describes the range in which the true mean of all such emission results would fall with 95% likelihood, which gives an indication of the precision of the calculated mean value shown.

Table 1. Test vehicle fleet summary.

MAKE	BRAND	MODEL (all 2008 model year)	ENGINE
Chrysler	Dodge	Caliber	2.4L I4
Chrysler	Dodge/Chrysler	Caravan/Town&Country	3.3L V6
Chrysler	Jeep	Liberty	3.7L V6
Ford	Ford	Focus	2.0L I4
Ford	Ford	500/Taurus/Freestyle	3.0L V6
Ford	Ford	F150	5.4L V6
Ford	Ford/Mercury	Explorer/Mountaineer	4.0L V6
GM	Buick/GMC/Saturn	Enclave/Acadia/Outlook	3.6L V6
GM	Chevrolet	Cobalt/HHR	2.4L I4
GM	Chevrolet	Impala	3.5L V6
GM	Chevrolet/GMC	Avalanche/Silverado	5.3L V8
Honda	Honda	Civic	1.8L I4
Honda	Honda	Accord	2.4L I4
Honda	Honda	Odyssey	3.5L V6
Nissan	Nissan	Altima	2.5L I4
Toyota	Toyota	Corolla	1.8L I4
Toyota	Toyota	Camry	2.4L I4
Toyota	Toyota	Sienna	3.3L V6
Toyota	Toyota	Tundra	4.0L V6

Table 2. Test fuel property summary.

Parameter	Units	Method	Test Fuel E0	Test Fuel E10
Ethanol	vol %	D5599	<0.1	9.35
T50	°F	D86	215	209
T90	°F	D86	324	319
RVP	psi	D5191	9.17	9.05
Aromatics	vol %	D1319	29.3	22.9
Olefins	vol %	D1319	6.4	5.7
Benzene	vol %	D3606	0.48	0.49
Sulfur	ppm	D5453	23	23
RON	-	D2699	93.4	93.7
MON	-	D2700	83.5	84.9
(R+M)/2	-	-	88.5	89.3

Table 3. Summary of Statistical Analysis of Emission Tests.

Emission	Test Temperature (deg.F)	Percent Difference (E10 vs. E0)	P-value*
NOx (composite result)	50	-12.87	0.64
NOx (composite result)	75	-7.59	0.94
NMHC (composite result)	50	-3.93	0.97
NMHC (composite result)	75	-12.96	0.09

*P-value refers to the significance level of the statistical comparison. In most studies of physical phenomena, a result is accepted as true or valid only if the significance level is p = 0.05 or less, suggesting relative safety from accepting a result which may have occurred only by chance. We interpret this to mean no significant differences were found, and thus no emission difference between E0 and E10 fuels.

Figure 1. LA92 test cycle.

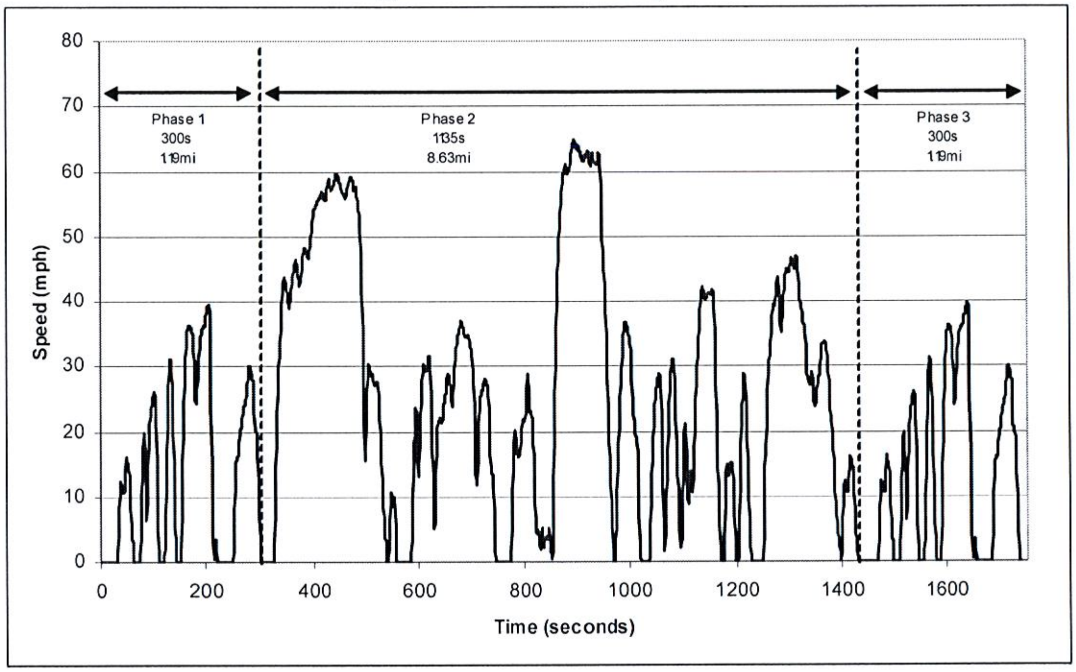

Figure 2. NMHC Composite Means (Blue Dots) and 95% Confidence Intervals (Vertical Lines) after outlier removal.

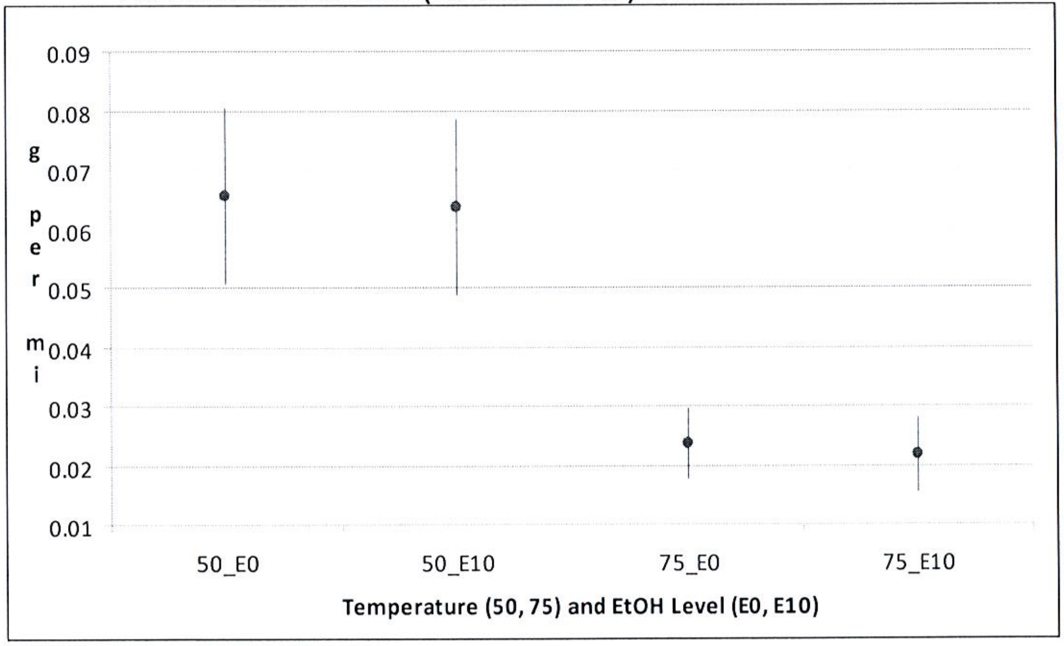

Figure 3. NOx Composite Means (Blue Dots) and 95% Confidence Intervals (Vertical Lines) after outlier removal.

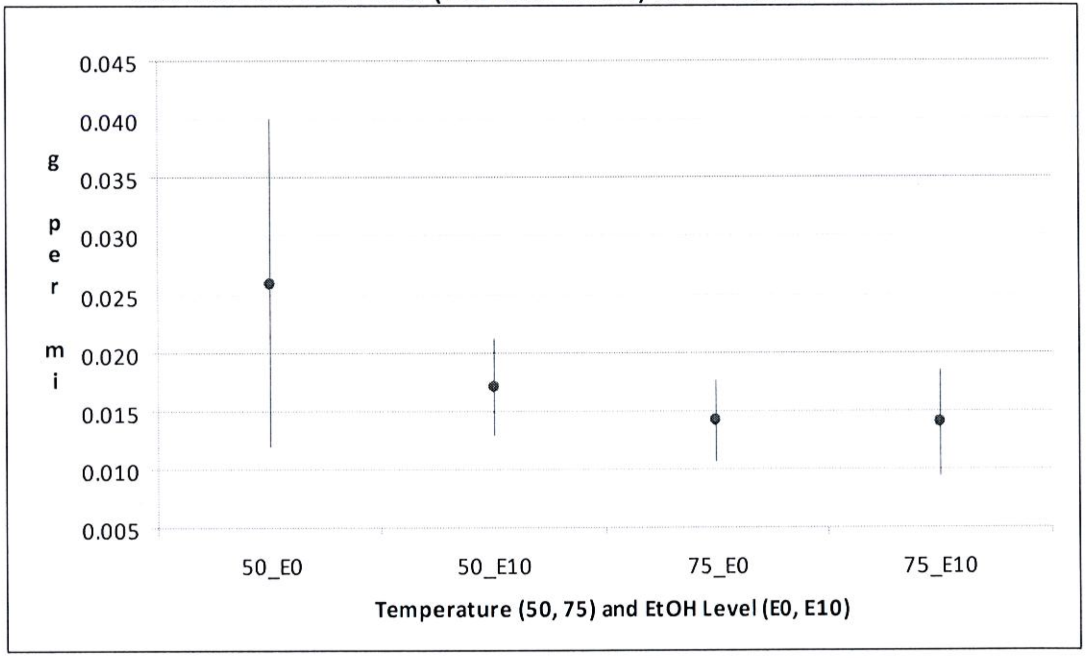

Exhibit 2

EXHIBIT 2

Inspection for CBOB UNL 9.0 Neat

Refinery Batch	160200
Release Number	
Sample Date	5/30/2016
Sample Number	1751204
Tank Number	TK2111 Final
C of A Date	5/31/2016 3:29 PM
C of A Number	144909

	Test Result	Min	Max
Benzene, D-3606, Vol%	0.46		3.80
Distillation, D-86			
Over point, F	86		
End point, F	394		430
10%	125		158
50%	208	170	250
90%	322		374
E200	47.1		
E300	84.7		
Gravity, API, D4052	60.2		
Olefins, D6550	6.25		
Oxidation Stability, D525	>240	240	
Wt% Oxygenates , D5599			
Methanol	0.00		0.00
Ethanol	0.00		0.00
MTBE	0.00		0.00
ETBE	0.00		0.00
TAME	0.00		0.00
t-Butanol	0.00		0.00
Total Oxygenates Wt%	0.00		0.00
Oxygen Wt%	0.00		0.00
Total Oxygenates Vol%	0.00		0.00
Nace Rust Test Rating, D665	A		B+
Sulfur, D2622, Wt%	0.0008		0.0080
Vapor/Liquid Ratio,D5188, F	140		
RVP, D5191	8.8		9.0
Total Aromatics, D5769	27.6		

Corrosion Inhibitor is injected at a minimum rate of :
1.3 lbs/1000 bbls for gasoline
2.6 lbs/1000 bbls for diesel
as product is pumping out of the refinery.

Exhibit 3

Exhibit 3

Inspection for CBOB UNL 9.0

Refinery Batch	160200
Release Number	
Sample Date	5/30/2016
Sample Number	1751205
Tank Number	TK2111 Final
C of A Date	5/31/2016 3:32 PM
C of A Number	144911

	Test Result	Min	Max
Appearance	Brt/Clr		Free Wtr
Benzene, D-3606, Vol%	0.40		3.80
Color, Visual	UnDyed	UnDyed	UnDyed
Copper Strip, D-130			
122F, 3Hrs. Rating	1a		1b
Distillation, D-86			
Over point, F	88		
End point, F	389		430
10%	121		158
50%	163	150	250
90%	316		374
E200	55.2		
E300	86.1		
Driveability Index	1009		1250
Exist Gum, D-381 g/100ml	1.0		4.0
Gravity, API	59.1		
Olefins, D6550	6.0		
Lead, D3237, G/Gal	L0.01		0.01
Octane			
Motor, D2700	82.9	82.0	
Research, D2699	91.4		
(RON + MON)/2	87.2	87.0	
Wt% Oxygenates , D5599			
Methanol	0.00		
Ethanol	10.47		
MTBE	0.00		
ETBE	0.00		
TAME	0.00		
t-Butanol	0.00		
Total Oxygenates Wt%	10.47		
Oxygen Wt%	3.64		
Total Oxygenates Vol%	9.78		
Phosphorus, D3231, G/Gal	L0.003		
Sulfur, Mercaptan, UOP163, Wt%	0.000		0.002
Sulfur, D2622, Wt%	0.0007		0.0080
Vapor/Liquid Ratio, D5188, F	127	122	
RVP, D5191	9.7		10.0
Total Aromatics, D-5769	24.8		
Silver Strip, IP227	0	0	1

Corrosion Inhibitor is injected at a minimum rate of :

1.3 lbs/1000 bbls for gasoline 2.6 lbs/1000 bbls for diesel as product is pumping out of the refinery.

Exhibit 4

Federal Register

Friday,
June 2, 2000

Part II

Environmental Protection Agency

40 CFR Parts 69, 80, and 86

Control of Air Pollution From New Motor Vehicles: Heavy-Duty Engine and Vehicle Standards; Highway Diesel Fuel Sulfur Control Requirements; Proposed Rules

The 50 ppm sulfur cap would therefore result in projected NO_X and PM emission reductions in 2020 of 540,000 and 17,000 tons per year, respectively, compared to 2.0 million and 83,000 tons per year for a 15 ppm cap. It should be noted that virtually none of the PM reduction comes from a reduction in the soot component of PM.

The cost of meeting a 50 ppm sulfur cap at the refinery would be substantially less costly than meeting the proposed cap of 15 ppm. In some cases, refiners may be able to meet a 50 ppm cap with only relatively minor capital investment of a few million dollars for a new hydrogen sulfide scrubbing unit and a PSA unit to increase hydrogen purity. New, high activity catalyst would also replace today's catalyst. In other cases, refiners would also have to add a second reactor. Finally, some refiners would require essentially the same two-stage hydrotreating unit that would be required to meet the proposed 15 ppm standard. In all cases, hydrogen consumption would be somewhat less than that required to meet the proposed 15 ppm standard.

Refiners who would be capable of meeting a 50 ppm cap with only minor capital investment would likely be those not blending any LCO into their diesel fuel, or those having substantial excess hydrotreating capacity in their current unit. We estimate that about 15 percent of on-highway diesel fuel production would fall into this category. Refiners blending some LCO into their diesel fuel (e.g., 15 percent or less), or with somewhat greater levels of LCO but also having significant excess current hydrotreating capacity, would likely be capable of meeting a 50 ppm cap with an additional reactor. We estimate that about 35 percent of on-highway diesel fuel production would fall into this category. Finally, about 50 percent of on-highway diesel fuel production would likely require a two-stage hydrotreating unit due to their higher LCO fraction or lack of excess current hydrotreating capacity. Overall, we project that the average cost of meeting the 50 ppm standard at the refinery would be about 2.3 cents per gallon, about 1.7 cents per gallon less than the corresponding cost for fuel meeting a 15 ppm sulfur cap.

It would be slightly less expensive to distribute the 50 ppm sulfur fuel than the15 ppm sulfur fuel. The pipeline interface between highway diesel fuel and higher sulfur products that must be sold with the higher sulfur product to ensure quality of the highway diesel fuel could be reduced. We estimate the cost savings per gallon of diesel fuel to be about 0.01 cents.

The overall cost of a program with a 50 ppm sulfur cap with a 30 ppm average is comprised of the hardware cost of lean NO_X catalyst technology, the cost increase in producing and distributing the fuel, and the cost of the projected 4% fuel economy loss. This corresponds to a net $35.4 billion 30-year NPV cost, compared to $37.7 billion for the 15 ppm sulfur cap proposal. Considering the PM and NO_X emissions benefits, the resulting aggregate cost effectiveness is projected to be $3600 per ton of NO_X+NMHC and $56,700 per ton of PM (including the SO_2 credit). These compare to $1500 per ton of NO_X+NMHC and $1900 per ton of PM for the 15 ppm sulfur cap proposal. The large difference in PM cost effectiveness is primarily due to the fuel economy penalty and the fact that none of the fuel cost could be allocated to hydrocarbon control, because of the lack of a hydrocarbon benefit.

Table VI.B–5 summarizes key emissions and cost impacts of a program adopting the sulfur levels analyzed. Note that, although the analysis finds that a 15 ppm average/25 ppm cap standard has potential to be adequate for enabling high-efficiency exhaust emissions controls, this finding involves a significantly higher level of uncertainty than the proposed 15 ppm sulfur cap, because it is based on the assumption that exhaust emission control designs could be focused on the average fuel sulfur levels. We believe that the possibility of some in-use fuel at near-cap levels would necessitate designing to accommodate this level, and they contend that this would not allow the high-efficiency technology to be enabled. If so, the technology enablement for this case would likely be similar to that for the 50 ppm cap case. The analysis results show that the 50 ppm cap case does not enable high-efficiency exhaust control technology at all.

TABLE VI.B–5.—SUMMARY OF EMISSIONS AND COST IMPACTS AT DIFFERENT FUEL SULFUR LEVELS

Sulfur level	2020 emission reductions (thousand tons/year)		Cost impacts			
	NO_X	PM	Vehicle[c]	Fuel consumption (percent)	Fuel (¢/gal)	Aggregate 30-yr NPV ($ billion)
5 ppm cap	2,020	86	$1,133	−1	[d] 6.0–7.3	[d] 47.1
15 ppm cap	2,020	83	1,133	0	4.4	37.7
25 ppm cap w/15 ppm average[a]	2,020	79	1,133	1	3.4	34.5
50 ppm cap w/30 ppm average[b]	538	17	603	4	2.7	35.4

[a] Note that this sulfur level involves significant increased uncertainty with respect to technology enablement. Manufacturers have commented that the possibility of some in-use fuel at or near the 25 ppm cap level would necessitate designing to accommodate this level, thus precluding high-efficiency technology enablement, and making technology for this case similar to that for the 50 ppm cap case.

[b] This sulfur level is not expected to enable high-efficiency exhaust control technology.

[c] Costs of added hardware combined with lifetime maintenance cost impacts; figures shown for comparison purposes are long-term costs for heavy heavy-duty vehicles.

[d] Fuel cost based on industry analyses of refinery and distribution costs; costs could range much higher depending on fuel segregation measures required.

We welcome comments on all aspects of these analyses for alternative fuel sulfur standards, including the technology enablement assessments, vehicle and fuel costs, emissions reductions, and cost effectiveness.

4. What Other Fuel Properties Were Considered for Highway Diesel Fuel?

In addition to changes in highway diesel fuel sulfur content, we also considered changes to other fuel properties such as cetane number, aromatics, density, or distillation. Each of these fuel properties has the potential to affect the combustion chemistry within the engine, and so aid in reducing emissions of regulated pollutants. Indeed, some manufacturers have made public statements to the effect that an idealized highway diesel fuel is necessary in order to optimize the efficiency of the next generation of heavy-duty diesel vehicles.

The focus of the fuel changes we are proposing today is to enable diesel engines to meet much more stringent emission standards. As described earlier in this section, we believe that diesel engines can meet much more stringent emission standards using advanced exhaust emission control systems, but the performance of these systems is dramatically reduced by sulfur. Thus, we have determined that sulfur in diesel fuel would need to be lowered. It does not appear that other fuel properties have the same sort of effect on advanced exhaust emission controls, and as a result we do not believe that changes in fuel properties other than sulfur are necessary in order for heavy-duty engines to reach the low emission levels offered by the advanced exhaust emission controls discussed above. In fact, after conducting a research study on this topic, industry members concluded that, "If in the future, fuel sulfur levels are significantly reduced in order to enable efficient exhaust emission controls, then it should be recognized that the exhaust emission control device becomes the primary driver on tailpipe emissions and that all other fuel properties will have only minor or secondary effects on the tailpipe emissions."[161]

Emission reductions can also be achieved through changes in diesel fuel properties as a direct means for reducing engine-out emissions. In this approach, it is not the exhaust emission control which is being "enabled," but rather the combustion process itself which is being optimized. This approach has the advantage that the effects are fleet-wide and immediate upon introduction of the new fuel, whereas new engine standards do not produce significant emission reductions until the fleet turns over. However, regulated changes in diesel fuel properties may produce emission reductions that disappear over time, if compliance test fuel is changed concurrently with the changes to in-use fuel (to assure that such fuel remains representative of in-use fuels). Manufacturers will redesign their new engines to take advantage of any benefit a cleaner fuel provides, resulting in engines still meeting the same emission standards in-use. Consequently, it would only be those engines sold before the compliance test fuel changes that would be likely to produce emission benefits, and as these engines drop out of the fleet, so also would the benefit of changes to diesel fuel.

Even so, it is useful to consider what emission reductions are achievable through changes to non-sulfur diesel fuel properties. The non-sulfur fuel properties most often touted as good candidates for producing emission reductions from heavy-duty engines are cetane number and aromatics content. According to correlations between these fuel properties and emissions that have been presented in various published documents, the effects are rather small. We have estimated that an increase in cetane number from 44 to 50 would reduce both NO_X and PM emissions by about 1 percent for the in-use fleet in calender year 2004.[162] Likewise a reduction in total aromatics content from 34 volume percent to 20 volume percent would reduce both NO_X and PM emissions by about 3 percent. We expect changes in other fuel properties to produce emission reductions that are no greater than these effects. These reductions are insignificant in comparison to the emission benefits projected to result from today's proposal, and would come at a considerable refining cost. As a result, at this time we do not believe that it is appropriate to require changes to non-sulfur diesel fuel properties as a means for producing reductions in engine-out emissions. There may, however, be performance or engine design optimization benefits associated with non-sulfur changes to diesel fuel that could justify their cost. Therefore we welcome cross-industry collaboration on voluntary diesel fuel improvements beyond the sulfur reduction proposed in this notice, and we continue to solicit information on the impact of non-sulfur fuel changes on exhaust emission control, engine-out emissions, and engine design and performance.

C. Should Any States or Territories Be Excluded From This Rule?

1. What Are the Anticipated Impacts of Using High-Sulfur Fuel in New and Emerging Diesel Engine Technologies if Areas Are Excluded From This Rule?

Section III discusses the technological feasibility of the emission standards being proposed today and the critical need to have sulfur levels reduced to 15 ppm for the technology to achieve these emission standards. The implications to be drawn from section III with regard to exemptions from the sulfur standards for States and Territories is fairly straightforward. If vehicles and engines employing these technologies to achieve the proposed emission standards will be operated in these states or territories, then low-sulfur diesel fuel must be available for their use.

Some have suggested allowing persons in Alaska to remove emission control equipment to enhance the viability of using high-sulfur fuel. In addressing this issue, we note that, under the Clean Air Act, it is prohibited in all 50 states to remove emission control equipment from an engine, unless that equipment is damaged or not properly functioning, and then is replaced with equivalent properly functioning equipment.

2. Alaska

a. Why is Alaska Unique?

There are important nationwide environmental and public health benefits that can be achieved with cleaner diesel engines and fuel, particularly from reduced particulate emissions, nitrogen oxides, and air toxics (as further discussed in section II). Therefore, it is also important to implement this program in Alaska. Any 2007 and later model year diesel vehicles in Alaska would have to be fueled with low sulfur highway diesel, or risk potential damage to the aftertreatment technologies or even the engines themselves. Although the engine standards proposed today do not have different technology and cost implications for Alaska as compared to the rest of the country, the low sulfur fuel program would have different implications (described below). Therefore, in evaluating the best approach for implementing the low sulfur fuel program, it is important to consider the extremely unique factors in Alaska.

Section 211(i)(4) provides that the states of Alaska and Hawaii may seek an exemption from the 500 ppm sulfur standard in the same manner as provided in section 325 of the Clean Air Act. Section 325 provides that upon request of Guam, American Samoa, the Virgin Islands, or the Commonwealth of the Northern Mariana Islands, EPA may exempt any person or source, or class of persons or sources, in that territory from any requirement of the CAA, with some specific exceptions. The requested exemption could be granted if EPA determines that compliance with such requirement is not feasible or is unreasonable due to unique geographical, meteorological, or economic factors of the territory, or other local factors as EPA considers significant.

Unlike the rest of the nation, Alaska is currently exempt from the 500 ppm

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[161] Lee, et al., SAE 982649.

[162] "Exhaust emissions as a function of fuel properties for diesel-powered heavy-duty engines," memorandum from David Korotney to EPA Air Docket A–99–06, September 13, 1999.