

Ozone Reduction Strategies from Fuels



Colorado Department of Public Health and
Environment

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Current Fuel Programs Overview

- **Summertime Low RVP Gasoline**
 - 7.8 lb. Summertime RVP
 - One-hour Ozone Maintenance SIP Area
 - June 1st – September 15th
 - One-pound ethanol waiver
 - 9.0 lb. Summertime RVP
 - Northern Front Range and rest of state
 - One-pound ethanol waiver

- **Tier II Low Sulfur Gasoline**
 - 30ppm average/80ppm max
 - Statewide/Year Round
 - Phased-in from 2004

Potential Fuel Programs To Reduce Ozone

- Federal Reformulated Gasoline
- Low RVP (7.0) Gasoline
- Elimination of One-Pound Ethanol Waiver

Federal Reformulated Gasoline

- Mandated in 9 worst ozone areas by Clean Air Act Amendments of 1990
- Ozone non-attainment areas may opt-in
- Performance based standards
 - Refiners have flexibility on how to meet standards
 - Standards based on EPA Complex Model

Emissions Reductions:

- 17.94 tons per day VOC reduction*
- Additional air toxics reductions
 - Unlike other options will result in reduction of VOCs with higher ozone forming potential

*All reduction strategies evaluated using MOBILE6 & Non-Road Mobile estimates for the year 2010 (assuming current IM program, 7.8 lb. RVP gasoline (9.0RVP in NFR) with ethanol waiver, and 85% ethanol marketshare prior to implementation)

Implementation Process/Issues:

- Permitted by 1990 amendments to Clean Air Act (42U.S.C. 7545(k)) for non-attainment areas
 - Effective one-year after receipt of petition
 - Governor must petition EPA
 - EPA may extend effective date based on supply issues
 - Not limited by Boutique Fuels Rule
- Federally Enforceable
 - More burdensome recordkeeping and reporting requirements than other options

Costs:

- EPA has estimated that RFG costs 4-8 cents more per gallon than conventional gasoline
- Refineries not currently equipped to make RFG may incur additional costs due to need for extensive retrofits

7.0 RVP Gasoline

- Ozone non-attainment areas are required to have 7.8 lb. RVP summertime gasoline
- May go lower if needed to attain NAAQS

Emissions Reductions:

- 9.45 tons per day VOC reduction with continued ethanol one-pound waiver*
 - Using California predictive model to account for reactivity, strategy has 42% of the benefit of RFG
- May increase air toxic emissions

Emissions Reductions:

- 13.69 to 15.81 tons per day VOC reduction with simultaneous elimination of one-pound ethanol waiver* (range dependent on ethanol marketshare after implementation of strategy, 0% to 85%)
 - Using California predictive model to account for reactivity, strategy has between 56% and 82% of the benefit of RFG
- May increase exhaust air toxic emissions

Implementation Process/Issues:

- Permitted by 1990 amendments to Clean Air Act (42U.S.C. 7545(k)) for non-attainment areas
 - Must implement as part of SIP
 - Must demonstrate that strategy is necessary to achieve attainment of the NAQSS
 - National Energy Policy Act of 2005, Boutique Fuels Rule, codified at 42 U.S.C. 7545(c)(4)(C) adds additional restrictions based on supply issues
- State Enforced

Costs:

- Greater costs than going from 9.0 lb. RVP to 7.8 lb. RVP
 - Change from 9.0 lb. RVP to 7.8 lb. RVP achievable through elimination of small volume of butane, which has a very high RVP
 - Change from 7.8 lb. RVP to 7.0 lb. RVP requires elimination of greater volume of pentane, which has a lower RVP than butane
- Study of Kansas City market in the 1990's estimated average cost increase of 3 cents per gallon; EPA cost estimates of 1-2 cents per gallon based on nationwide average
- Costs will be greater for some producers

Elimination of One-Pound RVP Exemption for Ethanol

- Blending of ethanol into gasoline increases the RVP of blended fuel
 - Typically around one-pound RVP for a 10% ethanol blend
 - Fuel permeability also increases with ethanol use
- Increased RVP and permeability leads to increased evaporative VOC emissions
- Ozone impacts offset to some degree by:
 - reduced exhaust VOC and CO emissions
 - lower ozone forming reactivities

Emissions Reductions:

- 7.40 to 9.60 tons per day VOC reductions with 7.8 RVP gasoline* (range dependent on ethanol marketshare after implementation of strategy, 0% to 85%)
 - Using California predictive model to account for reactivity, strategy has between 24% and 49% of the benefit of RFG
- 66.54 ton per day CO increase if 0% ethanol marketshare
- If less ethanol is used, fewer acetaldehyde and NO_x emissions, but additional air toxics such as benzene and toluene

Implementation Process/Issues:

- Permitted by National Energy Policy Act of 2005, codified at 42 U.S.C. 7545(h)(5)
 - Governor must petition U.S. EPA
 - Petition must provide documentation that ethanol waiver contributes to air pollution
 - Effective one-year after receipt of petition, or on June 1st of the following year, whichever is later
 - December 1, 2007 petition date would mean December 1, 2008 effective date
 - EPA may extend effective date based on gasoline supply concerns
- Federally Enforceable

Costs:

- Refiners and blenders may lose cost savings of blending ethanol, if they discontinue blending. Costs will depend on the cost of ethanol at the time of implementation
- Refiners and blenders will incur additional costs if they continue to blend ethanol, since they will have to use a more expensive sub 7.8 lb. RVP blendstock
- Possible supply issues for refiners
- Likely adverse economic impacts on ethanol producers