

Ozone Fuels Strategies



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LET'S TAKE CARE OF OUR SUMMER AIR.

OzoneAware.org

Current Fuels Programs



- **Denver area**

- 7.8 psi summertime RVP (June 1- Sept. 15)
 - » Began summer 2004 by federal rule
- 1.0 psi waiver for ethanol blends (8.8 psi max)
 - » Federal rule
 - » In 2006 estimated 85% of gasoline sold contained ethanol
- 30 ppm/80 ppm max low-sulfur gasoline
 - » Phased in since 2004 by federal rule

- **North Front Range**

- 9.0 psi RVP regulatory requirement
 - » Estimated 80% of gasoline sold is 7.8 base RVP
- 1.0 psi waiver for ethanol blends
- 30 ppm/80 ppm max low-sulfur gasoline

Potential Fuels Options



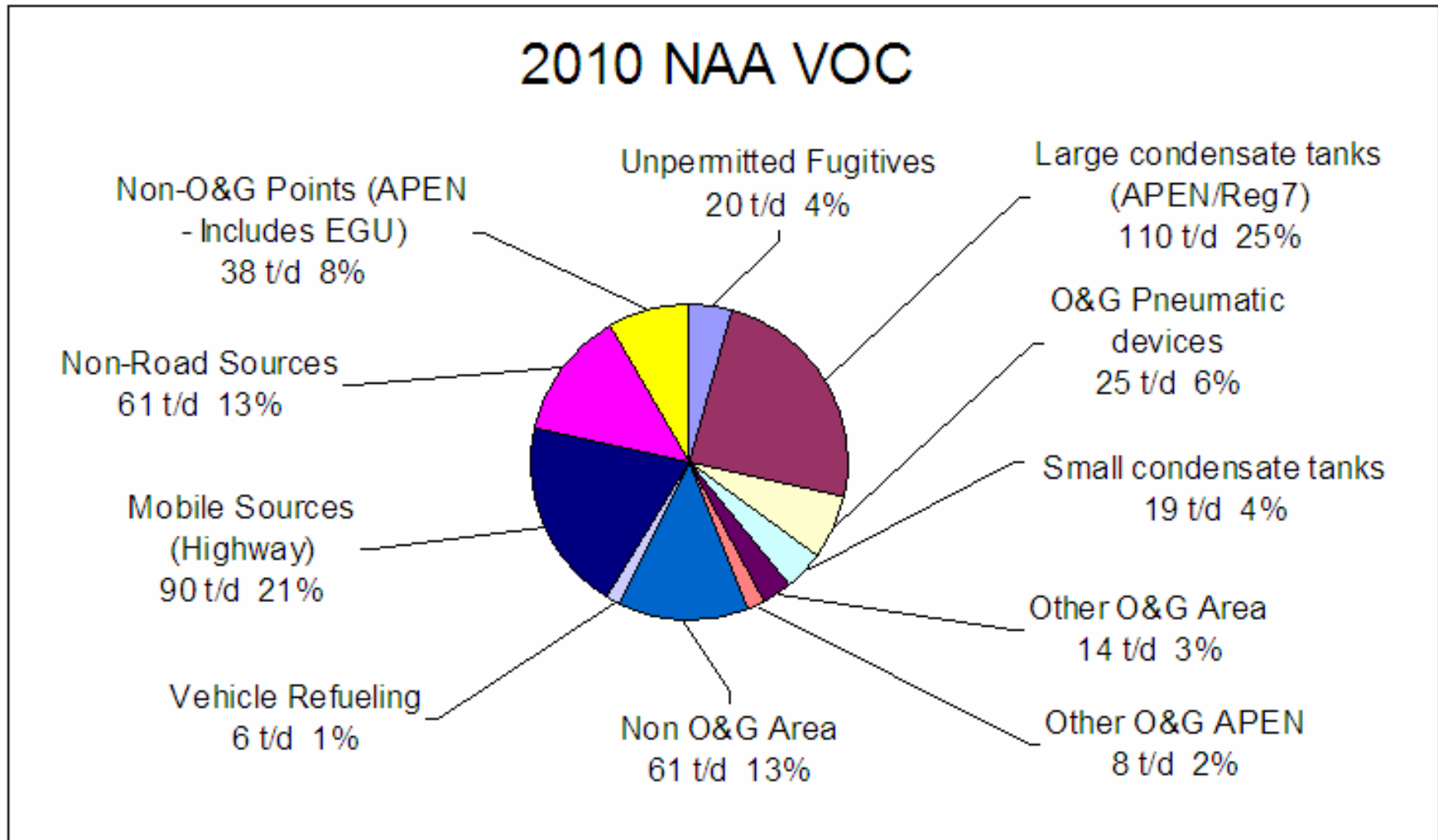
- 1. Expand 7.8 base RVP gasoline regulatory requirement to NFR**
- 2. Maximum 7.0 base RVP gasoline in Denver/NFR and maintain ethanol waiver (8.0 RVP for ethanol blends)**
- 3. Maximum 7.8 base RVP gasoline in Denver/NFR and eliminate ethanol waiver (7.8 RVP for ethanol blends)**
 - Suppliers blend 6.8 base RVP and/or eliminate ethanol blending
- 4. Maximum 7.0 base RVP gasoline and eliminate ethanol waiver (7.0 RVP for ethanol blends)**
 - Suppliers blend 6.0 base RVP and/or eliminate ethanol blending
- 5. Federal Reformulated Gasoline**
 - RVP and ethanol requirements can vary
 - Mandated in 9 worst ozone areas and other areas may opt-in

EPA Approvals



- **7.0 RVP gasoline**
 - Must be approved by EPA as part of a SIP
 - Schedule established in the SIP
 - State enforced
- **Ethanol waiver**
 - Governor must petition EPA
 - Must be approved by EPA based on demonstrated contribution to air pollution
 - Effective one-year after receipt of petition unless EPA extends effective date due to supply issues
 - Uncharted territory for EPA
- **Reformulated Gasoline**
 - Governor must petition EPA
 - Takes effect one-year after receipt of petition unless EPA extends the date (up to three additional years) due to supply issues
 - Federally enforced with extensive record-keeping requirements

VOC Emission Inventory



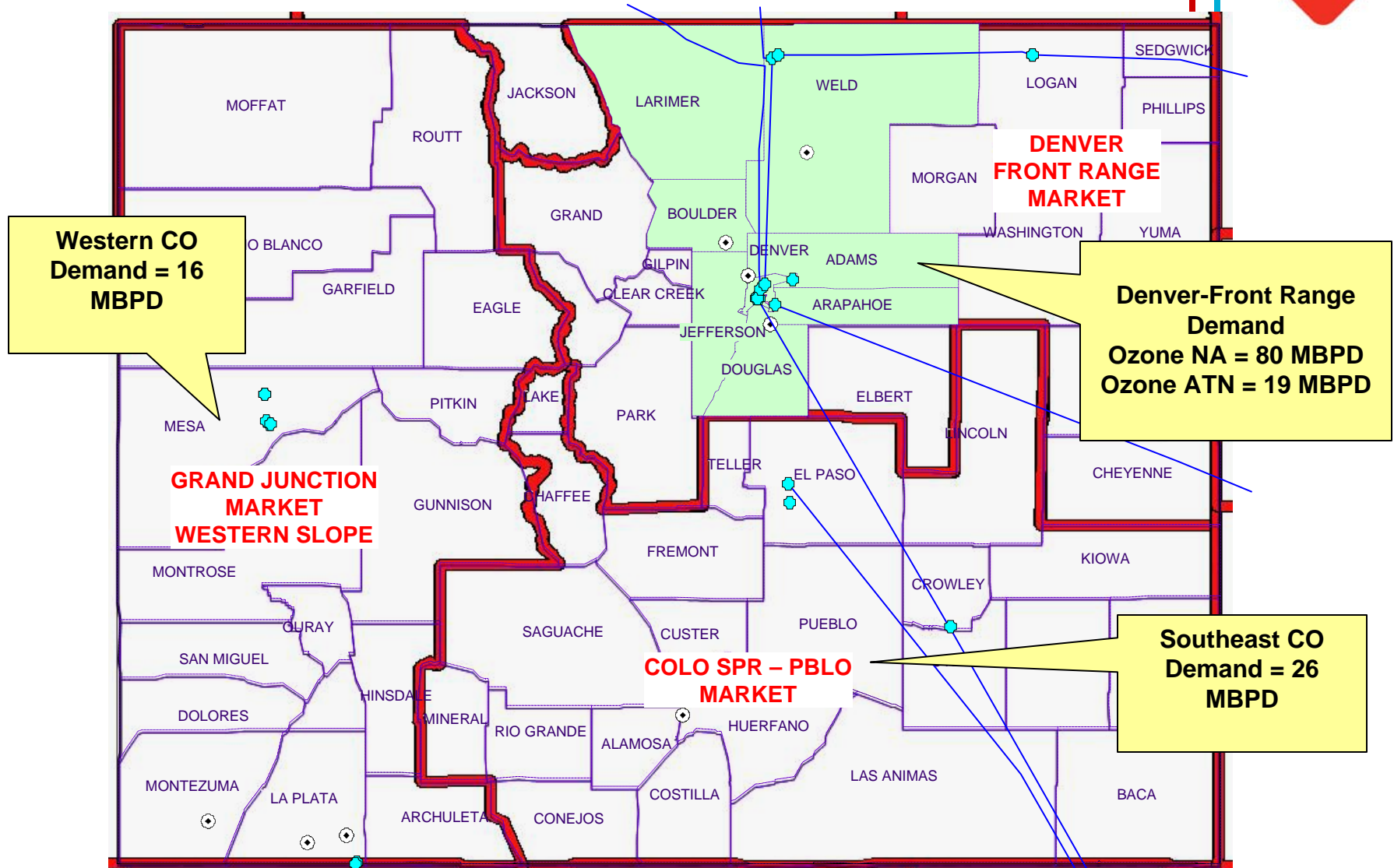
Emission Benefits



Fuel Option	Base RVP	Ethanol Blending	VOC Emission Reduction* *	Other Emission Impacts
7.8 RVP NFR	7.8	85% @ 10%	(2010) 2.7 tpd	
7.0 RVP/ maintain waiver	7.0	85% @ 10%	9.5 tpd	Small CO benefit
7.8 RVP/ eliminate waiver	7.8	0%	7.4 tpd	360 tpd CO increase
	6.8	85% @ 10%	9.6 tpd	
7.0 RVP/ eliminate waiver	7.0	0%	13.7 tpd	360 tpd CO increase
	6.0	85% @ 10%	15.8 tpd	Small CO benefit
Federal RFG	varies	varies	17.9 tpd	NOx and air toxics benefits

** compared to current 7.8 RVP gasoline (9.0 RVP in NFR), current ethanol waiver, and 85% ethanol market share, on-road and non-road mobile sources

CO Gasoline Demand



Source: EAI, Inc. 2008

Refineries Serving Front Range



- **ConocoPhillips**
 - Borger, TX
 - Billings, MT
- **Frontier**
 - El Dorado, KS
 - Cheyenne, WY
- **Sinclair**
 - Casper, WY
 - Rawlins, WY
- **Suncor**
 - Commerce City, CO
- **Valero**
 - McKee, TX
- **Total Crude Refinery Capacity**
 - 775 MBPD
- **Effective refining capacity accessing Front Range**
 - 300 MBPD
- **5 pipeline systems serve the Front Range**
- **Total Pipeline Capacity**
 - 214 MBPD
- **Summer open pipeline capacity**
 - 22 MBPD

Source: EAI, Inc.

Economic Impacts



- **Cost of production**
 - Capital costs
 - Operating costs
 - Lost opportunity costs (light end products)
- **Supply impacts**
 - Loss of light end gasoline constituents
 - Shift gasoline out of Front Range market
 - Possible reduced ethanol blending
- **Schedule impacts**
 - 1 to 5 years to implement
 - Varies by refinery
 - Depends on current refinery configuration, sources of crude, and potential markets

CPA Economic Impact Study



- **Prepared by EAI, Inc. (Energy Analysts International)**
- **Based on survey of CPA member refineries**
- **Looked at impact of fuels options on supply, costs and logistics**
- **Presented at June 10 stakeholder meeting**
- **Detailed presentation posted on www.ozoneaware.org**

Summary of Potential Impacts



		7.8/no waiver	7.0/waiver	7.0/no waiver	RFG
Cost Impact	Capital cost	\$140 mm	\$265 mm	\$380 mm	\$1,000 mm
	Annualized Cap. Cost	~1 ¢/gal	1-2 ¢/gal	2-3 ¢/gal	5-6 ¢/gal
	Operating cost	~1 ¢/gal	~1 ¢/gal	3-4 ¢/gal	2-3 ¢/gal
	Lost revenue**	6-7 ¢/gal	5-6 ¢/gal	8-9 ¢/gal	8-9 ¢/gal
	Total cost	8-9 ¢/gal	7-9 ¢/gal	13-16 ¢/gal	15-18 ¢/gal
Supply Impact	Product loss**	8-11%	10%	16-18%	15-16%
	Market shift	9%	9%	23%	30%
	Total supply impact	17-20%	19%	39-41%	45%
Schedule	Range	12-36 mos.	12-36 mos.	12-60 mos.	36-60 mos.

** includes both potential light ends and/or ethanol product losses

Source: EAI, Inc.
2008

Observations



- **RFG and 7.0 RVP/no waiver**
 - Greatest VOC emission reductions (13-18 tpd)
 - Significant capital costs (up to \$1 billion)
 - Significant potential supply impacts(40-45%)
 - Longer lead time (3-5 years)
 - Likely a potential longer term strategy
- **7.0 RVP w/waiver and 7.8 RVP/no waiver**
 - Appreciable VOC emission reductions (8-10 tpd)
 - Lower capital costs and ϕ /gal (half of RFG)
 - Supply issues less but still significant (20%)
 - Can likely be implemented in 2-3 years

Observations



- **Ethanol waiver vs. 7.0 RVP**
 - Removal of waiver does not prohibit ethanol blending
 - Ethanol has to be blended with lower RVP base gasoline
 - Renewable Fuels Standard mandates significant and increasing ethanol blending over time
 - Refiners can choose to reduce base RVP (6.8 psi) or blend less ethanol (and purchase ethanol credits) based on individual situations
 - Reduced ethanol blending would increase CO emissions, particularly from non-road sources (sensitivity modeling case is being run)
 - EPA process for considering waiver request is uncertain