Preliminary "High-Level" Evaluation Tool for Supporting Initial Prioritization of Ozone Reduction Measures

Fuels and Mobile Sources Subcommittee
September 3, 2010

Strategies Included:

- Federal Reformulated Gasoline
- 7.0 RVP Gasoline
- Eliminate Ethanol Waiver
- Eliminate Ethanol Blending during Ozone Season
    - Gasoline Fuels Options – Cost Benefit Summary
- Expanded Use of Alternative Fuels in Governmental and Private Fleets
- Electrification of Vehicle Fleet
- Reduce Fuel Use in Fleet Vehicles

Preliminary Draft for Discussion Only

This page intentionally left blank

Preliminary "High-Level" Evaluation Tool for Supporting Initial Prioritization of Ozone Reduction Measures

Preliminary Draft for Discussion Only

September 3, 2010

Measure type: Fuels - Gasoline

Measure name and description: Reformulated Gasoline (RFG)

RFG is gas is blended to reduce smog-forming and toxic pollutants (principally by lowering fuel evaporation rates). The Clean Air Act requires that RFG be used in cities with the worst smog pollution to reduce harmful emissions that cause ground-level ozone. A state may petition EPA to require RFG as part of efforts to meet the ozone standard.

Preliminary sense of anticipated air quality benefits (e.g. NOx/VOC reductions? Potential reduction amount?):

The benefits below are compared to the current base summertime fuel specification of 7.8 RVP with a 1 psi RVP waiver:

- Mostly on road mobile source benefits, but some off-road benefits as well.
- Approx. 15 TPD VOCs (w/potential small NOx benefits) total reduction based on 13 tpd on-road and 2 tpd non-road emissions reductions
- Reduction of 15 tpd represents around 11% reduction of total (on-road and non-road) transportation-related VOC emissions contributing to ozone

Preliminary sense of anticipated costs and economic impact:

The RAQC/CDPHE commissioned a fuels study in the fall of 2009 to assess the market impacts of four proposed fuel options, the costs incurred to make the designated fuels and how a particular fuel specification might impact the sourcing and availability of summertime fuel for the Denver/North Front Range Market.

- Based on Costs from draft Fuels Study :
  - Refining Costs:
    - Capital – 1-6 cents/gallon (cpg)
    - Operating/Maintenance – 2-4 cpg
    - Lost product – 9-11 cpg
  - Capital Costs: estimated at $590 Million
  - Market Costs:
    - To consumers via RFG passed on production costs – 12- 21 cpg
    - Market costs: supply tightening that could lead to some additional costs to consumers over and above refinery costs.
      - Price Spread in Chicago between RFG and conventional gas has been relatively stable at 8.9 to 6.8 cpg (2006-2010)

Additional technical analysis/input needed to refine benefits/costs estimates:

- Obtain feedback on fuels study/independent analysis from refining industry
- Evaluate benefits using EPA required MOVES model, as well as atmospheric model

Implementation feasibility (e.g. Who has authority? Who needs it? Who implements the measure?):

- Authority exists under the Federal Clean Air Act because region is nonattainment for ozone
- Governor must petition EPA to develop RFG for attainment purposes; no legislative approval needed since RFG is not part of the SIP, rather it is a federal program (see below)
- Implementation feasibility high; approximately 17 states have opted-in to the federal RFG program, so pursuing this does not raise issues with EPA regarding quantifiability, enforceability etc.
- EPA implements program, but likely process would be for the RAQC and AQCC to consider pursuing RFG and recommend to Governor.

Demonstrated ability to take "SIP Credit" for the measure:

- Yes. Measure not technically part of the SIP, rather associated benefits are accounted for via modeling to demonstrate attainment via the SIP

Likelihood that measure could be in place in time for SIP inclusion (approx 2015); and, if later, how much later (e.g. 2 years? 10 years, etc?):

- High likelihood, assuming commitment to pursue RFG is made within about one year so that predicted 5 year technical lead in begins in 2011 and assuming EPA provides reasonable flexibility from requirement that the RFG enters the fuels market within 1 year of the Governor's petition requesting to use it for attainment purposes.

Preliminary Assessment of Co-benefits (e.g. other air quality, economic, quality of life, transportation etc):

- Possible slight air toxics, but these benefits are most likely to be realized by other federal mobile source regulations
- No GHG benefits

Other Considerations/Comments (e.g. Employed elsewhere, particular challenges/opportunities etc?):

- Depending on where EPA sets the ozone standard, how many states pursue RFG, associated market supply and demand considerations, industry's need for uniformity, and whether the EPA pushes for a federal change in fuel standards, the cost/benefits of this measure could vary.

Preliminary "High-Level" Evaluation Tool for Supporting Initial Prioritization of Ozone Reduction Measures

Preliminary Draft for Discussion Only

September 3, 2010

Measure type: Fuels - Gasoline

Measure name and description: 7.0 RVP Gasoline

Summertime fuel standard w/ 1 psi ethanol waiver throughout the DMA/NFR NAA. The RVP of a gasoline is a measure of its volatility. Higher RVP gasoline is more volatile meaning it has a greater propensity to evaporate. Lowering the required RVP from the current 7.8 standard to 7.0 will reduce VOC evaporative emissions.

Preliminary sense of anticipated air quality benefits (e.g. NOx/VOC reductions? Potential reduction amount?):

The benefits below are compared to the current base summertime fuel specification of 7.8 RVP with a 1 psi RVP waiver:

- Approximately 7 TPD reduction in VOC from On-Road Mobile Emissions in 2015 (about 6% of On-road VOC)
- Approximately 1 TPD reduction in VOC from Non-Road Mobile Emissions in 2015 (tractors, lawn mowers etc.)

Preliminary sense of anticipated costs:

The RAQC/CDPHE commissioned a fuels study in the fall of 2009 to assess the market impacts of four proposed fuel options, the costs incurred to make the designated fuels and how a particular fuel specification might impact the sourcing and availability of summertime fuel for the Denver/North Front Range Market.

- Based on Costs from draft Fuels Study performed for RAQC/APCD by EAI, Inc.:
  - Refinery Costs: (capital, operating and light end loss) between 5 cents per gal. (cpg) and 8 cpg
  - Refinery Capital Investment: estimated at approximately $210 Million
  - Market costs: The Colorado Front Range market will likely experience a decline in available gasoline supply due to the light end loss and the fact some refiners may shift gasoline to other markets to avoid the capital costs of more stringent fuel specifications. This supply tightening could lead to some additional market costs to consumers over and above refinery costs. Past experience indicates market premiums of 2 to 21 cpg have been paid for 7.0 RVP fuels in Detroit and Kansas City depending on local market conditions.

Additional technical analysis needed to refine benefits/costs estimates:

- Reductions based on MOBILE6 and Non-Road Model analysis for 2015. Analysis needs to be conducted using MOVES mobile sources emissions model, which will be used in SIP. Impact of MOVES on fuel options analysis is uncertain.
- Assessment of Colorado's administrative costs to implement and enforce

Implementation feasibility (e.g. Who has authority? Who needs it? Who implements the measure?):

- The AQCC currently has regulatory authority to establish a 7.0 RVP fuel standard.
- State must implement as part of a SIP; effective date dependent on SIP approval date.
- State must demonstrate that strategy is necessary to achieve attainment of NAAQS.
- EPA can approve if it finds that no other measures that would bring about timely compliance exist or that other measures exist but such measures are unreasonable or impracticable.
- Implementation of strategy cannot cause supply or distribution in interruptions or have significant adverse effect on fuel producibility.
- Implementation of 7.0 RVP would be a State responsibility in the NAA.

Demonstrated ability to take "SIP Credit" for the measure:

- Using EPA mobile source emissions models (MOVES) properly ensures that SIP credit can be calculated and verified. Appropriate rulemaking ensures enforceability.

Likelihood that measure could be in place in time for SIP inclusion (approx 2015); and, if later, how much later (e.g. 2 years? 10 years, etc?):

- Refiners will require approximately 3-4 years to implement capabilities to produce 7.0 RVP w/ethanol waiver after regulatory requirement established. So measure could likely be in place in time SIP inclusion.

Preliminary Assessment of Co-benefits (e.g. other air quality, economic, quality of life, transportation etc):

- Potential gasoline supply loss due to light end rejection and choices by some refiners to shift to other markets
- Current 7.8 RVP fuel is oversupplied to NAA with overflow occurring to nearby attainment market areas. Higher cost product (7.0 RVP) relative to 9.0 RVP allowed in attainment market area, will cause refiners to minimize production of 7.0 RVP for NAA only and add storage tanks (costs) to accommodate both 9.0 and 7.0 RVP.

Other Considerations/Comments (e.g. Employed elsewhere, particular challenges/opportunities etc?):

- Five other areas (Atlanta, Birmingham, El Paso, Detroit and Kansas City) currently require 7.0 RVP gasoline
- Implementation by state would add to States administrative costs

Preliminary "High-Level" Evaluation Tool for Supporting Initial Prioritization of Ozone Reduction Measures

Preliminary Draft for Discussion Only

September 3, 2010

Measure type: Fuels

Measure name and description: Eliminate Ethanol Waiver

The current EPA DMA/NFR NAA summertime fuel specification is 7.8 Reid Vapor Pressure (RVP) with a waiver allowing for ethanol blended fuels (E10) to have a 1 pound per square inch (psi) increase in RVP. Specifically, this waiver allows ethanol to be blended at 10% volume with regular specification (7.8 RVP) gasoline, effectively resulting in E10 fuel being produced with a RVP of 8.8. Eliminating the waiver would mean that refiners would have to meet the applicable RVP requirement regardless of whether they blended ethanol or not.

Eliminating the waiver could either be done while retaining the current 7.8 RVP specification, or in connection with a reduction of the RVP specification to 7.0 to achieve even greater emission reduction benefits. Elimination of the waiver would require the refiners to either eliminate ethanol blending or make lower RVP conventional gasoline blendstock to accommodate the 1 psi increase resulting from 10% ethanol blending. Given current federal renewable fuel standards, continued blending of 10% ethanol is likely effectively mandated at least in the near term. Accordingly, elimination of the waiver will likely result in lowering the RVP of conventional gasoline blendstock from the current 7.8 RVP to either 6.8 RVP, or 6.0 RVP if the elimination of the waiver was done in conjunction with the lowering of the RVP specification to 7.0.

This strategy has been analyzed assuming use of a lower RVP conventional gasoline blendstock to accommodate the 1 psi increase resulting from 10% ethanol blending because the federal renewable fuel standards have mandated the use of ethanol at this time.

Preliminary sense of anticipated air quality benefits (e.g. NOx/VOC reductions? Potential reduction amount?):

The benefits below are compared to the currently effective summertime (June 1 to September 15) fuel specification of 7.8 RVP with a 1 psi RVP waiver and based on Mobile 6.2 modeling for the year 2015:

- Eliminating the 1 psi waiver assuming a summer time fuels specification of 7.8 RVP: would result in the following:
  - Approximately 9 tpd reduction of VOCs for total on road and non-road engines
- Eliminating the 1 psi waiver assuming a summertime fuels specification of 7.0 RVP would result in the following:
  - Approximately 15 tpd reduction of VOCs for on road and non-road engines

- Reduction of 15 tpd represents around 12% reduction of total (on-road and non-road) transportation-related VOC emissions in the non-attainment area in 2015. A reduction of 9 tpd represents a reduction of approximately 7% of the transportation related VOCs in the NAA.

Preliminary sense of anticipated costs and economic impact:

The RAQC/CDPHE commissioned a fuels study in the fall of 2009, designed to build off of a similar study commissioned by the refining industry. This study, in a preliminary draft phase, assesses the market impacts of four proposed fuel options, the costs associated with making the designated fuels, and how a particular fuel specification might impact the sources and market availability of summertime fuel in the Denver/North Front Range.

- Based on Costs from preliminary draft Fuels Study
  - 7.8 RVP w/o waiver (6.8 RVP blendstock + 10% ethanol)
    - Costs to refiners (capital, operating and light end loss)
      - Capital – 0.75 to 1.5 cents per gallon (cpg)
      - Operating - 0.5 to 2 cpg
      - Lost product – 5 to 6 cpg
    - Cost to consumer compared to current baseline could range from 6-10 cpg plus an additional premium depending on the market and supply.
  - 7.0 RVP w/o waiver (6.0 RVP blendstock + 10% ethanol)
    - Costs to refiners (capital, operating and light end loss) on
      - Capital – 0.75 to 6 cpg
      - Operating - 2 to 3 cpg
      - Lost product – 9 to 11 cpg
    - Cost to consumer compared to current baseline could range from 12-20 cpg plus an additional premium depending on the market and supply.

Additional technical analysis needed to refine benefits/costs estimates:

- Emissions estimates will need to be updated using EPA's new emissions model (MOVES) before this measure can be considered for SIP purposes, which will ultimately be used in the SIP analysis.
- Additional input and analysis of associated costs requested of and provided by the refining industry
- Photochemical air quality modeling to determine impact of lower emissions on ambient ozone levels.

Implementation feasibility (e.g. Who has authority? Who needs it? Who implements the measure?):

- Removal of the waiver requires that the Governor petition EPA requesting elimination of the waiver. The petition must document that the waiver increases air pollution.
- Elimination of the waiver will be effective date one year after receipt of petition. EPA may extend the effective date of the waiver elimination if it determines that elimination of the waiver would result in insufficient supply of gasoline.

Demonstrated ability to take "SIP Credit" for the measure:

- SIP credit can be calculated and verified provided that EPA's most current mobile source emissions models (MOVES) are employed
- Enforceability is assured via the petition and EPA action to approve the waiver elimination

Likelihood that measure could be in place in time for SIP inclusion (approx 2015); and, if later, how much later (e.g. 2 years? 10 years, etc?):

High likelihood, assuming commitment to pursue measure is made within one year so that predicted 3-4 years needed for refiners to modify operations can occur.

Preliminary Assessment of Co-benefits (e.g. other air quality, economic, quality of life, transportation etc):

No greenhouse gas benefits.

Other Considerations/Comments (e.g. Employed elsewhere, particular challenges/opportunities etc?):

The cost and benefit numbers listed above are based on the assumption that eliminating the ethanol waiver will result in refiners lowering RVP, not eliminating ethanol blending during the summer season. If, based on input from refiners, it appears that some or all refiners will try meet the strategy by eliminating summertime ethanol blending, a new cost and benefit analysis would be needed, as well as a consideration of additional policy consideration regarding the elimination of ethanol blending in the summer.

This page intentionally left blank

Preliminary "High-Level" Evaluation Tool for Supporting Initial Prioritization of Ozone Reduction Measures

Preliminary Draft for Discussion Only

September 3, 2010

Measure type: Fuels

Measure name and description: Eliminate Ethanol Blending during Summer Ozone Season

Prohibits ethanol (E10) blending during summer ozone season June 1-September 15. Because blending 10% ethanol with gasoline raises the RVP of the gasoline by approximately 1 pound, eliminating ethanol blending during the summer season would reduce the RVP of gasoline in the non-attainment area thereby lowering evaporative VOC emissions. Eliminating ethanol would also lower NO_x emissions in non-road vehicles and increase CO emissions in on-road and non-road vehicles.

Preliminary sense of anticipated air quality benefits (e.g. NOx/VOC reductions? Potential reduction amount?):

Based on Mobile 6.2 modeling for 2015 eliminating ethanol in gasoline during the summer months would:

- Reduce VOC emissions for on-road and non-road vehicles by approximately 6 tpd.
- Reduce NO_x emissions from non-road vehicles by approximately 2 tons per day.
- Increase CO emissions by approximately 206 tpd. However, while CO emissions are technically an ozone precursor, their reactivity is significantly lower (1 ton VOC = about 60 tons CO)
- Accounting for the lower reactivity of CO the total modeled ozone precursor emission reduction from this strategy in 2015 is approximately 4.6 tons per day (NOx+VOC+1/60CO).
- The projected VOC reduction of 6 tpd from this measure represents an approximately 5% reduction of the total (on-road and non-road) transportation related VOC in the non-attainment area. The projected NOx reduction of 2 tpd is approximately a 2% reduction of total transportation NO_x in the NAA, and the CO increase of 206 tpd is approximately a 14% increase in transportation related CO.

Preliminary sense of anticipated costs and economic impacts:

The RAQC/CDPHE commissioned a fuels study in the fall of 2009, designed to build off of a similar study commissioned by the refining industry. This study, in a preliminary draft phase, assesses the market impacts of four proposed fuel options, the costs associated with making the designated fuels, and how a particular fuel specification might impact the sources and market availability of summertime fuel in the Denver/North Front Range. Based on Costs from a preliminary draft Fuels Study:

- Cost to ethanol producers in lost sales could range between $1.70 to $2.00/gallon.
- Cost increase to consumer could be approximately 25-26 cpg due to the generally lower spot price for ethanol compared to conventional gasoline going forward, although prices do fluctuate.

- The Colorado ethanol industry spends approximately $225 million annually producing 10MBD of corn ethanol, which includes approximately $100 million annually in corn purchases.

Additional technical analysis needed to refine benefits/costs estimates:

- Emissions estimates will need to be updated using EPA's new emissions model (MOVES) before this measure can be considered for SIP purposes, which will ultimately be used in the SIP analysis.
- Additional input and analysis of associated costs requested of and provided by the refining industry and other interested parties.
- Photochemical air quality modeling to determine impact of lower emissions on ambient ozone levels.

Implementation feasibility (e.g. Who has authority? Who needs it? Who implements the measure?):

Additional analysis is necessary to assess whether the State can ban ethanol usage under federal law, and if it can, what the legal mechanism would be for enacting such a ban under Colorado law.

Demonstrated ability to take "SIP Credit" for the measure:

A mandatory program could receive SIP credit since it is enforceable and could be modeled using the EPA mobile source emissions model.

Likelihood that measure could be in place in time for SIP inclusion (approx 2015); and, if later, how much later (e.g. 2 years? 10 years, etc?):

A mandatory program, if there is authority to establish one, could possibly be effective as soon as an AQCC rulemaking is completed. However, the impact of the supply of motor fuel, the RFS and RINs issues would take time to sort out.

Preliminary Assessment of Co-benefits (e.g. other air quality, economic, quality of life, transportation etc):

- Based on a life cycle analysis, the EPA believes that an expanded use of renewable fuels (ethanol) would provide significant reductions in green house gases. Accordingly, banning ethanol during the summer months would increase GHG emissions.
- Elimination of ethanol in gasoline would increase CO emissions by 206 tpd.

Other Considerations/Comments (e.g. Employed elsewhere, particular challenges/opportunities etc?):

- The American Jobs Creation Act of 2004 encourages ethanol use via tax incentives of 51 cents per gallon (cpg)
- The Energy Policy Act (EPACT) of 2005 mandated ethanol use and other renewable fuels that increased over time. In December 2007 Congress passed the Energy Independence and

Security Act (EISA 2007) that further increased the mandate through provisions of the Renewable Fuels Standard (RFS).

- The RFS rules require any party that produces gasoline, including blenders that produce gasoline from blendstocks, to sell a set and increasing percentage of renewable fuels annually. Banning ethanol in the summer may make it difficult, if not impossible for refiners serving the Denver market to meet RFS requirements in upcoming years.
- Eliminating ethanol from the supply equation could decrease the supply of motor fuel in the Denver/North Front Range market.
- Elimination of ethanol in gasoline would negatively impact the agricultural and ethanol production industries in Colorado, which has a current production capacity of 10 MBPD, and planned additional capacity of 16 MBPD. If planned capacity is built this would meet Colorado's ethanol needs through 2017.

Gasoline Fuel Options
Cost and Benefit Summary

Strategy		Estimated Emission Reduction** (tons per day)			Estimated Cost Impact	
		VOC	CO	NOx	Cents/gal	Capital Cost
Federal Reformulated Gasoline		**15**	**26**	**0**	**12-21**	**$590 million**
7.0 RVP Gasoline *(with current ethanol waiver)*		**8**	**25**	**0**	**5-8**	**$210 million**
Eliminate Ethanol Waiver*	**7.8 RVP**	**9**	**25**	**0**	**6-10**	**$210 million**
	7.0 RVP	**15**	**26**	**0**	**12-20**	**$590 million**
Eliminate Ethanol (E10) Blending during Ozone Season		**6**	**+206** *(increase)*	**2**	**25-26**	**n/a**
	Assumes E10 is still blended and RVP standard is met with lower RVP blend stock* * Reduction compared to current 7.8 RVP gasoline with current ethanol waiver*					

Measure type: Fuels

Measure name and description: Expand use of alternative fuels in governmental and private fleets (CNG, LNG, biodiesel, E85, hybrid, electric, etc.)

Alternative fuels are used to reduce criteria emissions, toxic pollutants and greenhouse gases. Currently, many governmental organizations are seeking funding to purchase vehicles, implement fueling infrastructure and educating the public about alternative fuel benefits. Many private vehicle owners are also utilizing alternative fuels (including gas industry operators in Weld County, as presented and discussed during a recent RAQC meeting). Since many of these fuels are already being used the strategies listed here are focused on expanding the use of these fuels in the region's gasoline and diesel fleets.

Preliminary sense of anticipated air quality benefits (e.g. NOx/VOC reductions? Potential reduction amount?):

The transition to alternative fuel use can reduce criteria pollutants and greenhouse gases. State fleets are already using alternative fuels on a limited basis under Colorado's Climate Action Plan and some local governments are using these fuels under their own "greening government" initiatives. Broader adoption of these fuels can increase the associated air quality benefit. Table 1 below shows the estimated reductions in tons per day (tpd) per 1,000 vehicles per alternative fuel type.

Table 1 – Estimated Emissions Reductions by Fuel Type

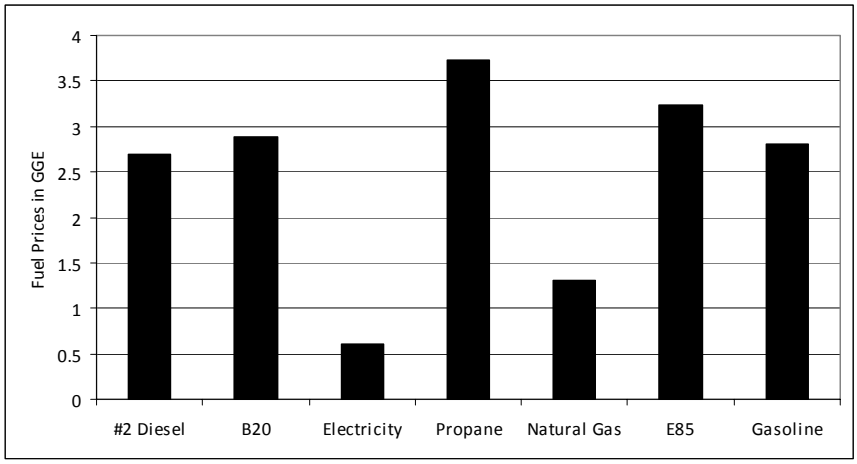
	VOC	NOx	CO	PM	CO2
1,000 CNG Vehicles (tpd)	0.005	0.000	0.090	0.000	2.808
1,000 Electric Vehicles (tpd)	0.049	0.001	0.449	0.000	13.370
1,000 E85 Vehicles (tpd)	0.009	0.001	0.081	0.000	2.273
1,000 Hybrid Electric Vehicles (tpd)	0.045	0.001	0.341	0.000	6.551
1,000 HDDV B20 (tpd)[5]	0.089	1.091	0.660	0.022	18.245

These estimates were developed using percentage emissions reductions from the Department of Energy's Advanced Fuels and Advanced Vehicles Data Center and EPA gasoline powered emissions factors. The biodiesel emissions reductions were developed from EPA's Diesel Emissions Quantifier.

While these numbers represent reasonable emission reduction numbers for the various fuels, actual reductions will depend on the new vehicle standards applicable to particular alternative fuel vehicles. Overall, emission reductions within the nonattainment area will ultimately be driven by the market penetration of the various alternative fuel vehicles identified.

Preliminary sense of anticipated costs:

Estimated costs alternative fuels costs are listed below in the graph on a gasoline/diesel per gallon equivalent. The gasoline/diesel per gallon equivalent (GGE) is the amount of alternative fuel it takes to equal the energy content of one gallon of gasoline or diesel fuel.



There are a range of costs associated with the fuels discussed above that include the estimated light-duty vehicle cost differential and estimated cost of infrastructure. The vehicle cost differentials are actual costs for light-duty vehicles from various sources. The infrastructure costs are estimates.

Industry estimates a dedicated CNG fueling station will cost $500,000 - $1.5M based on the fuel volumes. The $1.5M cost is for a new dedicated fueling station built under a canopy with four hoses to handle large volumes of fuel. CNG vehicle cost differentials are up to $10,000 per light duty vehicle.

Costs for electrical infrastructure are up to $8,000 per charging station. These costs were developed from a City of Thornton electrification project. This cost includes installing the proper wiring and charging stations in a parking lot at a local government. For home charging the electrical equipment cost can be very low if the time to charge the vehicle is not of concern. At this time, estimated light duty vehicle differential costs are $7,000 - $14,000.

The E85 infrastructure is approximately $10,000 to convert an existing gasoline pump to E85. This cost estimate is different than the above costs because it is utilizing an existing fueling facility and converting existing infrastructure. This information is from the Colorado Corn Growers Association that is assisting the Governor's Energy Office in developing E85 infrastructure. Heavy-duty vehicles have highly varied costs based on the vehicle type and are not included here. To install a brand new variable blend pump the cost could be up to $40,000. There is no vehicle cost differential for E85 flex fuel compliant vehicles.

Hybrid vehicles require no infrastructure expenditures. However, the light duty vehicle cost differential is approximately $5,000 per vehicle.

Additional technical analysis needed to refine benefits/costs estimates:

Analysis of vehicle/alternative fuels penetration under various scenarios to quantify nonattainment area emissions benefits. This would include a detailed examination of the emission reductions from the actual alternative fueled vehicles available or likely to be available, as well as a calculation of emission reductions under various fleet penetration scenarios. Given the uncertainty of these issues, significantly different costs and benefits than those identified above could be expected depending on which assumptions are used. This analysis could be completed in 2011 depending on funding.

Implementation feasibility (e.g. Who has authority? Who needs it? Who implements the measure?):

In 1994 a mandatory alternative fuels program was developed for the Carbon Monoxide SIP. The Legislature mandated this program in 1994. The AQCC then adopted Regulation #17 to implement the program. It required fleets of 10 or more vehicles to have a proportion of their vehicles (10%) fueled by alternative fuels. In 2002, the Legislature removed legislative authority for the program and the AQCC removed Regulation 17 from the SIP due to program ineffectiveness. Currently there is no legal authority to mandate alternative fueled vehicles. Regulatory or statutory provisions would be needed to implement a mandatory program (we are currently researching whether any other states have mandatory programs).

Currently, State of Colorado fleets are required to reduce petroleum usage by 25% by 2012, pursuant to a Governor's Executive Order evolving from the Colorado Climate Action Plan. Also under this Order, the Governor's Biofuels Coalition is expanding the E85 fueling infrastructure.

Many states have tax exemptions, credits and grants for ethanol and biodiesel. A number of states across the country have biofuels mandates in place including Minnesota, Oregon, Washington, Pennsylvania, New Mexico and Louisiana. These states require a certain percentage of diesel fuel sold in the state to be blended with biodiesel. This is usually in the 2% - 20% range.

Demonstrated ability to take "SIP Credit" for the measure:

Current gas/electric hybrid vehicles and natural gas vehicles are certified to the same criteria emission standards as gasoline vehicles and do not receive separate treatment in calculations for SIPs. Plug-in gas/electric hybrids may have lower criteria pollutant emissions than other gasoline vehicles but EPA does not have estimates of those benefits that would be acceptable for a SIP analysis. States cannot take credit in SIPs based on estimates of future purchases of advanced technology vehicles without a mandate that ensures that such vehicles will be cleaner and that they will be purchased. There may be SIP credit available for purely electric vehicles. At this point the potential for obtaining SIP credit is extremely unclear. We would need to explore with EPA.

Likelihood that measure could be in place in time for SIP inclusion (approx 2015); and, if later, how much later (e.g. 2 years? 10 years, etc?):

A voluntary program can be in-place for CNG, E85 and biodiesel in the short-term. However, a mandatory program could take longer due to the legislation required to implement the program

and ensuring there is proper infrastructure in place. To implement a long-term project, the past Regulation 17 model could be revisited. Data would need to be gathered and the issues encountered under Regulation 17 would need to be investigated. Any long term benefit would depend on fleet turnover.

Preliminary Assessment of Co-benefits (e.g. other air quality, economic, quality of life, transportation etc):

These fuels have lower greenhouse gas emissions. Other benefits include economic gains for Weld County and the Western Slope, which depend on the oil and gas industry for revenues and related economic benefits. Economic benefits will also be realized in rural areas based on the demand for feed stocks to produce renewable fuels. These fuels could reduce reliance on foreign petroleum.

Other Considerations/Comments (e.g. Employed elsewhere, particular challenges/opportunities etc?):

Currently, the natural gas industry has formed a partnership between Noble, Anadarko, Encana, Williams and Bill Barrett. The industry is working on co-evolving the infrastructure and vehicles needed to grow the market and implement CNG/LNG as a viable transportation fuel.
The industry is currently in the planning and development stage. The Colorado Oil & Gas Association (COGA) and the industry are developing a five year plan investigating natural gas opportunities. The natural gas industry is approaching fleets to install infrastructure. They are starting with governmental fleets and oil & gas service provider fleets. Weld County has funding for a fueling facility.

The industry is also working with the Big 3 to provide OEM vehicles. Honda's CNG Civic has been the primary fleet vehicle in the past. It is estimated there are approximately 100 CNG Civics on the road in the Front Range. The industry has approached the Big 3 to lobby for a wider range of OEM vehicles. GM is releasing a CNG van in 2011 and maybe a bi-fuel pick up truck in the future.

Many of these fuels do not have the energy content equivalent of gasoline and diesel fuels, thereby reducing the driving range and desirability for some fleets. However, focusing such a program on those fleets which operate solely within the region (e.g. gas industry fleet vehicles, waste haulers, etc.) may be a better option. Natural gas is good for fleets that have smaller areas of operation and are close to refueling infrastructure (i.e., Denver International Airport). Many fleets have experience with these fuels with varied experience.

Preliminary "High-Level" Evaluation Tool for Supporting Initial Prioritization of Ozone Reduction Measures

Preliminary Draft for Discussion Only

September 3, 2010

Measure type: Fuels

Measure name and description: Electrification of vehicle fleet

The conversion of the light-duty gasoline vehicle fleet to electric will reduce criteria emissions, toxic pollutants and greenhouse gases. This strategy uses tax credits/rebates to promote the purchase of electric powered vehicles in governmental and corporate fleets and personal vehicles. Currently, many governmental organizations are seeking funding to purchase vehicles, implement fueling infrastructure and educate the public about electric vehicle benefits and tax credits/rebates.

Preliminary sense of anticipated air quality benefits (e.g. NOx/VOC reductions? Potential reduction amount?):

These vehicles do not emit air pollutants. However, there are associated indirect emissions attributable to the power plants that generate the electricity used by these vehicles. Overall direct emission benefits will depend on the extent to which gasoline vehicles are retired and replaced. When the air quality benefits of HB1365 are determined, we will have a better sense of the direct and indirect air quality benefits of this measure. Furthermore, the market penetration of renewables as an energy source will also affect overall emission benefits.

Preliminary sense of anticipated costs:

Based on the current release of initial pricing on the Chevy VOLT and Nissan LEAF the estimated vehicle cost differential is $7,000 - $14,000. Estimated costs from a City of Thornton electrification project indicate infrastructure costs of up to $8,000 per plug-in. Other direct costs are the recharging costs to the consumer which are estimated at $0.61 gallon of gasoline equivalents (GGE). This effort could also include costs for a large public education campaign aimed at purchasers of new vehicles and fleet owners. Other indirect costs could include power grid and generation modifications.

Additional technical analysis needed to refine benefits/costs estimates:

Significant additional air quality and cost analysis is necessary to predict the timing and extent of replacement of gasoline vehicles with electric vehicles. Analysis will also be necessary for assessing additional emissions from the generation of power needed to operate the electric vehicles.

Implementation feasibility (e.g. Who has authority? Who needs it? Who implements the measure?):

In the short-term implementation feasibility on a large scale is limited because there are no vehicles available and there is no fueling infrastructure. However, HB1331 will generate interest in this measure because it provides a 75% tax credit/rebate for the cost differential between an electric and similar non-electric vehicle. HB1331 expires in 2016. Federal tax credits/rebates

are being investigated. Currently there is no legal instrument in place to mandate a transition to electric vehicles.

Demonstrated ability to take "SIP Credit" for the measure:

Emissions benefits could be realized with this measure and they could be quantified through EPA's mobile source modeling. However, regional SIP credit would have to be based on vehicle penetration which, currently and without a mandate, would be dependent on incentives. Colorado would also need to require that a certain portion of the fleet be electric in order to meet EPA guidance for taking credit for such a program. It is not clear what credit EPA would give for an incentive program. Clarification from EPA in the near future would be essential.

Likelihood that measure could be in place in time for SIP inclusion (approx 2015); and, if later, how much later (e.g. 2 years? 10 years, etc?):

It is not likely significant implementation and the resulting benefit could be achieved in time for the SIP. An effort of a scale necessary to realize significant benefits would take years. Such an effort would also be dependent upon incentives or a mandate utilized to promote fleet turnover to increase the penetration of electric vehicles. Nonetheless, long term air quality benefits could be significant depending on a host of factors to be determined; potentially assisting in a successful ozone standard maintenance strategy.

Preliminary Assessment of Co-benefits (e.g. other air quality, economic, quality of life, transportation etc):

Benefits are highly influenced on whether and to what extent coal, natural gas or renewables will be used to recharge electric vehicles. CO2 benefits could be realized through this effort. In addition, this could reduce the reliance on foreign petroleum.

Other Considerations/Comments (e.g. Employed elsewhere, particular challenges/opportunities etc?):

The Union of Concerned Scientists and others indicate electric vehicles will be a 'niche' market for the foreseeable future since manufacturers are just beginning to make cars and infrastructure is just being installed and is still expensive. Other issues to overcome include the time it would take to charge vehicles at public fueling stations. Another issue is that many homes do not have attached garages to plug vehicles in. Depending on the voltage requirements, some homes may not have the proper electrical supply. There are also grid capacity and electric generating unit emissions implications. The emissions increases from power plants are primarily SO2 and fine particulates. From the research, many of these issues are being addressed through technological solutions.

Measure type: Fuels

Measure name and description: Fleet Fuel Use Reduction

This strategy focuses on measures to eliminate excessive idling and associated fuel use. This strategy would address both diesel and gasoline powered vehicles in fleets and personal vehicles. Potential idling reduction strategies could vary from voluntary education programs, to mandatory and enforceable programs, to subsidized equipment retrofit programs for heavy duty vehicles and school buses. If a mandatory program is not feasible voluntary efforts to reduce idling are still an important strategy to pursue.

Preliminary sense of anticipated air quality benefits (e.g. NOx/VOC reductions? Potential reduction amount?):

This measure reduces criteria emissions, air toxics and greenhouse gases. The table below shows the estimated hours of idling that occur for light-duty gasoline powered vehicles, heavy-duty diesel vehicles and school buses. The gasoline, heavy duty and school bus annual idle hours are from the Lowering Emissions and Particulate (LEaP) website sponsored by a leading idle reduction equipment manufacturer. The emissions reductions use factors from EPA's 1998 Emissions Fact Sheet. Due to the age of the data, 2005 data from the Center for Alternative Fuels, Engines and Emissions (CAFEE) from West Virginia University was consulted to ensure the 1998 factors were still valid. The table shows that heavy duty diesel vehicles have the highest amount of idling. These high idle hours are to provide for heat/cool while the driver sleeps.

Table 1 – Estimated Annual Emissions Reductions by Vehicle Type

	Gasoline Vehicle Idling	Heavy Duty Diesel Idling	School Bus Idling
Annual Idle Hours	30	2,412	181
Annual 10% Reduction	3	241.2	18.1
VOC Reduction (pounds per vehicle)	0.11	6.64	0.50
CO Reduction (pounds per vehicle)	1.51	49.94	3.75
NOx Reduction (pounds per vehicle)	0.03	29.22	2.19
PM Reduction (pounds per vehicle)		1.37	0.10

Table 2 shows the estimated daily reductions by vehicle type if 1,000 vehicles reduced their idling. Gasoline vehicles and school buses have very low emissions on a tons per day (tpd) estimate.

Table 2 – Estimated Daily Emissions Reductions by Vehicle Type per 1,000 Vehicles

	Gasoline Vehicle Idling	Heavy Duty Diesel Idling	School Bus Idling
VOC (tpd)	0.00015	0.009	0.0007
CO (tpd)	0.00207	0.068	0.0051
NOx (tpd)	0.00004	0.040	0.0030
PM (tpd)	-	0.002	0.0001

These numbers are preliminary. While reduced idling reduces air emissions, the magnitude of reductions associated with this measure will depend on how the specific idling strategy is employed and how successful it can be in reducing idling hours.

Preliminary sense of anticipated costs:

Costs will vary depending on the strategy adopted. A voluntary approach could have low costs because there would be no enforcement component. The primary cost would be for driver training and any idle reduction equipment the fleet would purchase. A mandatory program would require additional costs for enforcing idling laws. The City and County of Denver has a program in place. Denver indicates the cost of their program is difficult to determine because the Safety Department cites idling vehicles as a part of their routine duties to reduce stolen vehicles. Court costs were eliminated by changing their ticketing procedure from a civil violation that would need to go to court to an administrative penalty that does not go to court. The only staff time expenditures are to mail these citations to motorists and the occasional site visit to discuss idling with a business that may be in violation on a complaint basis.

Additional technical analysis needed to refine benefits/costs estimates:

Evaluation of existing programs in other states to determine idling program types and associated benefits and costs, as well as how SIP creditable they are/could me. Also additional analysis is needed to determine the likely achievable idling hours reductions from implementing different idling reduction strategies in the region; as well as the commensurate emission reductions

Implementation feasibility (e.g. Who has authority? Who needs it? Who implements the measure?):

Research will need to be done to determine what authority currently exists or needs to be secured to implement a mandatory idle reduction effort. Home rule cities currently have this authority. The City and County of Denver and the City of Aspen have idling ordinances in place. A number other states have idling rules in place as well

Demonstrated ability to take "SIP Credit" for the measure:

A mandatory program with an enforcement mechanism would likely be eligible for SIP credit.

Likelihood that measure could be in place in time for SIP inclusion (approx 2015); and, if later, how much later (e.g. 2 years? 10 years, etc?):

A mandatory program could be in place in time for SIP inclusion.

Preliminary Assessment of Co-benefits (e.g. other air quality, economic, quality of life, transportation etc):

This program would reduce greenhouse gases. In addition, fleets would save fuel and vehicle maintenance costs through this effort. Quality of life would be improved around fleet yards, schools and other areas frequented by heavy idling traffic.

Other Considerations/Comments (e.g. Employed elsewhere, particular challenges/opportunities etc?):

In the early 2000's, the RAQC invited area law enforcement and code enforcement to a training session to discuss implementation of a mandatory smoking vehicle and idling vehicle enforcement program. All jurisdictions were invited to participate. Six jurisdictions attended the training. They indicated that they could not dedicate resources towards this effort due to other priorities.

Both a mandatory and voluntary effort were investigated under the previous RAQC Board. The strategy focused on reducing idling around schools, public works fleets, fast food drive thrus and railroad crossings across the state. The mandatory program was not implemented due to concerns over enforcement and cost. The voluntary program has been implemented through a partnership between the RAQC, CDPHE, the City and County of Denver and American Lung Association primarily throughout the Denver metropolitan area. CDOT is currently working with these partners to expand this effort statewide.

The primary consideration with voluntary idling programs is that as soon as the vehicle leaves the fleet yard the vehicle can idle excessively unless technology is in place to monitor vehicle idling frequency. These technologies include global positioning systems (GPS) and idle reduction preheat systems. GPS systems can track idle time and engine preheat systems can warm passenger cabins so that drivers do not idle their vehicles for warmth. At this time, the majority of preheat units are deployed on diesel vehicles but technology is available for gasoline powered vehicles now. Many of the primary idle reduction technologies are covered under the diesel retrofit strategy assessment.

The key consideration with mandatory idling laws is enforcement. Significant State or local enforcement resources may be necessary to identify and enforce against excessively idling vehicles**.** There resources include both law enforcement and court system resources to cite and adjudicate these cases. A number of exemptions, such as those contained in Denver's Idling Vehicles ordinance would also be provided for during extreme hot and cold weather for passenger safety considerations. Diesel vehicles also need to idle at times to operate equipment on the vehicle. Another issue that concerns many fleets is avoiding a patchwork of different local idling ordinances.