TLU – 6, Alternative Fuels Use

Policy Description

This policy option involves expanding the availability and use of alternative fuels and hybrid vehicles, low-speed vehicles (LSVs), and zero emission vehicles (ZEVs) in New Mexico through a renewable fuels standard, various incentives, and outreach. Alternative fuels include ethanol, biodiesel, electricity, and renewable hydrogen fuels. The zero emission vehicles would primarily utilize electricity and hydrogen made from verifiable renewable sources (i.e., solar, wind, and biomass generation). However, it should be noted that using electricity from coal-fired utility plants to recharge electric vehicles would still provide significant GHG reductions over a typical gasoline-fueled vehicle. In the near term, the policy also targets increasing sales of hybrid vehicles and partial ZEVs, while sales of ZEVs are targeted to meet the longer-term goals. Plug-in electric vehicles equipped with batteries would also serve as storage capacity for wind and solar power through grid interconnection (V2G). Use of these fuels is intended to offset fossil fuel use (e.g., gasoline and diesel).

This option is linked with AF Options A-3 and A-11 on Biofuels Production. This option seeks to develop the demand for biofuels, whether produced locally or out-of-state, while Options A-3 and A-11 look at the incremental GHG benefits that would be achieved beyond the TLU-6 option by promoting in-state production of ethanol and biodiesel using feedstocks and production methods with greater GHG benefits than the likely business as usual national market production methods (e.g., conventional starch-based ethanol).

Policy Design

The CCAG recommends that New Mexico should expand the availability and use of alternative fuels and expand the use of hybrid vehicles, low speed vehicles, and zero emission vehicles for transportation in New Mexico. The CCAG also recommends that New Mexico should build appropriate production capacity for renewables-generated electricity and hydrogen fuels for transportation purposes in New Mexico.

The goals for this policy should be phased in to utilize biofuels to replace the specified percentages of gasoline and diesel consumed for transportation throughout New Mexico by the specified years, as shown under Goal Levels, below. The policy also includes targets for hybrid vehicle, low speed vehicle, and zero emission vehicle sales and the implementation of a New Mexico “Multi-Fuel Corridor,” composed of a full range of alternative energy refueling options located every 120 miles on New Mexico’s highways.

Home electric charging is already technically feasible. Public recharging facilities would be made available along this "Multi-Fuel Corridor" as the population of electric vehicles increases. Home hydrogen appliances and hydrogen fueling stations will also be encouraged as part of the "Multi-Fuel Corridor" through market and financial incentives as the population of hydrogen vehicles increases.

These goals of this policy would be achieved through a combination of a renewable fuels standard, financial incentives, outreach, and market-based mechanisms.

- **Goal Levels and Timing:**

  The goal levels and timing for biofuels implementation are shown in the table below. The governor of New Mexico would have the authority to change these targets (up or down) based on technical and/or economic feasibility. The governor could also set intermediate targets.

Phase	Year	Percentage of Gasoline to be Replaced by Biofuels	Percentage of Diesel to be Replaced by Biofuels
1	2009	5%	2%
2	2012	10%	10%
3	2020	20%	20%
4	2050	50%	30%

The goal levels and timing for hybrid vehicle, low-speed vehicle (LSV), and zero emission vehicle (ZEV) sales are as follows:

Phase	Year	Percentage of New Vehicle Sales
1	2010	10% Hybrids/LSVs
2	2015	20% Hybrids/LSVs
3	2018	20% ZEVs/LSVs
4	2040	40% ZEVs/LSVs

The goal levels and timing for developing a New Mexico "Multi-Fuel Corridor are as follows:

Phase	Year	Goal
1	2010	8 stations located along I-25 and I-40
2	2015	15 additional stations installed along major non-interstate roads
3	2020	15 additional stations along other NM highways

- **Coverage of Parties:** State of New Mexico, fuel retailers, fuel wholesalers, business owners, car dealers, biofuels producers, and alternative vehicle advocates and private vehicle owners.

Implementation Mechanisms

Information and education: Use information and education outreach to focus on voluntary methods of alternative fuel expansion and on incentives and cost benefits of zero emission vehicle acquisition. Provide the public with information on the use of and effects of using ethanol in their existing vehicles. Target information and outreach about biodiesel use and effects to trucking and shipping companies, as well as smaller owner/operators in the State. Publicize the locations of dispensing stations that are part of the "Multi-Fuel Corridor." Provide information on flex-fuel vehicles, hybrids, and zero emission vehicles as well as information on where these vehicles can be purchased. Low speed vehicles and neighborhood electric vehicles are restricted to speeds of up to 25 mph and are only allowed on roads with a maximum speed limit of 35 mph (i.e., local roads). In addition, neighborhood electric vehicles have a limited range of 20-30 miles. Nonetheless, such vehicles are ideal for local travel and New Mexico consumers should be provided with information about these vehicles, emphasizing their ability to replace gasoline vehicle trips for frequent, short distance, local trips. Information should also be provided on where these vehicles can be purchased and their environmental and fuel-saving benefits.

Technical assistance: Provide technical assistance through vehicle dealers, consumer technical support groups and public demonstrations.

Funding mechanisms and or incentives: Pursue DOE and State funding for more alternative fuel pumps throughout the State and for introducing appropriate infrastructure throughout the State. Existing multifuel pump in Santa Fe provides model for dispensing three alternative fuels: B20 biodiesel, E85 ethanol, and E10. Create additional fuels options for electric and hydrogen–fuels vehicles. Expect energy investors in power and hydrogen production. Some federal tax incentives currently exist for the purchase of hybrid vehicles. When the federal incentives expire, examine the feasibility/need to continue such incentives for hybrids, ZEVs, and fles-fuel vehicles using State funds.

Codes and standards: This measure should include a mandated Renewable Fuel Standard (RFS), corresponding to the penetration rates listed above. The RFS should include a cost trigger, so that if the cost of alternative fuels exceeds conventional fuels by more than a specified amount, the RFS would be temporarily removed. The cost trigger should be based on costs over a period of time, and not spot prices. Additionally, production issues should be included in the trigger, such as water use in growing corn (or other crops) for the biofuels, such that the production of the biofuels does not increase GHG emissions or cause other resource problems.

Voluntary and or negotiated agreements: Provide financial incentives for alternative fuels distributors. Provide state funds and/or loan guarantees for construction of alternative fuels distribution facilities. Also, provide grow receipts tax exemptions, production tax credits and reduction in excise taxes on alt fuel sales.

Market based mechanisms: Provide payment structure for electric vehicle owners to sell stored power back to grid when needed (V2G). Provide special dedicated roads, preferential road access and parking benefits for neighborhood electric vehicles and other ZEVs.

Pilots and demos: Show example of existing multifuel pumps in Santa Fe which provides a model for dispensing three alternative fuels: B20 biodiesel, E85 ethanol and E10. Provide demonstrations of ZEVs charging, fueling and operating in New Mexico. State fleet vehicles meeting the flex-fuel and hybrid requirements under TLU-3 should be considered a pilot/demo program using the highest penetrations possible of these vehicles in the State fleets. The State's experience with these vehicles should be publicized

Research and development: Pursue in-state biofuels production from a variety of sources. The State should push for significant federal funds for research and development needed to commercialize cellulosic ethanol technology and processes as this will be required for the ethanol targets for 2020 and beyond to be met. Analyze and quantify range of cost benefits that accrue to alt fuels vehicle owners. Research on production of renewable electricity and hydrogen will be required in order to implement a cost effective process.

Related Policies/Programs in Place

The National Energy Act of 2005 includes provisions requiring an increasing volume of renewable fuel to be included in the gasoline sold in the United States starting in 2006 with 4 billion gallons, increasing to 7.5 billion gallons by 2012. In this Act, renewable fuel includes motor vehicle fuel produced from grain, starch, vegetable, animal, or other biomass material, cellulosic biomass ethanol, waste derived ethanol, and biodiesel.

Albuquerque currently implements an oxygenated fuel program as part of its carbon monoxide maintenance plan. This oxygenated fuel uses ethanol to provide a 2.7% oxygen content in gasoline sold in the Albuquerque area from November through February. As a result, ethanol currently accounts for approximately 1.7% of the volume of gasoline sold throughout New Mexico year-round.

Types(s) of GHG Reductions

CO_2 emissions are reduced by offsetting the use of petroleum-derived gasoline and diesel. In order to assess the CO2 benefit of using ethanol, the energy requirements of producing ethanol from starch needs to be compared to the energy requirements of producing gasoline. Current research indicates that starch-based ethanol production provides up to 18-29% reduction in CO2 from starch-based ethanol production compared to gasoline. To assess the benefits of using biodiesel, the overall energy required to produce biodiesel (e.g., life-cycle costs and benefits) need to be compared to the energy requirements of producing fossil fuel diesel. From a recent report (Hill et al., 2006), biodiesel from soybeans contains 93% more useable energy than its petroleum equivalent and reduces lifecycle GHG emissions by as much as 41%.

ZEVs will also reduce N_2O, CH_4, and criteria and toxic pollutant emissions. Electric vehicle research showed that in Arizona where 67 percent of power plants are coal-fired, electric vehicles would reduce greenhouse gases such as CO2 by 71 percent. Likewise, a study conducted by the Union of Concerned Scientists found that electric vehicles in the Northeast would reduce CO emissions by 99.8 percent, volatile organic compounds by 90 percent, NOx by 80 percent, and CO2 by as much as 60 percent.

According to the California Air Resources Board, electric vehicles in the LA Basin produce 98% fewer hydrocarbons, 89% fewer oxides of nitrogen, and 99% less carbon monoxide than gasoline vehicles when power plant emissions are taken into account. The LA Dept of Water and Power has determined that electricity generation sufficient to power 100,000 miles of EV driving produces less than 100 pounds of pollutants compared to 3,000 pounds produced by gasoline vehicles.

Estimated GHG Savings and Costs per MTCO2e

[The table below shows the total CO2e reductions associated with implementing the program described above in the Program Design section. The results are also shown broken down by the component programs (e.g., ethanol, biodiesel, and hybrids/LSVs/ZEVs. Note that some of these reductions would be attributable to the use of biofuels as a result of the Energy Policy Act of 2005. Costs are also being re-evaluated .]

	2012	2020	Units
GHG Emission Savings	0.49	1.79	MMtCO2e
-Ethanol	*0.19*	*0.45*	
-Biodiesel	*0.24*	*0.65*	
-Hybrids/LSVs/ZEVs	*0.06*	*0.69*	

Net Present Value (2006-2020)		$million
-*Ethanol*	*Zero net cost*	
-*Biodiesel*	*Zero net cost*	
-*Hybrids/LSVs/ZEVs*		
Cumulative Emissions Reductions (2006-2020)	10.48	MMtCO2e
-*Ethanol*	*3.30*	
-*Biodiesel*	*4.26*	
-*Hybrids/LSVs/ZEVs*	*2.92*	
Cost-Effectiveness		$/tCO2e
-*Ethanol*	*Zero net cost*	
-*Biodiesel*	*Zero net cost*	
-*Hybrids/LSVs/ZEVs*		

- **Data Sources:**

  Environmental, Economic, and Energetic Costs and Benefits of Biodiesel and Ethanol Biofuels, Jason Hill, et. al., University of Minnesota, published in Proceedings of the National Academy of Sciences of the United States of America, volume 103, no. 30, July 25, 2006.

  Well-to-Wheels Analysis of Advanced Fuel/Vehicle Systems— A North American Study of Energy Use, Greenhouse Gas Emissions, and Criteria Pollutant Emissions, General Motors, Argonne National Lab, and Air Improvement Resource, Inc., May 2005.

  "Documentation of Inputs to Macroeconomic Assessment of the Climate Action Team Report to the Governor and Legislature," California Climate Action Team, January 2006.

- **Quantification Methods:** Well-to-wheels CO2e emission factors from a recent Argonne National Laboratory Study were used to estimate the benefits of offsetting conventional gasoline with starch-based ethanol in the amounts specified by the ethanol goals. Well-to-wheels emission factors take into account the energy required to produce, process, and transport each fuel type (i.e., starting with the oil well for gasoline and the crop for starch-based ethanol). Based on this source of information,

the use of starch-based ethanol to replace gasoline is assumed to reduce CO2e by 18.3%.

The quantity of diesel fuel projected to be replaced in New Mexico with biodiesel was estimated based on the penetration rates of the above goals. A reduction in CO2 emissions of 41% was applied to the quantity of diesel fuel replaced by biodiesel. (Hill, et al, July 2006).

For zero-emission vehicles, the number of light-duty vehicles and trucks that would be replaced by hybrids or ZEVs was calculated by assuming that 6.5% of these vehicles registered in New Mexico each year are new vehicles (based on data from "Motor Vehicle Facts and Figures"). Starting in 2010, 10% of new LDVs and LDTs were assumed to be hybrids or ZEVs, increasing to 20% ZEVs by 2020. A 100% reduction was applied to the CO2 emissions corresponding to the shift from conventional vehicles to the portion of travel at zero-emissions, assuming the zero-emission vehicles are powered by a clean fuel source. Full ZEVs were assumed to be phased in over time. Thus, from 2010 to 2014, the 10% sales target for ZEVs was assumed to be met by vehicles running on electric or clean power 40% of the time (e.g. hybrids). From 2013 to 2014, this percentage was increased to 60 percent of the time and from 2015 through 2017, it was increased to 80%. Starting in 2018, it was assumed that 100% of the ZEV target was met with 100% electric or clean fuel vehicles.

- **Key Assumptions:** This policy option assumes that the ethanol and biodiesel demand will be met with fuels available from a national market. Therefore, it is expected that the ethanol would be produced with starch-based production and the emission factors used here reflect that. Option A3 considers additional benefits that might be achieved by producing the ethanol in-state with a variety of lower GHG-producing methods.

Key Uncertainties

Some uncertainty remains regarding the ethanol production life-cycle emission factors as well as the availability of ethanol and biodiesel at the levels needed by this policy.

The availability of ZEVs to meet the market penetration goals set above is uncertain at this time.

Additional Benefits and Costs

EPA has reported that the use of B20 biodiesel can lead to a 21% reduction in HC, 11% reduction in CO, and a 10% reduction in PM. Toxic emission reductions can also be significant. However, biodiesel can lead to increased exhaust emissions of NOx and some air toxics, depending on feedstock and blend level. EPA reports a 2% increase in NOx emissions for B20 blends. Effects on newer diesel vehicles are likely to be different.

An increased penetration of biofuels and ZEVs reduces our foreign fossil fuel dependency.

Feasibility Issues

Members of the CCAG have expressed concern over the land and water resources needed to produce the amount of biofuels required by this policy option.

Status of Group Approval

Pending

Level of Group Support

Pending

Barriers to Consensus

Pending