PROPOSED STAFF ADDITIONS TO DRAFT STATE ALTERNATIVE FUELS PLAN

October 24, 2007

Page 10, Chapter 2, under "An Alternative Fuel Use Strategy" and before the "Key Conclusions of the Plan" (or alternatively, page 32, Chapter 4, after Table 3) add

The fuel use goals achieved under the conditions discussed above are explained below by fuel groupings for biofuels, electricity, gaseous fuels, XTLs, and synthetic fuels.

BIOFUELS: BIODIESEL, RENEWABLE DIESEL, ETHANOL

Biofuels offer low-carbon liquid fuel options for California. Combined with enabling FFV technologies, they are an important transportation energy option to achieve California's multi-fuel future and significantly reduce petroleum fuel use. For purposes of the Plan, biofuels are defined as the ethanol fuels, biodiesel, and the renewable diesel variants. Although biofuels in the form of corn ethanol and to a limited extent soy-based biodiesel are being used in California today, their ultimate potential remains to be harnessed. With E10, California can see an increased use of ethanol from 900 million gallons today to as high as 1.5 billion gallons by 2012. Similarly, with an increase in the biodiesel and renewable diesel content from B2.5 to B5 and eventually B20, California can see a similar rise in biodiesel and renewable diesel use. But the larger opportunity for biofuels use will occur with the use of E85 as a major fuel in California. E85 can be produced from sugar cane ethanol or agricultural, forestry, and urban wastes with unique challenges for meeting the potential California demand. These challenges include limitations on in-state production capacity of corn, cellulosic and sugar cane ethanol, as well as cost barriers and distribution infrastructure constraints.

ETHANOL

California can increase its use of motor fuel ethanol to 1.5 billion to 6 billion gallons of gasoline equivalent by 2020 and 2050 respectively. Nearly 1 billion gallons of gasoline equivalent of ethanol use is possible by 2030. The associated GHG reduction benefits on a full fuel cycle basis compared to conventional gasoline could be greater than 75 percent at any level of use with biomass as a feedstock, in a manner that is cost competitive with the conventional fuels by the milestone years indicated. However, additional analysis is needed to evaluate land conversion ecosystem impacts and sustainability factors for row crop feedstock.

The ethanol element of the Plan is based on the moderate growth example of three scenarios evaluated for the fuel option. The evaluation consisted of the consideration of the full fuel cycle analysis results for ethanol, an assessment of vehicle technology progress, infrastructure development, feedstock availability, ethanol production capacity and supply at prices competitive with the conventional fuels. The detail discussion of

these factors which influence the increased use of motor fuel ethanol in California are treated in greater detail in the main report.

No net material increase in emissions occurs from the increased use of ethanol in California's transportation sector.

The following state actions are required to achieve the outcomes for motor fuel ethanol.

Policy Measures

- Cost-shared funding for fuel production project feasibility studies.
- Funding to support new fuel production facility permit streamlining, facility inspections for multi-jurisdictional projects. *

New Fuel Dispensing Infrastructure

- Cost-Shared funding for establishment of new, ethanol storage and dispensing systems.
- Cost-Shared funding for new, additional ethanol transportation fuel storage, blending and loading facilities at terminals and production sites.

Fuel Distribution Infrastructure Improvements

- Cost-Shared funding for improved fuel distribution for ethanol fuels; system streamlining, de-bottlenecking from terminals to dispensing facilities.
- Cost-Shared funding for upgrades and improvements to the existing non-petroleum or renewable transportation fuel station infrastructure.

Investments

- Support tax exempt bond financing of new cellulosic and sugar can ethanol plants to be built in California.

RENEWABLE/BIODIESEL

California can increase its use of motor fuel renewable diesel to 0.5 billion to 1.2 billion gallons of gasoline equivalent by 2020 and 2050 respectively. Nearly 0.7 billion gallons of gasoline equivalent of renewable diesel use is possible by 2030. The associated GHG reduction benefits on a full fuel cycle basis compared to conventional gasoline is about 20 to 40 percent at any level of use with U.S. sourced soybean and some foreign sourced plant oil as feedstock, and with incentives in a manner that is cost competitive with the conventional.

The renewable diesel element of the Plan is based on the moderate growth example of three scenarios evaluated for the fuel option. The evaluation consisted of the consideration of the full fuel cycle analysis results for biodiesel and renewable diesel, an assessment of vehicle technology progress, infrastructure development, feedstock

availability, fuel production capacity and supply at prices competitive with the conventional fuels. The detailed discussion of these factors which influence the increased use of motor fuel biodiesel and renewable diesel in California are treated in greater detail in the main report.

No net material increase in emissions occurs from the increased use of renewable diesel and biodiesel in California's transportation sector.

The following state actions are required to achieve the Plan outcomes for motor fuel renewable diesel.

Policy Measures

- Develop an incentive for infrastructure improvement at bulk distribution terminals to support the storage and blending of renewable and biodiesel.
- Facilitate the permitting process of transportation fuel supply infrastructure improvements.
- Establish "Floor" price protection that provides up to 25 cents per gallon excise tax exemption for Renewable and Biodiesel fuels indexed to California diesel rack prices and based on renewable/biodiesel feedstock costs.
- Establish an accelerated depreciation tax rate and loan guarantees for renewable diesel plants built in California that use agricultural waste, timber waste, and other feedstocks.
- Develop an incentive for Renewable diesel plants for the first 15 years of plant operation, for market periods when diesel rack prices drop below $1.75 per gallon.

Regulatory

- Facilitate and streamline permitting of renewable and biodisel production plants in California.

Investments

- Provide research, development, and demonstration funding for the construction of new plants that use unconventional feedstocks and advanced production technologies.

ELECTRICITY

Electric Drive Technology includes a low carbon fuel (electricity) in combination with its enabling technology, the battery and configurations of engines and other energy conversion devices. These produce very efficient use of transportation energy, and offer significant potential to transition California to its multi-fuel future and reduce petroleum fuel use. Although progress is being made to develop vehicles that use electricity and overcome key technical barriers such as battery storage and cost, challenges remain. Despite these challenges, automobile manufacturers, electric utilities and government

agencies are investing resources to harness the potential benefits of electricity as a transportation fuel. Electricity applications include Battery Electric Vehicles, Plug-in Hybrid Electric Vehicles, Electric Forklifts, Electric Truck Refrigeration Units, Truck Stop Electrification and Cold Ironing. The latter two applications refer to the use of electricity from the grid to eliminate truck idling at truck stops and ship idling while in port using their main or auxiliary internal combustion diesel engines.

California can increase its use of motor fuel electricity by 500 million to 4 billion gallons of gasoline equivalent by 2020 and 2050 respectively. Nearly 1 billion gallons of gasoline equivalent of electricity use is possible by 2030. The associated GHG reduction benefits on a full fuel cycle basis compared to conventional gasoline is greater than 75 percentage at any level of use with North American natural gas as a feedstock, as well as a renewables component, in a manner that is cost competitive with the conventional fuels.

The electricity element of the Plan is based on the moderate growth example of the three scenarios evaluated for the fuel option. The evaluation consisted of the consideration of the full fuel cycle analysis results for electricity, an assessment of vehicle technology progress, infrastructure development, feedstock availability, electric generation capacity and supply at prices competitive with the conventional fuels. The detailed discussion of these factors which influence the increased use of motor fuel electricity in California are treated in greater detail in the main report.

No net material increase in emissions occurs from the increased use of electricity in California's transportation sector.

The following state actions are required to achieve the Plan outcomes for motor fuel electricity.

Policy Measures

- Allow and encourage utilities to earn GHG reduction credits for the displacement of petroleum in the transportation sector with electricity (and natural gas), which are both low-carbon fuels.
- Exclude GHG emissions from the displacement of petroleum with electricity (and natural gas) from any emission caps placed on electricity or natural gas load under AB 32, so as not to discourage utilities support for the shift to low-carbon transportation cells.

Regulatory Measures

- Expand opportunities for electric (and natural gas) utility investments and programs in electric and natural gas transportation options.
- Provide regulatory incentives through new vehicle regulations such as Zero-Emission Vehicle regulations, AB 1493 and future GHG reduction regulations, to spur automobile and truck manufacturers development and offerings of electric cars and trucks with grid-recharge capability for petroleum reduction and GHG

benefits. This includes BEVs, PHEVs that use alternative fuels, and plug-in fuel cell vehicles.

Incentives

- Provide cash or tax rebates incentives to buy down up to 50 percent of the incremental cost of a BEV, PHEV or plug-in fuel cell vehicle.
- Provide low-interest loans or loan guarantees to cover the initial cost of the on-road and off-road BEVs and PHEVs based on the societal value of the societal benefits flowing from their use. Benefits to be considered include petroleum reduction, GHG reduction, criteria pollutant reduction and other avoided environmental impacts.

Investments

- Consider providing loan guarantees or tax-exempt bond financing for battery manufacturing facilities located in California.
- The state should provide matching funds for on-going research, development, and demonstration, to achieve cost-reduction, improved durability, reliability, useful life and increased performance of electric drive technologies over the range of vehicle segments (light, medium and heavy duty vehicles).

GASEOUS FUELS: NATURAL GAS, HYDROGEN, PROPANE

NATURAL GAS

Natural gas has been used as motor fuel in California for more than 20 years. Its use has experienced expansion in the transit sector, some package and beverage delivery applications as well as limited trash truck and port applications. At the same time, the natural gas supply and fuel infrastructure is gradually expanding thanks to fleet rules in several California air basins, market-leader fleets and the persistence of infrastructure developers. However as opportunities expand to increase motor fuel natural gas use, vehicle availability is declining. Several recommended actions unique to natural gas are offered in this section to leverage the convergence of motor fuel natural gas use opportunities, expanding infrastructure and remedy the declining availability of vehicles.

California can increase its use of motor fuel natural gas by 840 million to 6 billion gallons of gasoline equivalent by 2020 and 2050 respectively. Under the most likely scenario, nearly 1.7 billion gallons of gasoline equivalent of natural use is possible by 2030. The associated GHG reduction benefits on a full fuel cycle basis compared to conventional gasoline and diesel is greater than 20 percent on average at any level of natural gas with North American natural gas as a feedstock, in a manner that is cost competitive with the conventional fuels by the milestone years indicated.

The motor fuel natural gas element of the Plan is based on the moderate growth example of the three scenarios evaluated for the fuel. The evaluation consisted of the consideration of the full fuel cycle analysis results for natural gas, an assessment of vehicle technology progress, infrastructure development, feedstock availability, fuel production availability and supply at prices competitive with the conventional fuels. A detailed discussion of these factors, which influence the increased use of motor fuel natural gas in California are discussed in the main report.

No net material increase in emissions occurs from the increased use of motor fuel natural gas in California.

The following state actions are required to realize the outcomes for motor fuel natural gas.

Policy Measures

- Expand the criteria for environmental programs such as the Carl Moyer funding program to include other criteria such as petroleum reduction, GHG reduction and carbon intensity because these factors have a connection to public health, as much as criteria pollutants.
- Build strategic OEM alliances to deliver the natural gas vehicle product offerings California requires to advance the Plan. Under the governor's leadership, state agencies, California's natural gas utilities, and other stakeholders should meet with vehicle OEMs and request that they work with California to reinvent OEM NGV programs to make available product offerings for the California market.
- Include the medium- and heavy duty vehicle markets in the Low Carbon Fuel Standard regulatory framework, which has initially focused on the light-duty vehicle market.

Regulatory

- Insure utility gas and electric AFV rates are structured to support the rapid development of the natural gas and AFV market in California.

Incentives

- Implement financial incentives to reward utilities for successful AFV market development actions beyond baseline levels.
- Extend the Natural Gas Vehicle federal fuel tax credits, federal vehicle purchase credits, federal alternative fuel standards and U.S. Department of Energy budgets for Natural Gas Vehicle RD&D.

Investments

- Provide consistent funding for research and development to improve the on-board storage capacity, thus range and cost of NGVs, as well as fueling station

operating cost by reducing storage pressure from the current 3600 psi levels to pipeline gas pressure levels.

HYDROGEN

Hydrogen is a "low-carbon fuel," and in combination with its enabling technology, the fuel cell, offer very efficient use of transportation energy. Motor fuel hydrogen offers significant potential to transition California to its multi-fuel future and reduce petroleum fuel use. Although significant progress is being made in developing vehicles that use hydrogen and overcoming key technical barriers such as on-board storage and cost, challenges remain. Despite these challenges, automobile manufacturers, energy suppliers and government agencies are investing resources to harness the potential benefits of hydrogen as a transportation fuel.

California can increase its use of motor fuel hydrogen by 500 million to 4 billion gallons of gasoline equivalent by 2020 and 2050 respectively. Nearly 1 billion gallons of gasoline equivalent of hydrogen use is possible by 2030. The associated GHG reduction benefits on a full fuel cycle basis compared to conventional gasoline is greater than 75 percent at any level of hydrogen use. North American natural gas used as a feedstock in a manner that is cost competitive with the conventional fuels can be available in the future.

The hydrogen element of the Plan is based on the moderate growth example of the three scenarios evaluated for motor fuel hydrogen. The evaluation consisted of the consideration of the full fuel cycle analysis results for hydrogen, an assessment of vehicle technology progress, infrastructure development, feedstock availability, fuel production availability and supply at prices competitive with the conventional fuels. The detailed discussion of these factors, which influence the increased use of motor fuel hydrogen in California are discussed in greater detail in the main report.

No net material increase in emissions occurs from the increased use of motor fuel hydrogen in California.

Policy Measures

- Give energy companies added credits under the Low Carbon Fuel Standard for delivering hydrogen fuel prior to the deployment of a full retail model.
- Allow LCFS credits in combination with government funding through the California Hydrogen Highway Network.
- Provide preferential carpool lane access and parking privileges.
- Include the medium- and heavy duty vehicle markets in the LCFS regulatory framework, which has initially focused on the light-duty vehicle market.
- State government agencies should coordinate programs and activities to support the deployment of hydrogen fueling stations.
- Relevant state and local government agencies should have hydrogen station implementation experts available to consult with hydrogen station and infrastructure developers on the permitting process, current codes, standards, regulations and other requirements.

- Consider integrating the Million Solar Roofs Program with residential production of hydrogen for home refueling applications.
- Fund training programs for first responders and other local community officials to learn about fuel cell vehicle technology and hydrogen use for their communities.

Regulatory

- Facilitate and streamline the permitting process for building hydrogen fueling stations, biomass-feedstock based production facilities and central plant H2 production facilities.
- Insure utility gas and electric rates are structured to support the rapid development of H2 home energy units or refueling appliances in California.
- Support the implementation of FCVs under CARB's ZEV Mandate.

Incentives

- Implement financial incentives to reward purchase or lease of fuel cell vehicles and offset the incremental cost of FCVs compared to conventional fuel vehicles.
- Implement financial incentives to support the construction of central hydrogen production facilities to serve the transportation market.

Investments

- Provide consistent funding for research and development to improve the on-board storage capacity, thus range and cost of FCVs, as well as fueling station operating cost by reducing storage pressure from the current high pressure levels to reduced pressure levels (3,000 psi).

PROPANE

In the early 1980s, propane was the leading alternative fuel in California with over 200,000 propane vehicles operating in the state. Despite the advantages offered by Propane such as its availability and low cost infrastructure, the fuel experienced a decline in its use and an attrition of the market to negligible levels in 2007 as vehicle availability declined. However, propane continues to be an attractive motor fuel for fleets in medium duty vehicle applications in California. Elsewhere in the world, in such markets as Australia, propane's use is broader.

Based on the evaluation, California can increase its use of motor fuel propane by 150 million to 500 million gallons of gasoline equivalent by 2020 and 2050 respectively. Nearly 300 million gallons of gasoline equivalent of propane use is possible by 2030. The associated GHG reduction benefits on a full fuel cycle basis compared to conventional gasoline is greater than 20 percent at any level of propane use with North American natural gas as a feedstock in a manner that is cost competitive with the conventional fuels.

The propane element of the Plan is based on the moderate growth examples of the three scenarios evaluated for motor fuel option. The evaluation consisted of the consideration of the full fuel cycle analysis results for propane, an assessment of vehicle technology progress, infrastructure development, feedstock availability, fuel production availability and supply at prices competitive with conventional fuels. The detailed discussion of these factors which influence the increased use of motor fuel propane in California are treated in greater detail in the storyline for propane.

No net material increase in emissions occurs from the increased use of motor fuel propane in California. The higher tank-to-wheel emissions due to evaporative emissions during refueling could be resolved to allow full compliance with California emissions regulations.

The state can take the following actions to realize the outcomes for motor fuel propane.

Policy Measures

- Form an official stakeholder group consisting of kit/vehicle manufacturers, fuel providers, PERC, and government to evaluate the progress of California's propane transportation fuels market every 3 to 5 years.
- Review the CARB certification requirements for changes that can make certifying kits easier without degrading emissions standards.
- Consider exempting motor fuel propane from state excise taxes until sustainable annual sales volume for transportation purposes is achieved.

Regulatory Actions

- Allow a small number of vehicles that meet EPA certification to be sold in California to launch the market for propane vehicles.
- Establish demonstration programs to test for durability and emissions requirements.
- Review fuel quality specifications for propane.

Incentives

- Assist the industry in installing propane motor vehicle refueling infrastructure through the use of incentives and with obtaining permits.
- Provide fuel price support as needed to recover the incremental costs associated with vehicle and fuel infrastructure over 24 months.

Investments

- Offer R&D grants to co-fund certification costs.

XTLs AND DIMETHYL ETHER

XTLs (Biomass-To-Liquids, Coal-To-Liquids, Gas-To-Liquids, Petroleum Coke-To-Liquids)

XTLs represent a group of fuels that include Biomass-to-Liquids (BTL), Coal-to-Liquids (CTL), Gas-to-Liquids (GTL) and Petroleum-coke-to-Liquids (PTL). Other than BTL, various fuel developers and suppliers have developed processes to produce the XTL fuels. CTL was produced in large scale during World War II in Germany. The nation of South Africa meets a fraction of its transportation energy needs with CTL. In the U.S., several pilot operations have been explored to support production of CTL fuels. Several energy companies have built or are building industrial scale plants to produce GTL targeted for world markets. XTLs offer the attractiveness of alternative feedstocks to produce transportation fuels but suffer from cost barriers and limited environmental benefit potential

Based on the evaluation, California can increase its use of motor fuel XTLs by 500 million to 2 billion gallons of gasoline equivalent by 2020 and 2050 respectively. Nearly 1 billion gallons of gasoline equivalent of XTL use is possible by 2030. The associated GHG reduction benefits on a full fuel cycle basis compared to conventional gasoline and or diesel is negligible at any level of XTL use with cost remaining a persistent barrier compared to the conventional fuels by any of the milestone years indicated.

The XTLs element of the Plan is based on the moderate growth example of the three scenarios evaluated for the fuels. The evaluation consisted of the consideration of the full fuel cycle analysis results for CTL and GTL, an assessment of feedstock availability, fuel production availability and supply at prices and incentive levels to make the fuel competitive with the conventional fuels. The detailed discussion of these factors, which influence the possible increased use of motor fuel XTLs in California are discussed in in the main report.

No net material increase in emissions occurs from the increased use of motor fuel XTLs in California. The higher levels of emissions associated with some XTL fuels such as CTL or GTL can be remedied, although not without significant cost impacts. Any use of XTLs would be allowed only through full compliance with California emissions regulations.

The state can take the following actions to realize the outcomes for motor fuel XTL use.

Policy Measures

- Encourage the use of XTL fuels.
- Establish accelerated depreciation tax rates for XTL in-state production plants
- Offer preferred state bids for XTL fuels for state vehicle fleets choosing to use XTLs and 10-year fuel purchase contracts.
- Establish a carbon sequestration framework to provide regulatory certainty that support the construction of XTL plants in California.
- Support strategic development of secure and reliable XTL fueling infrastructure, including production, refining and transport.

Regulatory

- Facilitate the permitting of a pilot Pet-Coke-to-Liquids Plant with carbon sequestration and bio-fed plants.
- Support federal appropriations for the authorizations contained in EPAct 2005 for the production of XTL transportation fuel.

Incentives

- Provide incentives, such as a state fuel tax credit of 50 cents per gallon tied to the price of crude oil, to offset the possible higher cost of XTL fuels compared to

conventional diesel. The tax credit would apply when crude oil falls below $50/barrel.

Investments

- Provide loan guarantees equal to 80 percentage of the cost of XTL production plants located in California.
- The state should support the research and development of building small-scale XTL plants using dual feedstocks of biomass and petroleum coke.

Dimethyl Ether (DME)

DME is an ether with physical properties similar to liquefied petroleum gases (propane and butane). It offers the potential to replace petroleum based fuels in compression ignition engines as a diesel substitute. It is produced from synthesis gas using feedstocks such as biomass, coal and natural gas through the steam reforming of natural gas. It's production cost is a function of feedstock cost, plant scale and distance from end user markets. In the U.S., several pilot operations have been explored to support DME production. However, key challenges remain before this fuel can be used in significant amounts in California. Key Challenge include new storage on-board the vehicle, handling of two fuel systems, fuel leaking and premature engine wear.

Based on the evaluation, if the challenges with DME use are resolved, California can increase its use of motor fuel DME by 58 million to 500 million gallons of gasoline equivalent gallons by 2020 and 2050 respectively. Nearly 200 million gallons of gasoline equivalent of DME use is possible by 2030. The associated GHG reduction benefits on a full fuel cycle basis compared to conventional gasoline and or diesel is negligible at any level of DME use with cost remaining a persistent barrier compared to the conventional fuels by any of the milestone years indicated.

The DME element of the Plan is based on three scenarios evaluated for the fuel option. The evaluation consisted of the consideration of the full fuel cycle analysis results for DME, an assessment of feedstock availability, fuel production availability and supply at prices and incentive levels to make the fuel competitive with the conventional fuels. The detailed discussion of these factors which influence the possible increased use of motor fuel DME in California are discussed in the DME storyline.

DME can meet the no net material increase in Emissions requirement under certain conditions if the fuel is produced from biomass feedstock. Higher levels of emissions associated with DME from conventional natural gas feedstock can be remedied, although not without significant cost impacts by using biomass feedstocks. Any use of DME would be allowed only through full compliance with California emissions regulations.

The state can take the following actions to realize the outcomes for motor fuel DME use.

Policy Measures

- Support the production of DME in California and its use as a transportation fuel in the state.

Investments

- Include the targeted funding for research and development of diesel engines to operate on DME.
- Support the demonstration of engines that operate on DME in California.

Page 63Chapter 7 after paragraph 5 under "Economic Analysis" add

"Finally, numerous studies have evaluated the cost of externalities imposed on consumers and society by the use of petroleum fuels. These costs range from $1 to $6 per gallon. The costs cover attributable security of crude oil supplies, health care costs incurred from exposure to emissions of petroleum fuel use in vehicles, damage to materials and buildings, damage to forests, water pollution, federal tax breaks and subsidies as well as states direct subsidies. For example, "California alone bears health care costs attributable to petroleum that are between $9 billion to $240 billion every year. Alternative fuels use minimizes these costs in many instances and avoids them in some cases." ["Lives Per Gallon: The True Cost of Our Dependency on Petroleum," Terry Tamminen, page 54]