Comments on *Draft 2011 Integrated Energy Policy Report*
Docket 11-IEP-1A

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The Draft 2011 Integrated Energy Policy Report is designed to assess major trends and issues in California's electricity, natural gas and transportation fuels sectors in order to provide recommendations on the provision of "reliable, affordable, and environmentally sound" energy to the state economy. California has historically been a national leader in forward-thinking on energy issues, having first introduced mandatory energy efficiency standards in the 1970s and first to mandate zero-emission vehicles. This draft of the Integrated Energy Policy report, though continuing this legacy, has in some areas retreated to conventional and safe thinking, ignoring new challenges that conflict with a number of assumptions that underpin this study. Specific comments are provided below.

The IEP report completely ignores the large and growing body of evidence that rate of global extraction of conventional crude oil has likely peaked, and that there are significant short-term challenges to maintaining even current levels of supply through 2020. As the International Energy Agency's *World Energy Outlook 2011* notes (p. 123), output from currently producing fields will drop by 47 million barrels/day by 2035, requiring new production the equivalent of two Middle East OPECs in total to maintain current levels of production; by 2020, depletion of current fields will require new production of 17 million barrels/day (equal to the output of two Saudi Arabias) to maintain current levels. Achieving this enormous rate of replacement is not a given, even with adequate investment: indeed, IEA's forecast shows that nearly half of the new oil needed to maintain current production rates after 2015 has yet to be discovered. In contrast, the IEP report simply notes that "petroleum will be available far into the future and markets will fluctuate," a truism that hardly enhances the understanding of the oil supply risks that California faces nor provides a solid foundation on which to consider issues of policy options, scalability of alternatives, and timelines of needed action.

As a result, the discussion of the outlook for transport fuels in the IEP lacks a sense of urgency or risk by assuming sufficient, though more expensive, petroleum will be readily available to meet California's demand through 2030, placing policy risk entirely on the uncertainty over the supply of alternative fuels, particularly ethanol. In addition, the report appears to conflate gasoline and diesel fuel with all petroleum, overlooking specific dynamics of the petroleum refining system that could have a number of unintended consequences for the state as a result of current policies. For example, the Low Petroleum Demand Scenario projects gasoline demand to fall 4.2% to 2030, while diesel demand increases 22.3%. The magnitude of this shift is likely incompatible with California's current refinery configuration which maximizes gasoline production. Because petroleum refining is a co-production process, in which all products are produced simultaneously, for any given refinery configuration and crude oil slate, refiners have only a few percentage points of flexibility to run their processing units differently to adjust their output slate. To achieve a larger shift—such as that which would be necessitated under the report's Low

Petroleum Demand Scenario, refiners would need to invest in new capital-intensive processing units. Their incentive to do this given permitting constraints, possible carbon caps, and uncertain economics is questionable: several refiners have indicated to me that refineries would more likely shut down than to try to reconfigure to a different output slate. This means the state not only could lose local sources of gasoline and diesel, but also of propane, LPG, naphtha, solvents, kerosene, jet fuel, fuel oil, asphalt, lubricants, and other petroleum products, which would then need to be imported along with any shortfalls of gasoline and diesel. Although the mandate for the IEP report is laid out more narrowly on transport fuels, California's petroleum use includes critical end-uses outside the transport sector (such as petroleum use in agricultural production). I recommend that the scope of this study be expanded to look at not just two major co-products from refining, but petroleum supply and demand in its entirety, and to explicitly consider future supply risks to California, particularly in light of the slow rate of alternative fuel development, and to assess impacts across multiple sectors.

The IEP report discussion on biofuels and biomass energy use raises additional concerns. The report acknowledges that California cannot meet its LCFS targets without heavy reliance on imported Brazilian ethanol and imported Midwestern grain ethanol. In later years, the projections incorporate a growing proportion of cellulosic ethanol to achieve these targets. The LCFS metric, however, is only carbon, and this overlooks a critical shortcoming of both grain ethanol and cellulosic ethanol (as well as biodiesel): they produce little if any net energy. Currently, grain ethanol is essentially a process to turn natural gas, and in some cases coal, into a liquid, and it achieves its small net energy gain and marginally lower carbon footprint by allocating part of the energy used in production of ethanol to co-products that are not energy forms. Similarly, cellulosic ethanol production consumes more energy than contained in the ethanol output, but achieves a lower carbon footprint by the assumption that part or all of the process fuel is biomass (and of a scale not to induce a carbon deficit). A positive net energy return is achieved by omitting biomass in the energy balance. These practices may hold up to accepted accounting practices but they do not accord with fundamental principles of physics. The low and negative net energy returns of these products are not just an economic concern: the lower the net energy return on an energy form, the higher the amount of total primary energy is needed to produce a unit of output. The impact of significantly increasing grain or cellulosic ethanol use in California is dramatically higher primary energy consumption, either in California or elsewhere, compared to what would be required to provide those same energy services from petroleum.

The IEP report also indicates a focus on increased biomass use in power generation as a strategy to lower power sector emissions (assuming the biomass use is of a scale that does not induce a carbon deficit). Other biofuel production is assumed to come from forestry, agriculture or urban "waste". In both cases, new market mechanisms are being created that tie the value of what was previously an agricultural product, forestry by-product, or "worthless" urban waste to the energy markets. As we experienced in 2008 when oil prices soared to $147/barrel, corn prices moved in tandem with oil prices as farmers then had the option to sell to either the food or energy market. Similarly, as the scale of biomass use in California increases, it will in turn become increasingly linked to oil prices as well, since farmers or foresters will be choosing whether to grow and sell into agricultural or wood industry markets, or into the energy markets, depending on prices. For a biomass energy industry to thrive, it

needs a consistent and predictable amount of feedstock, and this suggests that energy prices will need to be higher than those in alternative markets in order to induce the shift from production for agriculture and forestry to energy. At the same time, for "wastes" that currently are of low or no price, creation of a sustained market for the material will introduce the same pricing dynamics, undermining the assumption of "cheap" inputs to bioenergy production. Already, new biomass power capacity in the Central Valley has bid away local biomass resources from wood markets in Northern California, where prices for wood for residential use have spiked in the winter of 2011, and in some cases physical shortages have emerged. Such unintended consequences should be explored as part of the "affordable and environmental sound" criteria.

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