

**Comments of Pacific Gas and Electric Company on  
CPUC Policy and Planning Division Staff White Paper  
“Light-Duty Vehicle Electrification in California:  
Potential Barriers and Opportunities”  
July 1, 2009**

**Introduction**

Pacific Gas and Electric Company (PG&E) is pleased to provide preliminary comments on the CPUC Policy and Planning Division’s May 22, 2009, white paper entitled “Light-Duty Vehicle Electrification in California: Potential Barriers and Opportunities” (“White Paper”).<sup>1</sup>

PG&E commends the Commission and its staff for a powerful and informative summary of current facts, market data, costs and benefits, ratemaking principles, and policy options for encouraging electric vehicles (EVs) in California. For the past several years, PG&E’s Clean Air Transportation team also has been monitoring and evaluating developments in electric vehicle markets, in anticipation that our customers will request that we provide a full range of electric services associated with their purchase and operation of EVs. We agree with the White Paper’s conclusion that, beginning as early as 2010, California is likely to be a major focus of initial mass marketing of a new generation of EVs that have the potential to provide significant environmental and economic benefits. We also agree with the White Paper that now is the time for the Commission, utilities, utility customers, auto manufacturers, vendors and other

---

<sup>1</sup> The staff notice stated that “The paper is intended to serve as a preliminary scoping tool to explore and provoke stakeholder input on potential policies that might support LDV electrification.” The staff notice invited comments on the paper by July 1, 2009, in order that the comments could be incorporated into and discussed at the July 15, 2009, workshop on electric vehicles in the Smart Grid OIR proceeding, Docket No. R.08-12-009.

stakeholders to establish overall policies, rates, and incentives in the electric sector *to ensure that electric infrastructure and customer services needed to support the market penetration of electric vehicles—especially electric charging infrastructure, load management programs and supportive rate designs and tariffs—are in place and available to every customer who purchases, owns or operates an electric vehicle in California.*

In support of this goal, PG&E strongly supports initiatives by the utilities and the CPUC to provide “fast charging” electric metering infrastructure and incentive pricing to serve plug-in EVs (PEVs) expected to be purchased by customers and charging on utilities’ electric transmission and distribution (T&D) systems beginning in 2010 and continuing through and beyond 2020. This PEV metering and “fast charging” infrastructure will provide customers with the convenience of standardized equipment that meets universal charging standards established by the auto industry and the electric utility industry and that can be installed in any residential, commercial, industrial, government or agricultural building that is connected to PG&E’s existing T&D system.

New PEV electric charging infrastructure can take advantage of the utilities’ already-deployed advanced metering infrastructure, such as PG&E’s SmartMeter and Home Area Network open technology, in order to provide customers with real-time, dynamic pricing options that reward customers for charging their PEVs during off-peak hours. In turn, PEV charging infrastructure will help shift PEV charging loads to off-peak periods and avoid the fixed costs of additional generation and T&D costs that would otherwise be incurred if PEVs were charged on-peak. Although the charging of PEVs will increase off-peak energy use and thus increase nominal CO<sub>2</sub> emissions in the electric sector, PEV charging infrastructure will help *reduce* CO<sub>2</sub> emissions *on a net basis* in all sectors, because “fast charging” and incentive electricity pricing

for PEV owners may be a significant factor in inducing customers to substitute zero-GHG emitting PEVs for a like number of GHG-emitting gasoline burning vehicles.

Utility PEV charging systems can be installed on a “turnkey,” streamlined basis at the request of each individual customer, and can consist of time-of-use (TOU) and fast-charging metering infrastructure and related hardware and software. The utility would competitively procure the metering infrastructure from third-party vendors on an “open system” basis and would arrange with third-party contractors to install the infrastructure on an expedited and streamlined basis upon notification by a new PEV owner or operator.

PG&E strongly recommends that the Commission encourage proposals for PEV charging infrastructure to be filed at the Commission in the near future, with the Commission giving high priority to approving such proposals so that the needed PEV infrastructure can be available for customers at the same time mass marketing of PEVs ramps up in the 2010- 2011 period. In addition, PG&E recommends that the Commission solicit and obtain up-to-date PEV market survey data and other customer survey information, metrics and insights, in order to better assess the timing and scope of PEV market penetration.

To this end, our specific comments on the White Paper below take into account not only the general policy options and scenarios outlined by the Commission staff, but also the options for specific proposals by utilities for approval of EV infrastructure, rates and customers services that can be filed and approved by the Commission on an expedited basis. PG&E’s comments follow the general issue topics contained in the White Paper, but begin first with comments on the White Paper’s conclusion on additional state agency options for reducing PEV barriers.

## **White Paper Chapter 6 – Conclusion: Additional State Agency Options for Reducing PEV Barriers**

PG&E supports the White Paper’s conclusion that California agencies, including the CPUC, should play a proactive role in exploring and implementing regulatory options

that can reduce the barriers to PEV adoption and help California customers and stakeholders realize the environmental and economic benefits associated with PEVs.

To this end, the White Paper recommends that the CPUC open a rulemaking to consider, *inter alia*, rate design options for PEVs, ratepayer-funded incentives for PEVs, policies for approval of investments in PEV metering and charging infrastructure, PEV permit and installation streamlining, PEV partnerships between utilities and non-utility vendors, potential integration of PEVs with renewable resources, and quantification of the environmental and economic benefits of PEVs, including load management and emissions reduction benefits. We support this recommended “menu” and “action plan” for the CPUC. However, we strongly recommend that if the CPUC initiates a separate, stand-alone OIR on PEVs, it make clear two key points about the OIR:

1. The OIR should expressly encourage and not discourage proposals for PEV incentives and infrastructure during the pendency of the OIR, and not wait for the OIR to conclude. This is essential to ensure that, where individual PEV programs already are being developed, those programs not be delayed or put on hold while the CPUC examines overall policies in an OIR.

2. The OIR should be coordinated closely with other related OIRs and generic proceedings at the Commission, such as the Smart Grid OIR, the Long Term Procurement Planning proceedings, and the utilities’ Rate Design Windows and dynamic pricing initiatives. This is essential to ensure that confusion and lack of coordination do not occur in these various proceedings, thus delaying the precise ratemaking and rate design policies and guidance the CPUC needs to provide utilities and stakeholders on an expedited basis before the mass marketing of PEVs develops momentum.

PG&E's additional preliminary comments on the White Paper's policy options are as follows:

Tariff/rate design options. PG&E agrees with the White Paper that, although uniform statewide PEV tariffs may have some surface appeal, they may not be workable because of cost differences across different utility service territories due to geographic and regulatory factors. Instead, the CPUC should set certain broad principles for PEV tariffs, such as eligibility, time-of-use characteristics, relationship to other tariffs such as baseline rates and net energy metering, and applicability to public charging as well as private charging. However, the CPUC should then allow individual utilities the flexibility to design the specific rates and tariffs consistent and compatible with their existing and planned rate designs and billing systems within their own service territories.

Vehicle incentives. PG&E agrees with the White Paper on the potential benefits of incentives for the early purchase and adoption of PEVs in California. However, PG&E is not yet convinced that electric ratepayers at large should be or need to be the source of purchase incentives, rebates and other financial incentives that would be directed at vehicle purchasers and manufacturers and modeled on the existing California Solar Initiative program. The federal and state governments, including the California Energy Commission, already are providing significant tax and other incentives to PEV purchasers and vehicle manufacturers. In addition, as the White Paper points out, at certain price levels for gasoline and diesel fuels, existing PEV electric rate designs would provide significant "life-cycle cost" benefits for PEV purchasers, without the need for actual subsidies for the vehicle purchase itself. In addition, the CPUC lacks jurisdiction over publicly-owned utilities, and thus would be unable under current law to ensure

consistency among all California utilities regarding vehicle purchase rebates and incentives.

Instead of focusing on PEV purchase incentives, the CPUC should focus first on setting the most effective policies for peak/off-peak rate design and utility infrastructure incentives needed to fill in the gaps between mass marketing of PEVs and customers' needs for actual day-to-day convenience in the use and operation of the vehicles. In particular, investments by California utilities themselves could be an efficient source for rapid deployment and streamlined installation of needed PEV electric infrastructure, such as separate metering and "fast charging" equipment for both private and public charging. This could be more efficient and streamlined than other sources of infrastructure, because California utilities are already deploying advanced metering infrastructure and innovative rate designs that represent an important component in the charging and metering infrastructure needed to serve PEVs. The additional infrastructure needed to accommodate PEV loads and fast charging, and to shift those loads and fast charging activities to off-peak periods for the benefit of all utility customers, is a natural extension of the utilities' own capital investments in their distribution and customer services systems. In addition, capitalizing PEV infrastructure as a rate base investment is less labor-intensive and provides smoother rates for PEV customers, because the capital costs are recovered from all customers over a longer period of time, rather recovered up front on a transaction-by-transaction basis from individual customers.

Encouraging partnerships between regulated and unregulated companies. PG&E welcomes the involvement of third-party vendors and entrepreneurs in the development of needed PEV products and infrastructure. We believe that such third-parties can be

cost-effective and innovative sources for PEV products and services, and can partner with utilities to help provide needed electric system infrastructure without jeopardizing or reducing the traditional public utility regulatory model, in which utilities remain primarily responsible for providing safe, reliable and non-preferential electricity service to customers at reasonable cost.

However, like other investments and products to support advanced meters and the Smart Grid in general, the electric infrastructure to serve PEVs must be designed based on standards that are open, inter-operable, reliable, convenient, compatible with the standards used by major PEV manufacturers, and—last but not least—fully protective of the rights of privacy of individual customers. To this end, PG&E has been participating actively in major PEV standard-setting groups with major auto manufacturers, other utilities and interested third-party vendors. All of us recognize the need for open standards and compatibility, but not all third-party vendors are willing to agree to give up their proprietary systems and technology in order to achieve these goals.

PG&E believes that ultimately utilities and the PEV manufacturers and sellers themselves, not third-party vendors, will insist on and dictate the open standards and compatibility needed to complete the PEV market chain. For this reason, PG&E is also in active discussions with major PEV manufacturers to ensure that the electric infrastructure needed to serve PEV customers is open, compatible with vehicle operating standards, and, above all, *convenient* for the customers who operate and charge the vehicles. We also hope and intend our discussions to lead to significant partnerships with third-party vendors from whom we and PEV manufacturers would procure, on a

competitive basis, the types of PEV infrastructure products and services needed to support mass PEV markets.

CARB Options. We support the White Paper's position regarding electric sector issues still in need of resolution at the California Air Resources Board (CARB) (page 69 - 70 D.CARB Options) and appreciate this well-thought out discussion and share the concerns outlined in the White Paper. PG&E will continue to participate in the ongoing collaborative process with CARB staff and industry stakeholders with our electric and natural gas vehicle customers' best interests in mind. We likewise applaud continued CPUC participation in the process, with an eye toward resolution and increased clarity to the marketplace by the end of 2009. The added certainty of a final rulemaking for the Low Carbon Fuel Standard (LCFS) is needed in order to provide stakeholders the regulatory certainty and economic insights needed to build viable business cases and attract necessary investment capital to meet the overall emissions reduction goals of the LCFS. In addition, we also support the continued participation by stakeholders and the CPUC in the design of CARB's GHG cap and trade program, in order to ensure that any shift of GHG emissions from the transportation sector to the electricity sector that results from policies supporting PEVs is accompanied by a commensurate reduction in the compliance costs and responsibility of electricity customers. (See White Paper, pp. 16, 69.)

## **White Paper Chapter 2 – Environmental Benefits and Costs of LDV Electrification**

The White Paper contains very helpful parameters for calculating, on a preliminary basis, the environmental costs and benefits of PEVs, based on some

statewide assumptions consistent with the scope of the paper. However, PG&E believes that regional and utility-by-utility cost and emissions differences will result in unique rate design considerations, different carbon benefits (e.g., due to PG&E's below state average carbon intensity of its generation and supply mix), and differences in demographic and geographic factors that will influence PEV adoption rates and load and system impacts.

For example, in PG&E's service territory, some national data indicates a more modest daily EV charging load than the White Paper's assumed 10 kWh/day or 300 kWh/month for the average residential customer, resulting in a 55% increase. Using year 2000 national DOT survey data yields an estimate of 5.4 kWh/day, or 162 kWh/month for a 30% increase for the average residential customer, assuming 32.7 miles average daily miles traveled, in contrast to the 40 miles per day figure stated in the White Paper. On the other hand, developing California, regional and utility-specific data probably would be a useful exercise in order to assess material differences, if any, between PEV benefits in California compared to the nation at large.

For purposes of assessing potential environmental benefits, the White Paper assumes that customer charging behavior could be 76% off peak, 24% on peak in the paper. We agree that PEVs will provide significant environmental benefits *if* charging behavior can be shifted off-peak. We believe that to achieve these benefits, comprehensive and integrated utility based programs will need to be designed and implemented to control charging loads through smart grid integration, demand side management incentives, pricing signals and technology interfaces that allow the customer, vehicle and home area network to communicate seamlessly among each other. In a "do nothing" scenario, without the necessary comprehensive load management and

charging programs, on-peak charging will occur predominantly as consumers arrive home from work and plug their vehicles in. This inability to optimally control PEV load would result in significantly higher generating capacity and T&D costs and higher rather than lower emissions, thus negating much of the potential environmental benefits of PEVs.

On the other side of the ledger, PG&E expects to achieve greater net carbon benefits than would result from the 408.2 kg CO<sub>2</sub>e/MWH assumed in the White Paper to represent a statewide average. For 2007, PG&E delivered electricity to its customers with carbon content at least 10% below this average, ~ 363 kg. CO<sub>2</sub>e/MWh. Thus, the White Paper's statewide calculations are a good proxy for carbon benefits, but should be improved through the use of utility-specific emissions estimates, forecast over the next few years as resource portfolios change.

In terms of the back-end costs of PEVs, including battery waste and disposal, PG&E agrees with the White Paper's conclusion, affirmed by the CARB as well, that increased disposal of batteries as a result of PEVs is not likely to have significant adverse environmental impacts, given the existing regulation of battery waste and the high degree of battery recycling already occurring.

### **White Paper Chapter 3 – Economic Benefits, Costs and Barriers to Entry**

The White Paper provides an assessment of the economic costs and benefits of PEVs from three perspectives: PEV users, electric utilities, and electric ratepayers.

PEV Users. The White Paper correctly concludes that the cost-effectiveness of PEVs from the user's perspective is dependent on gasoline prices, using a \$2 per gallon

gasoline price as a scenario in which the economics are unfavorable (37.5 years to break even compared to conventional fueled vehicles). However, the break-even analysis is also sensitive to PEV efficiency and the level of incentives available to defray up-front purchase costs. For example, using more efficient PEVs (4 to 5 miles per kWh instead of the 3 miles per kWh figure used by the White Paper), the same PEV premium of \$15,000 reduced by proposed incentives (\$7,500) and a gasoline cost of \$3.00/gallon results in a break even point at 8 1/3 years based on nominal fuel cost savings only. Additional O&M cost savings, carpool lane and bridge toll exemption benefits and potential carbon credits will further improve the economics of owning a PEV.

The White Paper also identifies utility rate designs, including TOU rates and customer charges, and economic disincentives to PEV users. PG&E agrees that current TOU tariffs with their AB X1-mandated rate tiers would disincent PEV purchase decisions. However, PG&E expects to propose new PEV-specific TOU rate designs to take into account the load management benefits that will accrue to all utility customers if PEV users choose to charge their PEVs off-peak. In addition, PG&E expects that AB X1 rate tiers will be modified to accommodate more fair rate tiers to ensure that excessive costs of utility service generally are not shifted to PEV users merely because they consume more electricity to charge their vehicles than non-PEV customers.

The White Paper implies that the costs of individual secondary or sub-meters for PEV use and supporting electricity charging infrastructure would be recovered only from individual PEV users as customer charges because “on the customer side of the meter.” (White Paper, p. 30.) This is incorrect, because advanced metering for PEV use would be on the utility side of the meter, as would other utility charging infrastructure required to

support PEV use. There are many reasons why PEV use is likely to be separately measured or sub-metered from whole house use, such as the need to provide unique pricing information for PEV use as well as the need to provide accurate measurement of emissions associated with PEV use. The issue of whether utility infrastructure costs such as these separate meters should be recovered through up-front customer charges or through variable or volumetric rates is a matter of rate design within the discretion of the Commission, not a matter of where the separate meter or submeter is located.

Electricity System/Utilities. The White Paper identifies a fairly broad range of potential increased electricity generation capacity needed to serve PEVs. PG&E agrees with the White Paper that uncertainties regarding market penetration of PEVs make estimating the timing of the additional loads difficult to predict. However, the White Paper omits to identify the transmission and distribution load impacts also associated with PEV use. These T&D impacts on both the primary and secondary systems of electric utilities also need to be evaluated and accommodated in utility planning. Especially in the early years, the Commission and utilities will need to evaluate T&D system needs in order to ensure the continued adequacy and reliability of utility equipment, such as transformers, that will be sensitive to “pockets” of localized PEV demand, especially on-peak “fast charging.”

PG&E agrees with the White Paper that incenting or requiring off-peak charging of PEVs can provide significant “cost-spreading” benefits to utility customers generally. Utility rate designs for PEV users should continue to take these benefits into account, in order to ensure that PEV users do not inadvertently cross-subsidize other utility customers as a result of shifting their PEV charging to off-peak periods. Conversely, the

benefits of off-peak PEV charging may be used to provide financial incentives to PEV users to voluntarily charge off-peak instead of on-peak. This is a key rate design issue that the Commission and stakeholders should evaluate as part of developing new rate designs for PEV users.

Utility Ratepayer Costs. The White Paper correctly concludes that widespread PEV use will significantly increase utility needs for electric energy and capacity, particularly if PEV charging is primarily on-peak. Although PG&E does not agree with the worst-case on-peak PEV charging projections provided by Southern California Edison (SCE) (11% increase in demand by 2020; several thousand megawatts increase in peak load by 2020), SCE's point is nonetheless extremely important and one of the key policy issues the Commission and stakeholders need to address. The economic and environmental benefits of PEVs can be substantial, but the load impacts of PEV charging can be equally substantial and difficult to handle. PG&E has been evaluating this issue extensively as part of its ongoing planning to meet the needs of its PEV customers, and we have concluded that two key decisions need to be made by the Commission and stakeholders as soon as possible to resolve this issue.

First, the Commission and stakeholders need to determine how to streamline and expedite the installation of needed utility metering and charging infrastructure for PEVs, so that PEV owners and potential PEV purchasers will know in advance where and how to obtain the separate price information and fast charging services they need for their vehicles.

Second, the Commission and stakeholders need to determine how to incent or require PEV users to charge their vehicles off-peak in order to avoid the adverse electric system impacts and costs associated with unlimited on-peak PEV charging.

These two decisions are inextricably linked and need to be made simultaneously. If separate metering and fast charging infrastructure is not available to PEV users when they bring their PEVs home for the first time, they will not know the precise costs of charging on-peak or off-peak, and they may not be able to charge off-peak even if they wish to do so. Likewise, if utility tariffs and rate designs do not provide PEV users the peak and off-peak pricing differentials needed to incent off-peak charging, PEV users will have no incentive to charge off-peak. Resolving this issue and making these two decisions should be one of the Commission's first orders of business in setting PEV infrastructure and rate design policies.

## **White Paper Chapter 4 – Other Barriers to PEV Commercialization**

The White Paper discussed the role of consumer behavior and preferences in determining the scope and pace of PEV market adoption and penetration. PG&E agrees that consumer behavior is a key variable in PEV markets. We are currently evaluating consumer behavior and modeling anticipated PEV adoption patterns in an effort to better inform our assessment of localized impacts on the transmission and distribution grid that may occur as a result of PEV adoption. We are also evaluating consumer preferences in order to best develop the communications and outreach strategies to provide information to our customers on PEV use generally and PEV electricity charging services specifically.

The White Paper’s discussion of the “Principal-agent rental barrier” and the difficulty in providing PEV charging services to master metered customers and multi-family dwellings, is not a new issue for PG&E. During our decades of marketing Customer Energy Efficiency and Demand Response programs to these same customers, we have customized communications, outreach and programs for these customer segments in order to provide equal access to our CEE and demand response offerings. We expect to do the same with PEV infrastructure and charging services. To this end, we are beginning the assessment of our multi-unit dwelling, renter and garage-less customer segments in order to determine and ultimately make available the customized PEV services needed to serve their needs.

This is also true for the so-called “public charging” segment of the PEV market. PG&E has decades of experience serving the specific needs of commercial and industrial customers, including CEE and demand response programs for retailers, fleet-owners, and building owners. As the White Paper also points out, we and other California gas utilities have experience in establishing and maintaining public fueling stations for natural gas vehicles. Ultimately, it may be that PEV charging services develop as a hybrid of public and private charging facilities. However, in light of the uncertainties regarding PEV battery technology, it is probably too early to determine whether one or the other (private charging or public charging) will predominate. Thus, PG&E is planning to be prepared to provide PEV electric charging infrastructure to serve PEV needs of all its customers, including residential, commercial, industrial and agriculture. We also plan to explore partnerships with other utility and non-utility providers to be sure that we can streamline and expedite the availability of PEV electric infrastructure when needed.

## **Conclusion**

PG&E commends the Commission and its staff for the cutting-edge and comprehensive analysis and options discussed in the White Paper. We look forward to working expeditiously with the Commission, our customers, PEV manufacturers, and other stakeholders to make the promise of PEVs available on a cost-effective basis to all Californians.