Southwest Energy Efficiency Project

Saving Money and Reducing Pollution through Energy Conservation

BEFORE THE COLORADO
PUBLIC UTILITIES COMMISSION

Docket No. 11I-704EG

IN RE: INVESTIGATION OF ISSUES RELATED TO ELECTRIC AND NATURAL GAS VEHICLES IN COLORADO

Comments of Environmental Stakeholders

Prepared by
Southwest Energy Efficiency Project
Robert E. Yuhnke, Director
Transportation Program

Michael Salisbury
Energy Policy Analyst

Howard Geller, Executive Director

The Southwest Energy Efficiency Project (SWEEP) submits these comments on behalf of itself, Environmental Defense Fund and the Colorado Environmental Coalition. Commenters welcome the opportunity provided by the Commission to address the role that electricity and natural gas should play in transforming the transport sector to support the creation of a sustainable energy system that will contribute to the stable climate that must be achieved for the Earth to continue to sustain human civilization. Your investigation of the policy options available to achieve this objective is important to the environmental and economic future of Colorado.

I. Executive Summary.

The global scientific consensus has concluded that annual emissions of fossil carbon to the atmosphere must be reduced at least 80% below 1990 emissions within the next 40 years to stabilize the planet's climate. In the *Colorado Transportation Blueprint for the New Energy Economy* (SWEEP 2009) [Exhibit 1], SWEEP demonstrates that this target will be difficult to achieve in the transport sector, and that every strategy for reducing the use of fossil carbon in the transport sector must be implemented to achieve this goal.

Based on what is known about the various technological developments occurring in the transport sector, the single most important and most cost-effective strategy for achieving this 80% reduction objective is the electrification of light duty vehicles (LDVs), in conjunction with decarbonization of electricity generation. The CO2 emissions from a future LDV fleet powered with electricity is 33% less than gasoline and moderately lower than a fleet fueled with natural gas even if 60% of the electricity is generated by coal-fired power plants. *See* "Ozone Precursor and GHG Emissions from Light Duty Vehicles: Comparing Electricity and Natural Gas as Transportation Fuels" [Exhibit 2]. But once the LDV fleet has been converted to electricity, GHG emissions from LDVs can be reduced much further, by 80% or more, as power generation is decarbonized. Not all vehicle miles travelled (VMT) by LDVs will be powered by electricity because of the limitations of battery capacity, but 65% to 75% of the VMT driven by LDVs can be electrified because the average daily travel for most commuters, stay-at-home parents, teenage drivers and retired seniors is much less than the battery range of most EVs coming on the market. Most of the 25% to 35% of LDV miles that cannot be powered by batteries could be fueled by bio-fuels, making possible the goal of reducing GHG emissions from LDVs to near zero.

If the Commission adopts time-of-use rates by applying the approach recommended in these comments, the life-cycle costs of electric LDVs will be significantly less than gasoline or natural gas, and provide the greatest net economic benefit to the State's economy of any currently available energy source for LDVs. After accounting for the increased capital cost of battery-powered vehicles, the lifecycle costs to the EV owner are expected to be from $16,400 to $25,000 less than a comparable new gasoline vehicle that achieves the average in-use fuel efficiency required by federal CAFE standards. See "ELECTRIC VEHICLES CAN BUFFER COLORADO FROM THE ECONOMIC SHOCKS OF RISING FUEL PRICES, CREATE JOBS AND REDUCE POLLUTION CONTROL COSTS." [Exhibit 3]. The lower range of life-cycle savings would be achieved if the recommended approach to setting time-of-use rates is adopted because the cost of electricity to drive the same distance as a gallon of gasoline would be close to $0.55 compared to $3.50 for petroleum fuels in 2011. The higher estimate of life-cycle savings will be achieved if EIA is correct in estimating that the future cost of gasoline will reach $5.50/gallon by 2030, compared to a much smaller increase in electricity costs.

If the Commission adopts appropriate time-of-use rates, families will be able to significantly reduce the share of the family budget spent on transportation, and avoid the disruptive impacts of global spikes in the price of petroleum fuels. In aggregate, these benefits to vehicle owners will contribute up to $11.8 billion in cumulative net benefits to Colorado's economy by 2035 if the most aggressive targets for EV sales are reached. Exhibit 3, Table 5. Most families will spend these savings on better nutrition, education, entertainment, recreation and other goods and services that create jobs here in Colorado. The net economic benefits to the State's economy are expected to create on the order of 4,200 more full time jobs from the economic activity that will result from retaining in Colorado the wealth that would otherwise leave the State to pay for petroleum fuels. Exhibit 3, Table 6. In addition, buying locally generated power to drive our vehicles will create up to another 500 jobs just to produce the additional power for EVs in Colorado.

Accelerating the penetration of EVs will also achieve other important public policy imperatives including —

- the protection of public health from the diseases of air pollution by reducing harmful emissions from motor vehicles;
- reducing the costs of pollution control to Colorado industries; and
- protecting Colorado's economy from destructive price shocks that will inevitably occur as the price of petroleum fuels are driven higher by limited supplies and burgeoning global demand.

The PUC has an important role to play in achieving these environmental and economic benefits for the people of Colorado. The Commission can help overcome the initial capital cost barriers to consumers by directing regulated utilities to offer incentives designed to encourage vehicle owners to replace their gasoline vehicles with EVs. These incentives can be funded from the savings that can be achieved for all utility customers by adopting polices that provide low cost power for EV owners who charge their batteries at night during hours of low power demand. When utilities put into production generating capacity that otherwise lies idle, their existing capital investment produces more revenue that can be shared to reduce costs for all ratepayers. The policies that can achieve these benefits for all system users are discussed below in detailed responses to each of the policy questions posed by the Commission's Docket Order.

II. Responses to Questions Posed by the Commission, and Policies Designed to Encourage EV Ownership While Achieving Cost Savings for All System Users.

18. The Commission solicits input on the following questions related to regulatory options for the various potential EV charging scenarios including residential, master-metered,
commercial, and third-party charging service providers:
a) Without changes in rates or supportive technologies, are Coloradans likely to charge EVs at home? At work? During what hours are they most likely to charge?

SWEEP: Consumer behavior is usually driven by (i) need, (ii) convenience, and (iii) cost. Applying these factors, consumers will charge their vehicles wherever and whenever they (i) are close to running out of electric power, (ii) are in convenient proximity to a power source, and (iii) when they can pay the least. These factors will typically converge most often when the vehicle returns to home base, often after work during the early evening period. The battery charge will most likely have been drawn down when a vehicle returns home. Assuming a charging station has been installed, this will be the most convenient location to charge because the driver will not have to wait for a charge. Since a full charge will require 4-8 hours (depending on battery size and power supply), this will be the location where the vehicle is most likely to have access to a power source for that length of time. In addition residential rates will likely be less expensive than commercial rates. Aside from plugging in the vehicle when the vehicle arrives at home base, charging at other times during the day may be necessary to reach planned destinations when a single battery charge is not sufficient. Charging may occur at other times if the power is discounted or offered for free.

b) Is it appropriate to have an EV-specific rate design? What are the potential regulatory implications of differentiating a rate by end-use?

SWEEP: Yes. The primary objectives of PUC policy should be to:

1) Achieve the improvements in system performance that could be achieved if the additional load associated with EVs is added to the system predominantly during periods when unused generating capacity is available and no increased investment in electric power generating capacity is required.
2) Optimize investment in wind capacity by augmenting nighttime demand;
3) Encourage the adoption of EVs by vehicle owners because of their economic benefits to the State from reduced petroleum fuel costs and retaining resources in the State's economy that would otherwise be lost to Colorado, and because of their potential benefits to the utility system through increased power production ("valley filling") at night;
4) Optimize regional air pollution improvements and associated public health benefits;
5) Reduce climate impacts from the transportation sector in Colorado.

If EVs are highly successful in the marketplace, the additional load attributable to EVs during the next 25 years could be as much as 25% of current total system demand. The growth of this load will depend heavily on a number of factors not within the PUC's control, including the global supply and price of petroleum fuels, the incremental purchase price of EVs which is directly linked to the cost of batteries, and manufacturer response to federal and California fuel efficiency and emissions standards. Each of these factors is directionally creating a stronger signal favoring EVs: a) petroleum fuel prices are rising faster than DOE's Energy Information Administration predicted one year ago for its high price scenario despite the global economic slowdown; b) battery prices are dropping faster than was expected one year ago; and c) auto manufacturers are moving rapidly to offer EV models to consumers during the next 1-3 years which will create more consumer awareness and demand, and more competition aimed at improving performance and reducing costs.

The most compelling factor that should drive the structure for rate design is channeling this new load to the time of day when unused generating capacity is available. Adding power production from existing capacity will reduce unit costs for the entire system by allowing capital costs to be allocated to more kWh sales. However, if large increases in demand occur during periods when existing capacity is not adequate, new capacity will be required which will increase unit costs to all users.

Differentiating rates for EVs could either be integrated into a broader policy designed to structure rates by end use or time-of-day, or by adopting a separate rate structure for EV users. The potential for future increased demand from EVs is greater than any other expected end use. With full conversion of the light duty vehicle (LDV) fleet to battery vehicles, approximately 65-75% of future LDV miles traveled are estimated to be powered from the grid, and 25% to 35% powered by on-board generators from liquid fuels. Batteries will not carry enough power for distances greater than 100 to 150 miles. Longer distance travel will require the use of hybrids that can generate electric power after the charge from the grid has been used.

Assuming this scenario, the power demand from EVs would exceed one-third of total current demand, but full conversion is not likely by 2035. Achieving two-thirds of new vehicle sales by 2035 is plausible, which would convert about 40-50% of all LDVs to run on electricity by 2035.

Time-of-use rates are one of the most important tools for managing this increased demand to avoid significant increases in power costs for all end users that would result if the increased demand occurred when current generating capacity is not adequate. These increased costs to all system users and the State's economy can best be avoided by a combination of time-of-day rate differentials and other policies described below to ensure the load is added predominantly during off peak hours when current generating capacity would be sufficient to supply the increased power without additional capital investments in new capacity.

c) If it is determined that an EV-specific rate design is appropriate, what is the optimal approach?

SWEEP: SWEEP recommends that the design of rate structures focus on optimizing the benefits to utility ratepayers, as well as maximizing the non-energy benefits such as reducing air pollution that will be achieved by accelerating the replacement of vehicles fueled with fossil carbon (petroleum and natural gas products) with vehicles that can be powered from locally generated electric power.

Each of these benefits can be optimized by utilities providing incentives for EV and plug-in hybrid electric vehicle (PHEV) purchasers. The magnitude of incentives can and should be based primarily on the utility system benefits that will result when such vehicles are powered using electricity generated predominantly during off-peak hours when capacity is otherwise not producing revenue. To estimate the magnitude of these benefits, consider the following scenario: each EV or PHEV consumes 12 kWh/day on average, or 4,380 KWh/year; through TOU rates and a timer; 4,000 kWh is consumed at night during the off-peak period. Also assume that the off-peak rate includes 0.3-0.5 cents/kWh of capital cost recovery, thereby yielding system benefits of $1,200-2,000 per year. Assuming a 15 year vehicle lifetime and 7% real discount rate, the NPV of system benefits over the 15 year life of the vehicle is $11,475-19,125. With system benefits of this magnitude, it is reasonable for the utility to offer a total incentive of $5,000-6,000 in order to stimulate greater adoption of EVs and PHEVs. The total incentive would include rebates or credits for the cost of installing a stage 2 charger, a smart meter to allow TOU billing, and a load control switch to ensure protection of lines, transformers and system stability (estimated at $3,000-3,500), and an additional incentive structured to help overcome the purchase price barrier associated with the incremental cost of battery-powered vehicles.

The key elements to the economic success of this approach are policies that stimulate most if not all charging at night, and to include a small level of capital cost recovery in the off-peak rate. At a minimum, these policies should include:

1) variable rates by time of use to create strong price signals favoring charging during off-peak hours. Rates should be structured so that any vehicle charging during peak periods is, at a minimum, billed at the marginal cost such demand imposes on the utility system.
2) linking incentives for EV purchasers who install a stage 2 or higher charger to the installation of a separate meter for the EV line, and a load control switch allowing the utility to shut off power during periods of peak demand, and
3) a timer on the line with a manual override that sets the time when routine charging begins to ensure that charging occurs during the nighttime hours. Customers should be allowed to activate charging at other times, but be notified that the costs will be significantly higher.

d) Should regulated utilities be required to propose EV tariffs, including time-based tariffs?

SWEEP: Yes, with directions to design the EV tariffs to achieve the policy objectives outlined in response to (b), and the principles recommended in response to (c).

e) If, rather than differentiating an EV-specific rate design, it is determined that time-based rates are appropriate and should be applied more generally across the rate base, what additional considerations (e.g., impacts on medical certificate holders) should the

Commission examine?

SWEEP: Shifting energy use from the peak hours to the off-peak hours benefits all users because it allows load on the system to grow without incurring the additional capital cost of building new capacity. To the extent that rate policies can shift load from peak to off-peak hours and thereby accommodate additional load on the system while avoiding new capital costs, the unit cost per kWh decreases for all users because capital costs remain fixed. This approach provides both a cost reduction to users, and a net economic benefit to the State's economy. For this reason, time-based rates are equitable and preferable. If this approach imposes additional costs on a limited number of users that cannot shift their uses outside of the peak demand hours, this should not be a reason to forego the broader aggregate benefits to all rate payers.

Another factor to consider is the climate impacts of energy production. Given that wind generation per kW of installed capacity is greater at night, shifting load to the nighttime hours also maximizes the return on the investment in wind capacity by reducing or eliminating the need to curtail wind generation because of inadequate nighttime demand. Thus shifting load to the nighttime hours increases the daily share of total generation that can be provided by renewables, and optimizes the return on the investment in renewables.

f) If time-based rates are utilized, either for EVs or more generally across the rate base, should those rates be optional or mandatory?

SWEEP: The critical policy question is whether time-of-use (TOU) rates will be sufficient to shift the bulk of the incremental load attributable to EVs from the 2 to 8PM peak load period onto the off-peak hours (after 10 PM). Experiments with TOU tariffs used relatively small price differentials (factor of 3-4) between peak and off-peak periods. These were shown to have little effect on user behavior. SWEEP believes that higher price differentials will be necessary and should be used in order to voluntarily shift the bulk of EV charging to off-peak periods. In designing TOU rates, SWEEP recommends that off-peak prices include some level of capital cost recovery in addition to fuel and O&M costs. This will result in utility system benefits due to capital cost recovery spread over a greater amount of kWh sales compared to a scenario without EV adoption.

Second, SWEEP believes that TOU rates must be mandatory for EV users. To implement TOU rates for EVs, such rate schedule may apply for all uses on the meter, or a separate meter must be installed on the line to the EV charger.

Third, reporting and tracking adoption of an EV at an existing point of service should be required. Reporting is necessary to track increases in load at the transformer, sub-station and system scales. This raises concerns about enforcement. As a practical matter, tracking adoption of EVs should not be a problem if these requirements are linked to a rebate program for the installation of stage 2 chargers. Most EV owners will prefer a stage 2 charger to achieve faster charging times. EVs charged on a 120V circuit may not be reported, but should not pose a system threat because the load will be distributed over 10-12 hrs. Under these circumstances the hourly draw is not expected to exceed that of other home appliances. Existing transformer and sub-station capacity should be adequate to serve this distributed load. But if higher speed chargers, with 240V and up to 80 amp circuits are installed, current infrastructure could be overwhelmed if many such units were installed in the service area of a transformer or sub-station. Thus rebates and the reporting required to qualify for the rebate should focus on the installation of these faster charging stations.

Since few residential garages or parking spaces are currently served by 240V circuits, implementation of reporting could be coordinated with local permitting agencies that issue approvals for service upgrades to identify installations by EV owners who do not apply for the rebate. If installations of unpermitted high-speed circuits are discovered by reviewing meter read-outs for changes in power use, the enforcement mechanism could be to require that the entire property served by the meter be subject to TOU rates.

Fourth, SWEEP recommends that users who report the purchase of an EV be given a financial incentive equal to a portion of the overall system benefits achieved by valley filling and spreading capital cost recovery over a greater amount of kWh sales. We recommend that the incentive include free installation by the utility provider of the charging station, free TOU meter and charging timer to EV purchasers, and a rebate towards the incremental cost of purchasing an EV or plug-in HEV. We recommend that the total value of this incentive be subject to a cap that reflects a reasonable "benefits sharing" (e.g., at least 50% of the system benefits over the lifetime of the EV remain with all users, and up to 50% be provided as an incentive to the EV purchaser) This is analogous to how demand-side management (DSM) and demand response (DR) policies and programs work. The incentive is needed to stimulate greater adoption of EVs which with proper policies such as strong TOU rates and other mechanisms described below will provide benefits to the entire utility system.

g) In addition to or instead of time-based rates, is direct load control necessary to manage EV charging? If so, what are the costs and technical feasibilities of such controls?

SWEEP: Yes. In addition to TOU rates, we recommend that load control devices such as timers and remote-controlled switches such as those used by Xcel in their Savers Switch program be installed along with the charging station. The remote-controlled switch, linked to sensors at each critical link: system, sub-station, and distribution transformer, would provide the mechanism for protecting each element of the service grid from overload by too many EVs being charged simultaneously.

Regarding the timer, we recommend that it automatically start EV charging during the off-peak period, subject to a manual override that could be activated by the end user at any time, but at a much higher electricity price if charging is turned on during peak demand hours. The timer will be an effective and low cost strategy for ensuring that EV charging occurs predominantly during off-peak periods.

In addition, for vehicles charged from a stage 2 station (240V line) consideration should be given to requiring a load control program analogous to the Savers Switch program for residential air conditioners. The need for and cost effectiveness of such a program should be evaluated before it is implemented. It is possible that other strategies such as strong TOU rates and a mandatory timer would obviate the need for or limit the value of such a program. SWEEP recommends that each utility be required to conduct a field study to evaluate the effectiveness of TOU rates and a timer, to determine whether or not a load control program analogous to Savers Switch will be necessary and cost-effective. If it is determined to be necessary, the switch can be installed with the meter and timer as part of the program for which the customer receives a rebate. For EV owners who do not qualify for the rebate program because they use a 120V line, the utility should provide an incentive to customers who agree to install a load control switch that would allow the utility to turn off the charger for brief periods when there is very high power demand on the system.

h) Should utilities be required to develop demand response plans for EVs?

SWEEP: Yes. If the objectives outlined in response to (b) are to be achieved, utilities should develop demand response plans. But more than passively responding to expected demand, utilities should develop strategies that promote the adoption of EVs because of their economic benefits to the Colorado economy.

Each utility should be required to develop a policy for approval by the Commission that defines the circumstances when load on the system will trigger the use of load cut-off switches, and the duration of the cut-off. Non-voluntary cut-offs should be kept to a minimum and used only in emergency situations, in order to not trigger a negative consumer backlash.

The policy should also set a target for the maximum number of load cut-off events that would be acceptable, and the response to be taken if that target is exceeded. Exceeding the acceptable load cut-off target should be viewed as an indicator that load during peak hours is exceeding expectations, and that current load management practices are not adequate. If this threshold is exceeded, the policy should require the utility to prepare and submit a demand analysis to identify the sectors that are contributing most to excess demand. This analysis would be similar to the demand response plan that the PUC has required XCEL to submit next spring.

If the excess peak demand is linked to increasing demand from EVs being added to the system, the utility should be required to revise its tariff and other policies and programs in order to shift the EV load to periods when excess capacity is available.

i) Should EVs be charged using existing meters or should they be sub- or separately metered?

SWEEP: The strategy we recommend assumes that a general time-of-day tariff structure for all users will not be necessary so long as each EV circuit is separately metered and governed by a TOU tariff. Therefore to achieve the policy objectives outlined in response to (b), the proposal relies on separate metering for EVs in order to implement the TOU rate structure for EVs.

j) Could/should the rate for charging (e.g., the rate for electricity) be tied to a customer's utility account through a vehicle identification module (VIM)?
What are the costs and technical feasibilities of this approach?

SWEEP: Both public and private charging stations should be governed by TOU tariffs so that all EVs are subject to the same minimum hourly rate differentials without regard to where the EV is charged. Third party providers could be permitted to charge the end user more or less than the minimum TOU rate charged by the utility, but the third party provider would be charged the TOU rate. Retailers and employers should not be prohibited from offering charging as an amenity to customers or employees.

VIM technology might have useful applications, but costs and feasibility are not yet well defined.

k) Are smart grid technologies (including electric system and vehicle smart grid technologies) essential to reducing the impacts of EVs on the system? At what point(s) in the system would those technologies be most critical and most effective?

SWEEP: Under the regulatory concept we are proposing, converting the entire grid to smart grid technologies would not be required. We fear that waiting until the grid is converted to smart grid technologies before creating an appropriate rate structure for EVs would delay the promotion of EVs by electric utilities and adoption of EVs by consumers, and make it difficult to develop the rate structures and incentive policies needed to avoid excess demand growth during peak hours. It is not advisable to wait for smart-grid technology in particular because Xcel Energy is not moving quickly in installing smart meters for all of its customers. .

Currently available meter technology, time-of-day switches on charging stations, remote-controlled load control switches, and system sensors, along with strong TOU pricing, should be adequate to ensure that EVs are predominantly charged during off-peak periods thereby providing system benefits. Of course real world experience will be need to adjust these policies and confirm (or not) if this is the case.

l) In the event that EVs create additional system costs, should those costs be borne by the cost-causer, the entire customer rate base, or some hybrid of the two? What equitable methodologies could be employed to appropriately evaluate cost allocation?

SWEEP believes that if our recommendations are implemented, unit cost savings will accrue to all customers as a result of valley filling and allocating current capital costs across more kWh sales. The scenarios discussed in response to question (c) provide examples that support this conclusion. These system benefits should be greater than any incremental system costs incurred to install each EV charging station on its own meter, with a time-of-day charging timer and a load control switch, as well as any increase in system costs due to additional load on peak. Therefore, we recommend that the costs be borne by all system users and that a portion of the system benefits be used to incentivize EV and PHEV purchases. This is analogous to the wide range of incentives offered to residential and business customers to stimulate adoption of energy efficiency measures that offer system benefits, as part of utility DSM programs.

But if unit cost savings for all energy users are not sufficient to offset these investments in charging stations, separate meters and load switches, then the Public Utility law authorizes the Commission to approve load management and demand response programs such as these if they are “cost-effective” because they also provide non-system benefits. See C.R.S. §40-1-102:

> (5) (a) "Cost-effective", with reference to a natural gas or electric demand-side management program or related measure, means having a benefit-cost ratio greater than one.
>
> , (b) In calculating the benefit-cost ratio, the benefits shall include, but are not limited to, the following, as applicable:
>
> (I) The utility's avoided generation, transmission, distribution, capacity, and energy costs;
>
> (II) The valuation of avoided emissions; and
>
> (III) Nonenergy benefits as determined by the commission.

If necessary, EV-related incentives can be justified on the combination of system benefits and the "nonenergy benefits," especially if those benefits accrue to customers of a particular utility. Nonenergy benefits such as reducing the cost of owning and operating a vehicle needed for access to employment or school, and the value of "avoided emissions" when an EV replaces a gasoline-fueled vehicle are relevant to the Commission's approval of load management and demand response programs. These benefits should be monetized, and weighed by the Commission for the purpose of determining the magnitude of incentives that are appropriate to support the accelerated replacement of gasoline LDVs.

The PUC has approved the inclusion of nonenergy benefits in the determination of benefit-cost ratios for potential utility DSM programs. The incentive program we propose is a "load management" and "demand response program" encompassed within the statutory and generally accepted definition of "demand-side management programs." See C.R.S. §40-1-102(6).

To provide the Commission with a factual record that will support consideration and valuation of these nonenergy benefits in justifying and structuring an incentive policy for EVs, SWEEP submits an analysis of the net economic benefits to the Colorado economy that result from the fuel cost savings achieved by replacing petroleum-fueled LDVs with EVs and PHEVs. *See* "Protecting Colorado's Economy From the Economic Shocks of Higher Petroleum Fuel Prices." [Exhibit 3].

To provide the Commission with a factual record that will support consideration and valuation of avoided emissions we have estimated the reductions in ozone precursors and CO_2 emissions that can be achieved by replacing petroleum-fueled LDVs with EVs and PHEVs, and show the potential pollution control costs that would be incurred by Colorado industries if such reductions were required to be achieved by adopting other control measures. *See* "Ozone Precursor and GHG Emissions from Light Duty Vehicles: Comparing Electricity and Natural Gas as Transportation Fuels" [Exhibit 2].

III. Policies Related to Natural Gas Vehicles.

Commission policies related to natural gas vehicles should facilitate the conversion of those petroleum-fueled vehicles that are not suited to electrification. These would include vehicles for which OEM battery-powered vehicles are not available or expected to be available, and where load or duty cycles cannot be satisfied by electric motors, or the energy density limitations of batteries.

The emissions analysis presented in the "Comparison of CNG and EV Ozone and GHG Emissions" demonstrate that conversion of LDVs to CNG cannot achieve significant long-term reductions in CO2 emissions because the initial reductions compared to gasoline are not sufficient to offset the effects of statewide population and VMT growth. Emissions of CO2 from LDVs would return to 2005 levels by 2050 if gasoline LDVs were replaced with NGVs. Investments in NG fueling infrastructure and NGVs made in the near term would be wasted and would need to be scrapped in order to achieve the 80% CO2 reduction target by 2050. In addition, NG use in LDVs will significantly increase emissions of methane (CH4), which is a GHG with about 20 times more climate-forcing effect than CO2. The increased emissions of methane from fueling, leaks, and tailpipe emissions from NGVs could overwhelm the benefits achieved by reducing CO2 compared to gasoline vehicles. There is no evidence to show that conversion of the 4 million LDVs in Colorado to NG would provide any net GHG benefit.

Compared to EVs, the life-cycle costs of OEM natural gas vehicles provide little or no net economic benefit for owners, and little if any net economic benefit to the Colorado economy. The fuel cost per mile driven is three times more than electricity, and when the incremental purchase price is added to the fuel cost, the life-cycle costs are little better than a gasoline vehicle.

The cost of installing fueling infrastructure is also much higher for NGVs than for EVs. A four-vehicle fueling station for NGVs requires a $1.5 million investment, whereas a similar facility for EVs can be installed for $50,000. Residential fueling facilities also cost two times more than a residential stage 2 charging station for EVs.

In view of less valuable economic benefits, and evidence that natural gas will continue to contribute to adverse climate impacts by returning GHG emissions to the high levels achieved in 2005, the Commission should not facilitate the replacement of gasoline LDVs with natural gas.

IV. Policies Related to Public Charging and Fueling Infrastructure.

Commenters believe the public charging stations for EVs should be made available at sufficient density to eliminate the fear by EV owners that they may run out of power where they will not have access to a charging station. The details of a statewide public charging infrastructure plan will be addressed in the development of the EV readiness plan by the Colorado Clean Cities consortium that was recently funded by the U.S. DOE. Commenters urge the Commission to participate in the development of that plan, or to closely monitor the development of that plan.

Commenters believe that public charging facilities are likely to be funded by private investment. To encourage third parties (not utilities) to offer electric power for sale to EV owners, the definition of “public utility” needs to be changed. The current definition requires that all sellers of electric power to end users are subject to regulation by the Commission as a utility. Commenters believe that the regulation of resellers of electric power, who are not generators and who sell only to EV users, is not necessary, and may be counter-productive by imposing regulatory barriers on competition.

Commenters also believe that solar generators who offer power for sale to the retail market for use in EVs should not be regulated as a public utility. This change is intended to facilitate the installation of solar trees/umbrellas in parking lots and other locations where the power generated is offered for sale or otherwise made available to users of the parking facility. Such facilities remove mid-day charging demand from the utility grid, and transfer it to local sources of solar generation that can relieve the grid of load from EVs during periods of peak demand. These facilities also help make the transition to a renewable system by increasing the use of innovative renewable generation technologies.

Eliminating the regulatory burden that comes with being a public utility for solar generators and third-party resellers should open the door to entrepreneurial innovation for the provision of electric power to EV users without compromising the demand for power from traditional utility generators.