Center for American Progress

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Electric Utilities and the Future of Clean Transportation

By Myriam Alexander-Kearns and Alison Cassady April 2016

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Introduction and summary

As part of the global coalition of countries committed to fighting climate change, the United States has pledged to reduce its greenhouse gas emissions by 26 percent to 28 percent below 2005 levels by 2025. To meet that goal, the Obama administration has taken action to clean up the power sector, make cars and trucks more energy efficient, and reduce emissions from other parts of the economy. To avoid the worst impacts of climate change, however, the United States—and its global partners—will have to achieve much steeper emissions reductions in the coming decades.

The transportation sector accounts for more than one-quarter of all U.S. greenhouse gas emissions, the majority of which come from gasoline-powered cars and light trucks.[1] One critical path toward a cleaner transportation sector relies on the increased presence of electric cars and trucks, running on electricity generated from an increasingly cleaner power sector.

The need to deploy more electric vehicles[2] comes at an interesting time for the U.S. electricity sector. The U.S. economy is more energy-efficient, meaning the nation is using less energy per dollar of GDP, and a growing number of U.S. households are installing solar panels to generate their own electricity and rely less on the power grid. As a result, many electric utilities are selling less of their product. In 2015, total electricity sales fell, marking the fifth time in eight years that sales have declined year-over-year. Experts predict electricity consumption to remain flat in the coming decades.

The United States needs more electric vehicles in order to reduce emissions and utilities need new electricity demand to stay in business. This confluence presents a unique opportunity for electric utilities to play an active role in deploying more electric vehicles and related infrastructure. Recognizing this opportunity, the Edison Electric Institute—which represents the entire U.S. investor-owned

utility sector and 70 international electric company members—signed a memorandum of understanding, or MOU, with the U.S. Department of Energy, or DOE, to work together to accelerate the deployment of electric vehicles and the charging infrastructure to support them.

Many utilities are already engaged. Some are offering special rates to electric vehicle owners in their service area to incentivize them to charge their cars during off-peak electricity demand hours. This saves consumers money and helps utilities manage their demand load. Several utilities, including the three largest in California, are investing directly in electric vehicle infrastructure to accommodate a predicted increase in electric vehicle ownership in coming years.

Both private companies and consumer groups are concerned about this involvement by electric utilities. Private companies, such as Chargepoint, that provide charging services worry that the utilities will stifle healthy competition and crowd out, rather than build upon, privately funded charging infrastructure. Consumer groups—such as The Utility Reform Network and California's Office of Ratepayer Advocates—are worried that ratepayers will suffer and be charged higher rates if the utilities' investments fail or do not meet expectations.

Given the urgent challenge posed by climate change and the need to cut greenhouse gas emissions from the U.S. transportation sector, it is important that utilities work with concerned stakeholders and state public utility commissions to develop a workable model for utility engagement in electric vehicle deployment. As providers of a service that reaches nearly every household and business, utilities have a unique reach into American communities. The Center for American Progress recommends that electric utilities do the following:

- Starting with pilot programs, invest in a public charging infrastructure in their service areas to complement the private sector's investment in this area.

- Offer time-of-use rates to encourage electric vehicle owners to charge during low-demand times, and identify ways to offer electric vehicle owners electricity generated from renewable or zero-carbon energy sources.

- Expand charging access to low-income areas and multifamily residences, and encourage state policymakers to offer point-of-sale rebates for residents in these areas to make the cars a more affordable option.

By implementing these recommendations, utilities can encourage a large customer base to consider electric vehicle ownership, resulting in vast greenhouse gas emissions reductions from the transportation sector and a steady, sustainable demand for electricity. For customer who are already interested in electric vehicle ownership, utilities can increase access and affordability of cars and charging infrastructure.

The need to electrify the transportation sector

In advance of the December 2015 U.N. Framework Convention on Climate Change Conference of Parties meeting in Paris, the United States committed to reduce its greenhouse gas emissions by 26 percent to 28 percent below 2005 levels by 2025.[3] At the conference, 195 countries—including the United States—adopted a global agreement to aim to reduce greenhouse gas emissions and limit global warming to less than 2 degrees Celsius above preindustrial levels in order to avoid the most catastrophic impacts of climate change.[4]

The United States is on its way to meeting its Paris commitment, although more work remains.[5] To limit warming to 1.5 degrees Celsius to 2 degrees Celsius, however, the United States will need to identify ways to cut total greenhouse gas emissions by at least 80 percent below 1990 levels by 2050, a level that climate scientists have long agreed upon as necessary to limit warming at this level.[6]

The United States has started by cleaning up the power sector. The U.S. Environmental Protection Agency, or EPA, finalized the Clean Power Plan, which, if implemented, will reduce carbon emissions from the power sector 32 percent from 2005 levels by 2030.[7] This is a step toward meeting the 2025 and 2050 goals for emissions reductions in all sectors.

To achieve even deeper pollution reductions, the United States needs to find a cleaner way to power vehicles; the transportation sector accounted for more than 27 percent of domestic greenhouse gas emissions in 2013.[8] The majority of those emissions—60 percent—came from light-duty vehicles, such as passenger cars, that rely on gasoline for fuel.[9]

As the U.S. electricity system continues its transition toward lower- and zero-carbon energy sources, electric vehicles will become even cleaner than they already are on a life-cycle basis, taking into account all emissions stemming from manufacturing to driving the car. (see text box on page 5) Already, greenhouse gas emissions from the average battery electric vehicle are 50 percent lower than

emissions from a comparable gasoline car on a life-cycle basis—from manufacturing to driving.[10] An electric vehicle driven in every region of the United States currently produces less pollution than a new, gasoline-fueled car, and about two-thirds of Americans live in regions where driving an electric vehicle that plugs into the regional grid creates less pollution than a traditional car that gets 50 miles-per-gallon.[11]

By replacing gasoline-fuelled cars with cleaner electric vehicles, we will see significant reductions in greenhouse gas emissions from the transportation sector.

Cleaning up electricity: The surge forward with renewables

2015 was a momentous year for clean energy initiatives in the United States:

- In August, the EPA finalized its Clean Power Plan, regulations that would require states to reduce carbon emissions from electricity generation.[12] If implemented by the EPA, pending a decision by the U.S. Supreme Court, states will develop individual plans to achieve their emissions reductions goals or collaborate with other states.[13] Many states will increase their generation from renewable sources, such as wind and solar power, as one way to comply with the new regulations.

- In December, Congress authorized a five-year extension of the investment tax credit for solar energy and the production tax credit for wind energy. Other renewables, like geothermal energy, received one-year extensions to their investment tax credit. With the extension of the tax credits, experts predict that utilities that are not already investing in solar and wind technology will begin to invest in these areas.[14]

- Rooftop solar power generation became cost-competitive, achieving grid-parity with other forms of electricity in 19 states and Washington, D.C., according to recent data.[15] Parity is achieved when the levelized cost of solar power slips below the total electricity bill savings within the first year of installing the system.[16] According to the Solar Energy Industries Association, solar energy grew significantly in 2015: For the first three-quarters of the year, 30 percent of all new generating capacity in the United States came from solar power.[17]

- Wind energy is also projected to continue its substantial rise. Between 2010 and 2013, wind capacity increased roughly 50 percent, from 40 GW across 27 states to 60 GW across 34 states.[18] By the end of 2015, the U.S. wind capacity passed 74 GW, and installations in 2015 were 77 percent greater than in 2014.[19] By 2020, capacity is expected to rise to 113 GW in the United States.[20]

Current state of electric vehicles in the United States

More electric vehicles are on the road than ever before, and experts expect the electric vehicle market to continue to grow. The cost of vehicles is declining, as is the cost of battery manufacturing, and battery life is longer than ever. Meanwhile, charging infrastructure is going up across the country—particularly in cities throughout California and on the East Coast—which allows drivers to charge away from home.[21]

Sales of electric vehicles

Electric vehicle use is on the rise in the United States. As of October 2015, plug-in hybrids and battery electric vehicles totaled roughly 417,000 in the United States, or 3 percent of the vehicle market.[22]

Many states are working to deploy more electric vehicles as a means to clean up air pollution and mitigate climate change. In 1990, California adopted the Zero Emissions Vehicle, or ZEV, program, establishing a goal that manufacturers include ZEVs as 2 percent of the vehicles they produce for sale.[23] California updated this goal in 2012, now requiring ZEVs and plug-in hybrids to comprise 15 percent of new vehicle sales by 2025.[24] Connecticut, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Vermont have adopted the California ZEV program under Section 177 of the Clean Air Act of 1970, which allows states to adopt California's vehicle emissions standards.[25]

In 2013, governors from California, Connecticut, Massachusetts, Maryland, New York, Oregon, Rhode Island, and Vermont signed a memorandum of understanding that committed to put at least 3.3 million ZEVs, most commonly battery-electric vehicles, on the road in these states by 2025.[26] In this agreement, the states committed to the coordinated effort so they could achieve the 3.3 million goal.

The federal government also is working to encourage consumers to purchase electric vehicles. The federal government offers a federal tax credit for electric vehicle buyers of up to $7,500. Some states have done even more to encourage electric vehicle ownership by offering their own rebate and tax credit programs.[27]

Battery prices

One factor that has slowed the deployment of electric vehicles is cost, much of which is attributed to the battery. Fortunately, battery prices are falling. Between 2009 and 2014, the cost of a lithium ion battery—the battery used in electric vehicles—fell by more than 70 percent, while cumulative electric vehicle sales rose to nearly 300,000 in five years.[28] In 2015 alone, electric vehicle sales increased 60 percent, and battery prices fell 35 percent.[29]

Battery costs are expected to continue to decline, and electric vehicle sales are expected to continue to rise, although at a slower rate than at present.[30] By 2020, electric vehicles will likely be as affordable as gasoline-powered cars.[31] More affordable electric vehicle models are already emerging in the market. Chevrolet, Ford, Mitsubishi, Nissan, Smart, and VW all released electric vehicle models in 2015 or 2016 that sell for less than $30,000 even before state and federal incentives are applied.[32] Even Tesla introduced its more affordable Model 3 in March 2016, which is priced at $35,000 before government incentives, about half the current cost of Tesla's next-cheapest model, the Model S.[33]

The predicted boom in electric vehicle sales has great implications for the oil market worldwide. According to a recent Bloomberg New Energy Finance report, if electric vehicle sales keep growing the way they have been, electric transportation will displace 2 million barrels of oil each day by 2028.[34]

Charging infrastructure

To meet the goal of putting 3.3 million ZEVs on the road by 2025, the United States will need to expand its charging infrastructure. There are currently 12,682 public charging stations in the United States, about 9,000 of which are located in California.[35] With more than 53,000 electric vehicles and plug-in hybrids registered in California in 2014, there is roughly one public station available for every six cars.[36] New England has its fair share of charging stations as well, with 2,200 of the 3,211 vehicles registered in 2014.[37]

When away from home, drivers can use these public charging locations to charge on the go. Drivers of EVs can charge via membership networks across the country, like Chargepoint and NRG Energy's EVgo charging program. In late 2015, EVgo solidified its place as the country's largest public infrastructure provider for direct current, or DC, fast chargers, the quickest type of charging infrastructure, by partnering with BMW, Ford, and ROEV, an electric vehicle trade association.[38] While public charging is available across the country, it is concentrated most heavily in California and on the East Coast. Pockets are also prevalent in the middle of the country, usually clustered around metropolitan areas, such as Chicago and Fort Worth, Texas.[39] Tesla has also built a network of so-called superchargers, which are only compatible with Tesla vehicles.[40]

Some would-be electric vehicle drivers cite lack of public charging infrastructure as a reason for not purchasing an electric vehicle. They have range anxiety; that is, they worry they will get stranded without access to a charge. A Canadian study examining the EV300 Program, which worked with private and public organizations to replace some fleets with electric vehicles, found that range anxiety is very real for fleet drivers. The evaluators discovered that these fears translate into less use of the vehicles' all-electric capacity.[41]

To alleviate this anxiety and accommodate 3.3 million electric vehicles by 2025, more charging infrastructure will be needed to attract new buyers. Currently, charging options are limited for residents of multifamily buildings that do not have installed chargers, and many employers do not provide charging stations at the workplace.[42] In some areas of the country, public charging sites are more frequently used than others, and more data is needed on how to identify prime charging locations.[43] Stakeholders such as electric utilities can have a role in promoting charging infrastructure, collecting this necessary data, and increasing access to charging in low-income markets.

Increasing the availability of charging infrastructure, and offering charging solutions for multifamily residences, can ease the range anxiety that would-be EV owners may face.

Electric vehicle growth can benefit electric utilities

As more electric vehicles hit America's roads, electric utilities will enjoy certain benefits. First, electric vehicle charging creates new electricity demand. This comes at an important time for utilities, many of which are seeing declining demand for their product. Second, electric utilities can use electric vehicles as temporary energy storage, which can help them balance electricity load during peak-demand times.

Electric vehicles provide a new source of electricity demand

Electric utilities are facing significant challenges to their current business model. In 2015, total electricity sales fell—the fifth time in eight years that sales declined from the previous year.[44] The U.S. Energy Information Administration predicts a relatively flat growth rate for electricity use in the next 25 years. Total electricity use is expected to grow only 0.8 percent from 2013 to 2040.[45]

This trend is due to improvements in energy efficiency and to the growth of distributed solar generation. Analysis by the American Council for an Energy-Efficient Economy, or ACEEE, shows that the U.S. economy has become more energy efficient over the last quarter century, decreasing energy used per dollar spent by 50 percent.[46]

State and federal policies encourage utility customers to use electricity more efficiently and to install solar panels to generate their own electricity. As of January 2016, 41 states plus Washington, D.C., have rules for net metering, which allows customers with renewable generation capacity, like solar panels, to sell electricity back to the local utility.[47] Additionally, the federal government, 35 states, and the District of Columbia offer residents or small businesses financial incentives for contributing clean generation to the grid—including performance-based

incentives, personal tax credits or deductions, property tax incentives, or sales tax incentives.[48] As many customers take advantage of these existing incentives to set up their own electricity generation, utilities will see fluctuations and possible decreases in traditional demand for their product.

The power sector is not blind to these trends. In 2012, the Edison Electric Institute, or EEI, noted that a "growing number of customers are increasingly exercising their options to manage electricity bills through energy efficiency, demand management and on-site generation."[49] EEI warned of a potential "death spiral" if utilities failed to adapt to these disruptive technologies and practices.[50]

Electric vehicle deployment, however, has the potential to help stabilize electricity demand in many markets. As more vehicles require electricity as fuel, utilities will see an increase in demand for their product and can find new ways to use electric vehicles to manage their product flow. One study estimates that, assuming the average car drives 12,000 miles per year, an electric vehicle will increase a household's electricity demand by 33 percent, and a plug-in hybrid will increase demand by 37 percent.[51]

In recognition of the opportunity presented by electric vehicles, EEI signed a memorandum of understanding with the Department of Energy in June 2015. The MOU recognizes "the mutual interest in realizing the economic, environmental, and national security benefits achieved by the growing use of electricity as a transportation fuel."[52] The goal of the MOU is to allow the DOE and EEI to "pursue key opportunities for collaborative action between the government and utility industry in order to accelerate plug-in electric vehicle (PEV) and charging infrastructure deployment."[53]

Electric vehicles as storage

Electric vehicles can also provide storage when they are plugged into the grid, storing energy and helping the utility manage the demand on the grid during peak demand times.[54] EV owners can connect their vehicles to the grid through home-charging infrastructure or at public chargers, offering storage capabilities to the grid or a home, much like a stationary battery. According to a study by Navigant Research, plugged-in vehicles can capture generation from renewables when demand is lower, store it in their batteries, and help offset generation needs when

demand is higher. Theoretically, this would make electricity cheaper and the grid more flexible and resilient.[55] A typical electric vehicle can store in its battery as much power as a home consumes in three days.[56] Navigant predicts that worldwide revenue from these vehicle-to-grid services will grow from $335,000 per year in 2015 to $20.7 million annually by 2024.[57]

Utilities have a lot to gain from the growth of electric vehicles—a steady source of demand for electricity, and a way to manage that demand to ensure a reliable flow of electricity.

The role of electric utilities in promoting electric vehicle growth

Because they provide the fuel for electric vehicles, electric utilities have a natural role to play in expanding electric vehicle ownership and installing new charging infrastructure. Utilities can promote electric vehicle growth in two main ways: incentivizing and supporting electric vehicle ownership and the charging infrastructure, and investing directly in the deployment of new charging infrastructure in their service areas. Utilities are also in the unique position to be able to expand charging access to underserved areas not served by the private sector, including low-income neighborhoods and multifamily residences. Some stakeholders have raised potential concerns about utilities' direct investment in electric vehicle infrastructure and are working actively to protect ratepayers and a competitive marketplace as more utilities engage in this space.

Incentivize and support electric vehicle ownership and infrastructure

There are two primary ways electric utilities can incentivize customers to purchase electric vehicles: offering time-of-use rates for charging and investing directly in charging infrastructure.

Time of use rates

One way that electric utility companies can incentivize electric vehicle use is by offering special time-of-use, or TOU, rates—alternative rate structures for electric vehicle owners who are charging vehicles in their homes. Under a TOU program, electric vehicle owners are charged different rates based on what time they plug in, which allows utilities to incentivize residents to charge their cars during off-peak hours, such as overnight, when electricity demand is lowest.

For the utility, shifting demand to off-peak times reduces generation costs and avoids unnecessary investment in generation, transmission, and distribution.[58] By shifting charging times, utilities gain revenue while utilizing existing capacity.[59] Shifting demand from peak times is key to grid sustainability and helps avoid the need for carbon-intensive generation at peak times.[60]

While gasoline prices can be volatile, electric vehicle owners know what they will pay to charge their vehicles at any given time, and they pay lower rates if they charge at night, when there is less demand on the grid. A 2014 study by Energy and Environmental Economics modeled the effects of tiered and TOU pricing on customers. It found that the bills that electric vehicle owners pay offset the cost to the utility to deliver the electricity. Because these costs would be distributed among those who pay electricity bills as part of the rate base, the cost savings are passed on to all ratepayers, including those who do not own electric vehicles.[61] Through consumer education, utilities can demonstrate how a TOU charging program offers these benefits to all customers.

Several electric utilities already offer special TOU rates to electric vehicle chargers, including ConEd in New York, Dominion Power in Virginia, DTE Energy in Michigan, Georgia Power in Georgia, and Pacific Gas & Electric Company and Southern California Edison in California.[62]

The main utility serving the Sacramento, California, metropolitan area—Sacramento Municipal Utility District, or SMUD—established a two-year pilot program for TOU pricing, offering customers three time-varying options during which to charge their vehicles. The results of the pilot indicate that TOU pricing works: SMUD saw a reduction of demand during peak times by 12 percent.[63]

San Diego Gas & Electric offers electric vehicle owners special rates for those who opt into the EV-TOU program. The program gives customers the option to charge during "off-peak" and slightly cheaper "super off-peak" hours. Depending on when customers charge their vehicles and whether they use solar energy, they can choose from different time-of-use charging models to get the most electricity for their buck. Regardless of which option customers choose, the utility benefits from having some electricity consumption shifted to times of lower demand.[64]

Implementing this structure for electric vehicle owners is a bit complicated, as it involves tracking electric vehicle charging use separately from general residential electricity use. However, this is feasible through smart-charging technology, which links chargers directly to the grid and allows for data collection and scheduling of

charging periods.[65] Similar to smart thermostat programs, such as Nest, customers allow utilities to control when the charge flows to their plugged-in vehicle so that the utility can stagger the flow among various households to achieve balanced demand on the grid over the course of the night.[66]

In Toronto, Canada, the government collaborated with smart charging company CrossChasm Technologies and the electric company Toronto Hydro to create a pilot program to establish TOU rates for charging. The pilot offers electric vehicle owners new Level 2 chargers, a logger that tracks battery usage and charging patterns, and an app in which participants set charging preferences and receive requests to shift consumption when electricity is in peak demand. The pilot ended at the end of 2015, and CrossChasm expects to release an evaluation in spring 2016.[67]

Incentives to use renewables for electric vehicle charging

Utilities can combine the benefits of TOU charging and renewable energy by offering electricity that is generated by alternative energy sources during off-peak times for electric vehicle-charging, without shifting rates. This practice is not yet widespread. In Minnesota, for example, the energy cooperative Great River Energy, which provides electricity to 1.7 million customers across 28 co-ops, initiated a program in 2015 called Revolt. The program allows plug-in vehicle customers the option to get electricity from wind energy through the co-op at no extra cost. While there is no way to send wind energy directly to registered homes, the company sets aside renewable energy credits annually for each participant. Because electric vehicle owners primarily charge at their residences at night, when wind is strongest, the connection creates a reliable method for the utility to manage its load and encourage residents to take advantage of charging while demand is low overnight.[68]

Types of EV charging

There are currently three types of electric vehicle chargers: Level 1, Level 2, and DC Fast Chargers.

Level 1 charges the vehicle through a basic 120 Volt plug, the kind found in the wall of a house. It requires no special equipment but can take over 20 hours to charge fully; this method is often used in homes where owners can charge their vehicles overnight.[69]

Level 2 charging requires a 240 Volt AC plug and requires additional charging equipment: the same type of hook up as an electric dryer or oven. Level 2 chargers can fully charge a battery in eight hours or less, depending on vehicle range, and are often found in homes and workplaces. Level 2 chargers are more expensive than Level 1, but they are still a cheaper option than the DC Fast Chargers that are commonly found at public charging stations.[70]

DC Fast Chargers offer 480 Volt charging and can fully charge a 60- to 100-mile range battery in 20 minutes. These are the most expensive chargers and also require specialized equipment to be installed in the charging space and in the vehicle itself.[71]

Utilities can support electric vehicle charging by investing directly in residential and public charging locations, meaning, they own, install, and maintain electric vehicle charging infrastructure in their service areas. This represents a significant capital investment, but it can offer significant potential benefit: higher demand during off-peak hours, when car owners are charging at home. According to recent analysis by Silver Spring Networks, a smart grid solution provider, the benefits of utility ownership outweigh the costs 1.83 to 1.[72]

Some utilities have started investing in public charging infrastructure. These initial programs will provide important lessons-learned as additional utilities across the country opt in.

In 2015, Kansas City Power and Light, or KCP&L, installed more than 1,000 charging stations around the Kansas City, Missouri, area.[73] The utility is offering free charging for the first two years of the program. KCPL estimates that the charging network can support up to 10,000 electric vehicles.[74] The utility has yet to receive approval from the Missouri Public Service Commission to include the $20 million cost in its rate base, which incorporates the investment in the stations

into the total value of the utility's assets on which the utility is allowed to collect a profit. By including the cost of the chargers into the utility's rate-based assets, the utility can recoup its investment through the price it charges customers for electricity, passing along some of the risk of the investment to ratepayers. While host sites are paying for their own stations, the utility has made the initial investment to support the infrastructure, and the utility hopes to pass these costs along to ratepayers. If denied by the commission, KCP&L will finish the pilot but not expand, according to its CEO, Terry Bassham.[75] The utility argues that building infrastructure to support electric vehicles will encourage consumers to purchase these vehicles and make Kansas City an electric vehicle hotspot.

In California, three major utilities are taking initiative to sponsor public electric vehicle charging through different business models. In 2014, Pacific Gas and Electric, or PG&E; Southern California Edison, or SCE; and San Diego Gas & Electric, or SDG&E, filed proposals with the California Public Utilities Commission, or CPUC, to invest in electric vehicle charging around the state.[76]

In January 2016, the CPUC approved SCE's proposal for its Charge Ready pilot project, giving the green light for SCE to install 1,500 electric vehicle charging stations in its service area, which includes parts of southern, coastal, and central California. The pilot will cost $22 million and will expand charging options for residents in apartments, low-income areas, workplaces, and college campuses. Under the SCE pilot model, SCE will install and maintain the required electrical infrastructure to support the charging stations, which participants will own, operate, and manage. SCE will subsidize some of the cost of installing the charging stations at levels that vary by market. After the pilot program has run its course, SCE will seek approval from CPUC to expand the program to build 30,000 charging stations across the service area by 2020, at an estimated cost of $355 million. The program also calls for an education and outreach program to increase awareness of electric vehicles.[77]

In January, CPUC also approved SDG&E's pilot research initiative, which was designed to test market response to variable rates for electric vehicle charging. The vehicle-grid integration pilot will install 3,500 charging stations in areas that lack existing chargers, such as multifamily dwellings and workplaces.[78] The dynamic pricing structure of the program allows for time-varying rates for charging. The program includes a mobile app that sends customers signals on charging rates and lets

them set their preferences for charging times.[79] This program initially will cost $59 million and an estimated $44 million over the life of the project for operation and maintenance.[80] Under this program, SDG&E will own the charging infrastructure, but third-party contractors will construct, operate, and maintain the stations.[81]

Initially, PG&E proposed to build 25,000 Level 2 charging stations and 100 DC fast chargers. The company would have fully owned and operated the stations, unlike in the proposals of SCE and SDG&E.[82] In October 2015, the CPUC rejected this proposal, raising concerns that the company's plan could threaten fair competition; it directed PG&E to propose a pilot program with a transition period.[83] In March 2016, PG&E submitted a proposed settlement to CPUC for a pilot program called Charge Smart and Save that would install 7,500 Level 2 chargers and 100 DC fast-chargers over three years. PG&E submitted this proposal with several stakeholders that helped craft it, including the Sierra Club, Natural Resources Defense Council, Greenlining Institute, California Coalition of Utility Employees, Plug In America, General Motors, Honda Motors, and the Alliance of Automobile Manufacturers.[84] In the revised plan, the utility would own the infrastructure but hire contractors to install and maintain it. The program would locate most of the Level 2 chargers at workplaces and multifamily dwellings with the goal of filling critical market gaps. CPUC is expected to make a decision on this proposed settlement agreement during the summer of 2016.[85]

Concerns about direct utility investment

During the debate about PG&E's initial proposal to add 25,000 charging stations, several stakeholders raised concerns about the utility's proposed model for investing in an electric vehicle charging infrastructure. These comments provide important lessons for other utilities that may want to make a significant investment in their own service areas.

To cover the significant upfront capital costs of its proposal, PG&E would have passed the costs on to all residential electricity consumers at a cost of about 70 cents each month. Consumer advocacy group The Utility Reform Network, or TURN, raised equity concerns about this policy, because all ratepayers would pay the increased costs regardless of whether they owned electric vehicles. TURN also warned that PG&E's initial proposal could saddle ratepayers with stranded costs if the infrastructure is built but underutilized.[86]

TURN argued that utilities should not own charging stations but work with private host sites that own the actual chargers. With site host ownership, the risk of stranded assets doesn't fall on ratepayers but is assumed by the host site, as well, giving them "skin in the game."[87] The California Office of Ratepayer Advocates, or ORA, agrees that ratepayers should only fund a pilot program with limited charging stations to avoid stranded assets, and this pilot should be used to collect data and evaluate the program. ORA believes that any utility seeking to build charging infrastructure should start with a small-scale pilot with minimal financial risk to ratepayers so the program can be evaluated before being expanded.[88] If the PG&E proposal is eventually implemented in full, ORA suggests that PG&E should own no more than 20 percent of charging stations with shareholder funds, minimizing anti-competitive effects on the market.[89]

On the other side, PG&E argued that all ratepayers benefit from cleaner air. As a state policy goal, PG&E sees the effort to put more electric vehicles on the road as an appropriate cost to be shared among ratepayers, similar to energy-efficiency measures for low-income residents.[90]

Network charging company ChargePoint commented that PG&E's ownership of charging infrastructure as it was originally proposed would lead to a monopoly, blocking the competition necessary to keep prices low. ChargePoint CEO Pasquale Romano suggested that the PG&E proposal might even slow down the market, because people and businesses might hesitate to install chargers privately if they assume PG&E will put one in for them.[91] When the CPUC denied PG&E's original proposal for its installation of more than 25,000 charging stations, Commissioner Carla Peterman cited in her ruling concerns that PG&E would gain an unfair advantage and create an anti-competitive market environment.[92]

While PG&E's recent proposal scales down the size of its program to create a more phased-in model, some still expressed concerns. ChargePoint's Romano argued that this newest proposal still contains terms that could stifle competition.[93] TURN also reacted to the settlement proposal unfavorably, citing concerns that the proposal is still too large, does not phase in the program, and will be too costly to customers, many of whom would not benefit from the new charging stations.[94]

Others endorsed the revised plan, including the environmental groups, automakers, and other stakeholders that crafted it. The Sierra Club called it a program that would "benefit the electricity grid, all utility customers, and the environment."[95]

Expanding electric vehicle access to underserved areas

Utility ownership and operation of the charging infrastructure could provide expanded access into underserved, less profitable areas that private companies have not yet reached.[96]

SDG&E's proposal for its charging pilot includes installing 10 percent of its stations in multifamily residences and workplaces in low-income communities. This proposal has seen a lot of support from a broad coalition of environmental partners, including the Natural Resources Defense Council, Environmental Defense Fund, and the Greenlining Institute.[97] The goal of this initiative is to help all communities gain access to the benefits of zero-emissions vehicles. According to a 2011 report by the Greenlining Institute, communities of color in California are more concerned about air quality and pollution than their white counterparts, so they represent a potential market base for electric vehicles. Expanding infrastructure into these communities can increase their access to these vehicles.[98]

The proposals from SCE and PG&E also include plans to extend the charging infrastructure into underserved areas. In its approved pilot, SCE commits to siting 10 percent of charging stations, or 150 stations, in disadvantaged areas.[99] If PG&E's newest settlement proposal is approved by the CPUC, the company will install at least 15 percent of its charging facilities in disadvantaged communities and aim for an additional 5 percent of chargers installed in these communities.[100]

Under a 2012 settlement with Dynegy—which was partially owned by NRG at the time—NRG agreed to install 200 DC fast charging stations throughout California. Twenty percent of these stations were installed in low-income areas; the company targeted mixed-income housing locations as well. The settlement was designed to address the lack of a public charging infrastructure, deemed a major barrier to electric vehicle expansion in the state.[101]

Expanding charging into low-income areas is not sufficient to bring real access to electric transportation to everyone. While it does address the charging needs of residents in multifamily residences and apartment buildings, building the infrastructure for charging does not make the actual electric vehicles more affordable to low-income drivers. One way to address this is to lower the price for vehicles at the point of sale. TURN, for example, recommends using Low

Carbon Fuel Standard revenue to give low-income drivers a rebate upfront on the purchase or lease of an electric vehicle. This could lower the price point to an affordable level, especially for the purchase of used vehicles, which are cheaper but not eligible for the $7,500 federal tax credit.[102]

Utilities can play a significant role in incentivizing customers to purchase electric vehicles and in expanding charging access to under-served areas. They can offer special time-of-use charging rates to make charging more affordable and spread out electricity demand. Some consumer advocacy groups have expressed concern about utilities directly investing in charging infrastructure, and utilities should address these concerns through stakeholder engagement and well-designed pilot programs to collect data and avoid stifling competition from private charging providers.

Recommendations

As electricity becomes cleaner, it will become a common-sense alternative fuel for vehicles. While the electric vehicle and hybrid vehicle market has seen growth in recent years, it still accounts for only 3 percent of vehicles on the road in the United States. While car manufacturers, municipalities, and federal and state governments have been incentivizing electric vehicle production and use, electric utilities also have a significant role to play in expanding access to electric transportation as a clean, affordable alternative to gas-powered cars.

Given the position that utilities play in delivering electricity to households and businesses across the country, the Center for American Progress recommends that electric utilities:

- Invest in and maintain a public charging infrastructure in their service areas. Electric utilities that are interested in adding charging stations to their service area should prioritize early stakeholder engagement and, if necessary, start with pilot programs to evaluate the size and type of investment that best meets the needs of the community. Utilities should also demonstrate that their investment does not obstruct market competition and innovation. The goal should be to complement, not supplant, private sector involvement in charging infrastructure.

- Offer electric vehicle owners in their service areas special time-varying rates to incentivize off-peak charging. These utilities also should identify ways to allow electric vehicle consumers to purchase or use electricity generated from renewable or zero-carbon energy sources to maximize the climate benefit of the electric vehicles.

- Expand charging to low-income areas and multifamily residences that are often neglected by private charging providers. For this to work, utilities also should encourage state policymakers to offer point-of-sale rebates for residents in these areas to purchase new or preowned electric vehicles to make the cars a more affordable option.

Electric utilities serve nearly every household and business in the United States. Their broad reach positions them as key players in promoting expansion of electric vehicles and reducing emissions from the transportation sector. To incentivize electric vehicle ownership, utilities can implement pilot infrastructure investment programs and offer special rates and access to renewable energy. They can also increase access to charging infrastructure in underserved areas that are less profitable for private charging companies.

Conclusion

As the United States works to reduce greenhouse emissions as part of a global effort to curb global warming and prevent the worst impacts of climate change, reductions will need to be made from multiple sectors. The United States has made great strides in implementing policy to reduce emissions from the power sector, and it must now turn to the transportation sector, which accounts for more than one-fourth of all greenhouse gas emissions in the country.

Putting more electric vehicles on the road is important for achieving these reductions, and electric utilities have a critical role to play in the deployment of electric vehicles. CAP recommends that utilities use their expansive presence across the country to incentivize electric vehicle ownership and invest directly in charging infrastructure. CAP also recommends that utilities use these incentives and investments to expand electric vehicle and charging access to low-income and underserved areas.

Electric vehicles will play a prominent role in the transportation of the future, and utilities are well positioned to encourage and benefit from this growth.

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Endnotes

1 U.S. Environmental Protection *Agency, Fast Facts: U.S. Transportation Sector Greenhouse Gas Emissions, 1990-2013* (2015), available at https://www.epa.gov/sites/production/files/2016-02/documents/420f15032.pdf.

2 Unless otherwise specified, "electric vehicle" refers to a category of plug-in vehicles that includes Battery Electric Vehicles, or BEVs, and Plug-in Hybrid Electric Vehicles, or PHEVs. BEVs run solely on an electric battery and are charged by plugging them into an electric outlet or charger. PHEVs contain both an electric battery, which is charged by plugging them into an outlet or charger, and an internal combustion engine, which runs on a conventional fossil fuel like petroleum.

3 The White House, "Fact Sheet: U.S. Reports its 2025 Emissions Target to the UNFCCC," Press release, March 31, 2015, available at https://www.whitehouse.gov/the-press-office/2015/03/31/fact-sheet-us-reports-its-2025-emissions-target-unfccc.

4 Coral Davenport, "Nations Approve Landmark Climate Accord in Paris," *The New York Times*, December 12, 2015, available at http://www.nytimes.com/2015/12/13/world/europe/climate-change-accord-paris.html?_r=0.

5 Maria Belenky, "Achieving the U.S. 2025 Emissions Mitigation Target" (Washington: Climate Advisors, 2016), available at http://www.climateadvisers.com/wp-content/uploads/2016/02/US-Achieving-2025-Target_Jan-2015-final.pdf.

6 O.Edenhofer and others, "Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change" p. 12, (Geneva: Intergovernmental Panel on Climate Change, 2014), available at https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_full.pdf.

7 Environmental Protection Agency, "FACT SHEET: Clean Power Plan By The Numbers," available at https://www.epa.gov/cleanpowerplan/fact-sheet-clean-power-plan-numbers (last accessed March 2016).

8 Environmental Protection Agency, "Fast Facts – U.S. Transportation Sector Greenhouse Gas Emissions 1990-2013," October 2015, available at https://www.epa.gov/sites/production/files/2016-02/documents/420f15032.pdf.

9 Ibid.

10 Union of Concerned Scientists, "Cleaner Cars from Cradle to Grave: How Electric Cars Beat Gasoline cars on Lifetime Global Warming Emissions" (2015), p. 21, available at http://www.ucsusa.org/sites/default/files/attach/2015/11/Cleaner-Cars-from-Cradle-to-Grave-full-report.pdf.

11 Ibid., p. 11.

12 U.S. Environmental Protection Agency, "Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units" *Federal Register* 79 (34829) (2014), available at https://www.federalregister.gov/articles/2014/06/18/2014-13726/carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility-generating.

13 U.S. Environmental Protection Agency, "Clean Power Plan – Technical Summary for States," available at https://www3.epa.gov/airquality/cpptoolbox/technical-summary-for-states.pdf (last accessed April 2016).

14 Daniel Cusick, "Renewables Boom Expected Thanks to Tax Credit," *Scientific American*, December 21, 2015, available at http://www.scientificamerican.com/article/renewables-boom-expected-thanks-to-tax-credit/.

15 Cory Honeyman, "U.S. Residential Solar Economic Outlook 2016-2020: Grid Parity, Rate Design and Net Metering Risk," (Boston: GTM Research, 2016), available at https://www.greentechmedia.com/research/report/us-residential-solar-economic-outlook-2016-2020.

16 Ibid.

17 Solar Energy Industries Association, "Solar Market Insight 2015 Q3," available at http://www.seia.org/research-resources/solar-market-insight-2015-q3 (last accessed March 2016).

18 U.S. Department of Energy, "Wind Vision," available at http://energy.gov/maps/map-projected-growth-wind-industry-now-until-2050 (last accessed March 2016).

19 American Wind Energy Association, "U.S. Wind Industry Fourth Quarter 2015 Market Report," (2015), available at http://awea.files.cms-plus.com/FileDownloads/pdfs/4Q2015%20AWEA%20Market%20Report%20Public%20Version.pdf.

20 U.S. Department of Energy, "Wind Vision."

21 U.S. Department of Energy, "Electric Vehicle Charging Station Locations," available at http://www.afdc.energy.gov/fuels/electricity_locations.html (last accessed April 2016).

22 Electric Drive Transportation Association, "Electric Drove Sales Dashboard," available at http://electricdrive.org/index.php?ht=d/sp/i/20952/pid/20952 (last accessed March 2016).

23 California Air Resources Board, "Zero-Emission Vehicle Legal and Regulatory Activities and Background," available at http://www.arb.ca.gov/msprog/zevprog/zevregs/zevregs.htm (last accessed March 2016).

24 California Air Resources Board, "The Zero Emission Vehicle (ZEV) regulation," available at http://www.arb.ca.gov/msprog/zevprog/factsheets/general_zev_2_2012.pdf (last accessed March 2016).

25 Center for Climate and Energy Solutions, "ZEV Program," available at http://www.c2es.org/us-states-regions/policy-maps/zev-program (last accessed March 2016).

26 Multi-State ZEV Task Force, "About the ZEV Task Force," available at http://www.zevstates.us/ (last accessed March 2016).

27 U.S. Department of Energy, "State Laws and Incentives," available at http://www.afdc.energy.gov/laws/state (last accessed March 2016).

28 U.S. Department of Energy, "FACT #914: February 29, 2016 Plug-in vehicle sales climb as battery costs decline," available at http://energy.gov/eere/vehicles/fact-914-february-29-2016-plug-vehicle-sales-climb-battery-costs-decline (last accessed March 2016).

29 Tom Randall, "Here's How Electric Cars Will Cause the Next Oil Crisis," Bloomberg Business, February 25, 2016, available at http://www.bloomberg.com/features/2016-ev-oil-crisis/.

30 Ibid.

31 International Energy Agency, "Global EV Outlook: Understanding the Electric Vehicle Landscape to 2020" (Paris: Clean Energy Ministerial, Electric Vehicles Initiative, Intergenerational Energy Agency, 2013), p.17, available at http://www.iea.org/publications/globalevoutlook_2013.pdf.

32 Stephen Edelstein, "Electric Car Price Guide: Every 2015-2016 Plug-In Car, With Specs: UPDATED," Green Car Reports, January 27, 2016, available at http://www.greencarreports.com/news/1080871_electric-car-price-guide-every-2015-2016-plug-in-car-with-specs-updated.

33 Andrew Moseman, "Confirmed: The $35,000 Tesla Model 3 Will Be Unveiled in March 2016," *Popular Mechanics*, February 11, 2016, available at http://www.popularmechanics.com/cars/a12983/35000-tesla-model-iii-coming-in-2017/.

34 Randall, "Here's How Electric Cars Will Cause the Next Oil Crisis."

35 U.S. Department of Energy, "Electric Charging Locations by State."

36 Jay Cole, "Plug-In Vehicle Adoption: State By State, And By Brand For 2014 In US," Inside EVs, October 2015, available at http://insideevs.com/ev-adoption-state-state/.

37 U.S. Department of Energy, "Electric Charging Locations by State"; Cole, "Plug-In Vehicle Adoption: State By State, And By Brand For 2014 In US."

38 Excluding Tesla, which uses its own charging technology that is incompatible with DC fast chargers; Mark Kane, "EVgo Announces Three Major Partnerships in One Big Week," InsidesEVs, November 25, 2015, available at http://insideevs.com/evgo-announces-three-major-partnerships-one-big-week/.

39 CarStations, "Map of charging stations," available at http://carstations.com/ (last accessed March 2016).

40 Tesla, "Supercharger," available at https://www.teslamotors.com/supercharger (last accessed April 2016).

41 Toronto Atmospheric Fund, "Fleetwise EV300: Findings Report on EV Usage in Sixteen GTA Fleets" (2015), p.12, available at http://taf.ca/wp-content/uploads/2014/09/FleetWise-EV300-Findings-Report-16-June-2015.pdf.

42 Idaho National Laboratory, "Plugged In: How Americans Charge Their Electric Vehicles" (2015), p.5, available at http://avt.inel.gov/pdf/arra/SummaryReport.pdf.

43 Ibid., pp. 14-15.

44 U.S. Energy Information Administration, "Total electricity sales fell in 2015 for 5th time in past 8 years," Today in Energy, March 14, 2016, available at https://www.eia.gov/forecasts/steo/report/renew_co2.cfm.

45 U.S. Energy Information Administration, "Short-term Energy and Summer Fuels Outlook," April 12, 2016, available at http://www.eia.gov/forecasts/aeo/data/browser/#/?id=8-AEO2015&cases=ref2015.

46 Steven Nadel, "35 years of energy efficiency progress, 35 more years of energy efficiency opportunity," American Council for an Energy-Efficient Economy, June 30, 2015, available at http://aceee.org/blog/2015/06/35-years-energy-efficiency-progress.

47 Database of State Incentives for Renewables & Efficiency, "Detailed Summary Maps," available at http://www.dsireusa.org/resources/detailed-summary-maps/ (last accessed March 2016).

48 Database of State Incentives for Renewables & Efficiency, "Summary Tables," available at http://programs.dsireusa.org/system/program/tables (last accessed March 2016).

49 Eric Ackerman and Paul De Martini, eds., "Future of Retail Rate Design" (Washington: Edison Electric Institute, 2013), p. 2, available at http://www.eei.org/issuesandpolicy/stateregulation/Documents/Future%20of%20Retail%20Rate%20Design%20v4%20021713%20eta%20-%20pjd2.pdf.

50 Ibid., p. 8.

51 Scott Shepard, "Plug-In Vehicles: For Utilities, More Opportunities than Challenges," Navigant Research Blog, January 3, 2014, available at http://www.navigantresearch.com/blog/plug-in-vehicles-for-utilities-more-opportunities-than-challenges.

52 Edison Electric Institute, "Memorandum of Understanding Between the Department of Energy and Edison Electric Institute," (2015), available at http://www.eei.org/resourcesandmedia/newsroom/Documents/MOU.pdf.

53 Ibid.

54 Robert Walton, "IHS: Electric vehicle charging infrastructure poised to grow globally," Utility Dive, June 16, 2015, available at http://www.utilitydive.com/news/ihs-electric-vehicle-charging-infrastructure-poised-to-grow-globally/400792/.

55 Navigant Research, "Vehicle-Grid Integration Services Revenue is Expected to Reach Nearly $21 Million by 2024," Press release, March 9, 2015, available at http://www.navigantresearch.com/newsroom/vehicle-grid-integration-services-revenue-is-expected-to-reach-nearly-21-million-by-2024.

56 Brad Berman, "Electric Vehicles and the Smart Grid," Plugin Cars, October 14, 2015, available at http://www.plugincars.com/guide-electric-vehicles-and-the-smart-grid.html.

57 Navigant Research, "Vehicle-Grid Integration Services Revenue is Expected to Reach Nearly $21 Million by 2024."

58 Energy and Environmental Economics and ICF International, "California Transportation Electrification Assessment – Phase 2: Grid Impacts" (2014), p. 19, available at http://www.caletc.com/wp-content/uploads/2014/10/CalETC_TEA_Phase_2_Final_10-23-14.pdf.

59 Energy Foundation, "How Utilities Can Drive the Future of Transport," July 22, 2015, Energy Foundation Blog, available at http://www.ef.org/how-utilities-can-drive-the-future-of-transport/.

60 Laurie Guevara-Stone and David Posner, "A California Utility Explores Time-Sensitive Electricity Pricing," Rocky Mountain Institute RMI Outlet blog, April 21, 2015, available at http://blog.rmi.org/blog_2015_04_21_california_utility_explores_time_sensitive_electricity_pricing.

61 Ibid., p. 17.

62 Zach McDonald, "Which Utilities Offer Time-of-Use Rates for Plug-ins?" January 16, 2016, FleetCarma, available at http://www.fleetcarma.com/utility-time-of-use-plug-in-vehicles/.

63 Guevara-Stone and Posner, "A California Utility Explores Time-Sensitive Electricity Pricing."

64 San Diego Gas & Electric, "EV Rates," available at http://www.sdge.com/clean-energy/ev-rates (last accessed March 2016).

65 CrossChasm, "Canada's First Residential Smart Charging Pilot," available at http://www.crosschasm.com/charge-to/ (last accessed March 2016).

66 Sunny Trochaniak, "Is TOU pricing enough for electric vehicle charging?," November 17, 2015, FleetCarma, available at http://www.fleetcarma.com/tou-pricing-smart-charging/.

67 CrossChasm, "Canada's First Residential Smart Charging Pilot."

68 Great River Energy, "Electric vehicles," available at http://greatriverenergy.com/we-use-energy-wisely/energy-efficiency/electric-vehicles/ (last accessed March 2016).

69 U.S. Department of Energy, "Developing Infrastructure to Charge Plug-In Electric Vehicles," available at http://www.afdc.energy.gov/fuels/electricity_infrastructure.html (last accessed April 2016).

70 Tom Saxton, "Understanding Electric Vehicle Charging," January 31, 2011, Plug In America In the Driver's Seat blog, available at http://www.pluginamerica.org/drivers-seat/understanding-electric-vehicle-charging.

71 U.S. Department of Energy, "EV Everywhere: Vehicle Charging," available at http://energy.gov/eere/eveverywhere/ev-everywhere-vehicle-charging (last accessed March 2016).

72 Silver Spring Networks, "The Dollars—and Sense—of EV Smart Charging: Thinking Through the Options for Utility Integration of Electric Vehicles" (2010), p. 12, available http://www.rmi.org/Content/Files/DollarsandSense.pdf.

73 Kansas City Power & Light, "KCP&L Clean Charge Network," available at http://www.kcpl.com/about-kcpl/environmental-focus/clean-charge-network (last accessed March 2016).

74 Ibid.

75 Peter Kelly-Detwiler, "KCP&L Looking to Make Kansas City An Electric Vehicle Hotspot," *Forbes*, August 11, 2015, available at http://www.forbes.com/sites/peterdetwiler/2015/08/11/kcpl-looking-to-make-kansas-city-an-electric-vehicle-hotspot/#43a806ca60c1.

76 Kyle Field, "California Public EV Charging Expansion Comes With Growing Pains," CleanTechnica, March 25, 2016, available at http://cleantechnica.com/2016/03/25/california-public-ev-charging-expansion-comes-growing-pains/.

77 Edison International, "SCE Receives CPUC Approval for 'Charge Ready' Pilot Program; Will Install As Many As 1,500 Electric Vehicle Charging Stations in Southland," Press release, January 14, 2016, available at http://newsroom.edison.com/releases/sce-receives-cpuc-approval-for-charge-ready-pilot-program;-will-install-as-many-as-1-500-electric-vehicle-charging-stations-in-southland.

78 Max Baumhefner, "San Diego Gas & Electric to Use Electric Cars to Integrate Renewable Energy," Natural Resources Defense Council Expert blog, January 28, 2016, available at http://switchboard.nrdc.org/blogs/mbaumhefner/san_diego_gas_electric_to_use_.html.

79 Robert Walton, "How SDG&E wants to power the electric vehicle market," Utility Dive, October 8, 2014, available at http://www.utilitydive.com/news/how-sdge-wants-to-power-the-electric-vehicle-market/315887/.

80 Ibid.

81 California Electric Transportation Coalition and Energy and Environmental Economics, "San Diego Gas & Electric Vehicle-Grid Integration Pilot Program," available at http://www.eei.org/issuesandpolicy/electrictransportation/PEVengagement/Documents/Summary%20of%20SDGE%20Final2.pdf (last accessed March 2016).

82 Herman K. Trabish, "As regulators pump brakes, what's next for PG&E's EV charging program?" Utility Dive, October 7, 2015, available at http://www.utilitydive.com/news/as-regulators-pump-brakes-whats-next-for-pges-ev-charging-program/406691/.

83 Ibid.; George Avalos, "California PUC Rejects Plan for Electric Vehicle Charging Station Network," GovTech, September 8, 2015, available at http://www.govtech.com/fs/California-PUC-Rejects-Plan-for-Electric-Vehicle-Charging-Station-Network.html.

84 Proposed Settlement Agreement to CPUC by PG&E, March 21, 2016, available at http://greenlining.org/wp-content/uploads/2016/03/JtMotiontoAdoptSettlementAll-03-21-16.pdf (last accessed March 2016).

85 Ibid.

86 Eric Borden, Energy Policy Analyst, "Prepared Direct Testimony of Eric Borden Regarding Pacific Gas and Electric Company's Supplement to Application 15-02-009 for an Electric Vehicle Infrastructure and Education Program," Testimony before the Public Utilities Commission of the State of California, November 30, 2015.

87 Ibid.

88 Office of Ratepayer Advocates, "Electric Vehicles (EVs): SDG&E Infrastructure Program," available at http://www.ora.ca.gov/SDGEEVPilot.aspx (last accessed March 2016).

89 Ibid.

90 Anne C. Mulkern, "Calif. utility sparks debate, proposing to install 25,000 charging stations to promote electric vehicles," E&E News, February 10, 2015, available at http://www.eenews.net/stories/1060013167.

91 Ibid.

92 George Avalos, "PG&E plan to build network of electric vehicle charging stations in northern and central California is turned back," *The Mercury News*, September 4, 2015, available at http://www.mercurynews.com/business/ci_28760989/.

93 Julia Pyper, "PG&E Submits a Revised Plan to Build up to 7,500 EV Chargers," Greentech Media, October 20, 2015, available at http://www.greentechmedia.com/articles/read/PGE-Submits-a-Revised-Plan-to-Build-Up-To-7500-EV-Chargers.

94 The Utility Reform Network, "PG&E Ignores CPUC Order, Demands Excessive, Unnecessary Electric Vehicle Charging Experiment," Press release, March 21, 2016, available at http://www.turn.org/press-room/press-releases/item/909-pge-demands-excessive-unnecessary-ev-charging-stations.html.

95 Sierra Club, "Diverse Coalition Backs Plan for Deployment of Electric Vehicle Charging Stations in Northern California," Press release, March 21, 2016, available at http://content.sierraclub.org/press-releases/2016/03/diverse-coalition-backs-plan-deployment-electric-vehicle-charging-stations.

96 New York State Energy Research and Development Authority, "Compilation of Utility Commission Initiatives Related to Plug-in Electric Vehicles and Electric Vehicle Supply Equipment" (2013), p. 25, available at https://www.nyserda.ny.gov/-/media/Files/Publications/Research/Transportation/Compilation-Utility-Commission-Initiatives-Plug-acc.pdf.

97 Application of San Diego Gas & Electric Company (U902E) for Approval of its Electric Vehicle-Grid Integration Pilot Program, available at https://www.sdge.com/sites/default/files/documents/regulatory/VGI%20Motion%20for%20Adoption%20of%20Settlement%20FINAL.PDF (last accessed March 2016).

98 C.C. Song, "Electric Vehicles: Who's Left Stranded?" (Oakland, CA: The Greenlining Institute, 2011), p. 8, available at http://greenlining.org/wp-content/uploads/2013/02/ElectricVehiclesReport.pdf.

99 Edison International, "SCE Receives CPUC Approval for 'Charge Ready' Pilot Program; Will Install As Many As 1,500 Electric Vehicle Charging Stations in Southland," Press releases, January 14, 2016, available at http://newsroom.edison.com/releases/sce-receives-cpuc-approval-for-charge-ready-pilot-program;-will-install-as-many-as-1-500-electric-vehicle-charging-stations-in-southland.

100 Proposed Settlement Agreement to CPUC by PG&E, March 21, 2016, available at http://greenlining.org/wp-content/uploads/2016/03/JtMotiontoAdoptSettlementAll-03-21-16.pdf (last accessed March 2016).

101 California Public Utilities Commission, "CPUC Files Settlement That Will Bring Electric Vehicle Charging Infrastructure to California's Diverse Communities," Press release, April 27, 2015, available at http://docs.cpuc.ca.gov/PUBLISHED/NEWS_RELEASE/165145.htm.

102 Eric Borden, Energy Policy Analyst, "Prepared Rebuttal Testimony of Eric Borden Regarding PG&E's Application 15-02-009 for an Electric Vehicle Infrastructure and Education Program," Testimony before the Public Utilities Commission of the State of California, December 21, 2015.

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