ELECTRIC VEHICLES: ROLLING OVER BARRIERS AND MERGING WITH REGULATION

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ABSTRACT

Electric vehicles are merging into the mainstream of transportation. Although the technology still comprises a small fraction of the current market, it is more widely available due to competitive pricing, technological improvements, and available state and federal incentives. The benefits of electric vehicles include reduced fossil fuel emissions and associated climate change mitigation, new independence from oil-driven policies in foreign markets and international relations, and potential opportunities for increasing and complementing renewable energy electric resources. The risks of widespread electric vehicle deployment are largely thought to involve potential impacts on existing utility generation, distribution, and transmission systems and how the costs of any needed changes to these resources should be allocated among customers, including those not utilizing the technology. This Article argues that the potential risks of increased electric vehicle deployment can be tempered by targeted involvement of the state agencies tasked with regulating electricity, for example in requiring utilities to take the lead on public education and in mandating certain rate structures that minimize load impacts. It provides a road map for state agencies to answer the novel legal and policy questions posed by traveling vehicles as electric load, and also examines how state involvement can actually mitigate the barriers to further growth in this nascent sector by allowing increased opportunities for competition, information gathering and dissemination, and minimization of unnecessary regulatory burdens, particularly at this early stage of deployment. This Article makes the case that, given the scope of potential environmental and social benefits, state agencies can and should actively explore and develop policy mechanisms to integrate electric vehicle growth into the electric regulation space.

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INTRODUCTION

Electric Vehicle ("EV")[1] regulation represents a departure from the traditional public utility business model because of the inherent nature of vehicle travel. EVs and associated refueling infrastructure represent new, potentially large centers of electric load that move in all directions and at all times from their primary meter. As regulators examine the suite of policy issues underlying the market barriers to widespread EV adoption in the United States, it is critical to establish a public interest framework to approach EV integration. This Article identifies one road map to addressing the barriers of EV adoption from a regulatory perspective. This Article argues that the benefits that EVs may bring to utilities, the environment, energy independence, and foreign policy justify a proactive approach by regulators that challenges certain traditional regulatory principles.

The challenges presented by EV technology are by no means alone in terms of presenting new challenges for regulators. EVs are yet another nuance for utilities and regulators managing the impacts of distributed generation, demand-side management, smart grid, storage, net metering, and demand response technologies that have disrupted the electric utility market in the last decade.[2] EV regulation can and should be a part of the suite of policies and practices that continue to reshape the utility industry. Regulators are tasked with balancing the public interest in integrating each of these new technologies with the myriad of real and kinetic benefits into the electric marketplace while providing adequate protections for both ratepayers and electric utilities.[3] EVs pose only the latest challenge, and one that only a few state commissions have directly addressed.[4]

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[1] There are several types of electric vehicles, including plug-in hybrid electric vehicles and plug-in/battery electric vehicles. This Article selects the acronym "EV" for simplicity.

[2] *2015 Utilities Trends*, PWC STRATEGY&, http://www.strategyand.pwc.com/perspectives/2015-utilities-trends [http://perma.cc/7NFK-7K8M] (last visited Jan. 22, 2016) (discussing the need for radical utility restructuring amidst new energy technologies); *see generally* Peter Kind, *Disruptive Challenges: Financial Implications and Strategic Responses to a Changing Retail Electric Business*, EDISON ELEC. INST. (2013) (outlining strategies to stabilize financial electrical sector in light of new technological advancement).

[3] *See* INT'L ENERGY AGENCY, TECHNOLOGY ROADMAP ENERGY STORAGE 1 (2014), *available at* https://www.iea.org/publications/freepublications/publication/TechnologyRoadmapEnergystorage.pdf [https://perma.cc/97JN-FS7R].

[4] *All Laws and Incentives Sorted by Type*, U.S. DEP'T OF ENERGY [hereinafter *All Laws and Incentives*], http://www.afdc.energy.gov/laws/matrix/tech [http://perma.cc/UB9N-U8D3] (last visited Jan. 22, 2016).

A. The Benefits of Increased EV Penetration

The benefits of EVs to society derive from this technology's utilization of electricity as a primary fuel rather than gasoline derived from oil. In turn, the ability of EVs to access the growing diversity of power resources of the transmission grid could unlock economic load growth in an era where load growth has been relatively stagnant.[5] Electric load growth by its nature creates domestic infrastructure investment and a rare potential utility profit center.[6]

America's EV market has experienced a renaissance in the last five years.[7] Factors key to the technology's resurgence include a popular response to EV's ability to combat man-made sources of global climate change and to mitigate volatile gasoline prices both in the United States and abroad.[8] Also, advances in EV drivetrain and automotive technology have fed economies of scale.[9]

EV integration symbolizes a convergence of two dynamic policy areas—each of which dramatically influence global emissions—transportation and electric policy. EVs produce about one half of the carbon dioxide ("CO_2") emissions per mile of gasoline fueled vehicles, even with coal fired generation comprising a significant portion of the electric generation portfolio.[10] Reducing the import and domestic use of gasoline for vehicle travel engenders greenhouse gas ("GHG") emission reductions while delivering economic and foreign policy benefits.[11] One of the key

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[5] *See, e.g.*, AM. SOC'Y CIVIL ENG'R ("ASCE"), FAILURE TO ACT: THE ECONOMIC IMPACT OF CURRENT INVESTMENT TRENDS IN ELECTRICITY INFRASTRUCTURE 5 (2011) (projecting an investment gap of electric generation, transmission, and distribution that are projected to grow over time to a level of $107 billion by 2020, about $11 billion per year, and almost $732 billion by 2040).

[6] *See id.*

[7] *See, e.g.*, *Global Production of Electric Vehicles to Surge by 67 Percent This Year*, IHS (Feb. 4, 2014), http://press.ihs.com/press-release/automotive/global-production-electric-vehicles-surge-67-percent-year [http://perma.cc/FUH8-FKQS].

[8] *See id.*

[9] *See, e.g.*, GREGORY KEOLIAN ET. AL., UNIV. OF MICH. CTR. FOR SUSTAINABLE SYS., ENVIRONMENTAL ASSESSMENT OF PLUG-IN HYBRID ELECTRIC VEHICLES IN MICHIGAN: GREENHOUSE GAS EMISSIONS, CRITERIA AIR POLLUTANTS, AND PETROLEUM DISPLACEMENT (2011), *available at* http://css.snre.umich.edu/css_doc/CSS11-01.pdf [http://perma.cc/9KLZ-KQVV].

[10] CHRISTENSEN ASSOCIATES ENERGY CONSULTING, ELECTRIC VEHICLE RATE DESIGN STUDY PREPARED FOR XCEL ENERGY, Attachment B to NSP Petition 3 (Jan. 19, 2015) [hereinafter Christensen Study]. (Note that more nuanced state by state studies show differences depending on each state's generation mix).

[11] *See id.*

potential benefits from EV penetration is to reduce the United States' need to import oil.[12] This factor alone could reshape America's military and diplomatic priorities around the world. Domestically, EVs may potentially leverage increasing amounts of renewable energy penetration at the distribution and transmission levels of the grid.[13]

B. Challenges to Increased EV Adoption

Despite the many benefits of EVs, as of September 2014, the EV market accounts for only 0.75% of U.S. automobile market share.[14] Discrete markets such as California are surging, but the EV market generally is nascent.[15] Early adopters have embraced the technology, but deployment has not been sufficient to generate widespread consumer awareness or production efficiencies.[16] Massive market barriers dominate the road ahead. Among the industry's biggest challenges are threshold consumer topics: (1) education and societal recognition, (2) development of refueling (i.e., charging) infrastructure, and (3) normalization of statutory and regulatory treatment.[17] Electric utility regulators may establish policies and procedures that impact each of these variables.

Policies that address the barriers to EV market growth are critical if EV technology is to successfully merge into our gasoline-fueled roads. Although the EV market is developing on its own, the impacts (as well

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[12] *Id.* at 1.

[13] Tony Markel, *Plug-In Electric Vehicle Infrastructure: A Foundation for Electrified Transportation,* NAT'L RENEWABLE ENERGY LAB. 1 (2010), *available at* http://www.nrel.gov/docs/fy10osti/47951.pdf [http://perma.cc/4LSQ-9EEY].

[14] Jeff Cobb, *September 2014 Dashboard,* HYBRIDCARS.COM (Oct. 2, 2014), http://www.hybridcars.com/september-2014-dashboard/ [http://perma.cc/RW4C-2FVG] (reporting that plug-in hybrid vehicles had a total market share of 0.27%, while battery electric vehicles reached all-time high in share of 0.48%).

[15] *See* Alan Ohnsman, *Californians Propel Plug-in Car Sales with 40% of Market*, BLOOMBERG NEWS (Sept. 8, 2014), http://www.bloomberg.com/news/2014-09-09/californians-propel-plug-in-car-sales-with-40-of-market.html [https://perma.cc/LV48-2UW2] (accessed by running the url through https://archive.org/web/ ("WayBackMachine")).

[16] *See* Lingzi Jin, Stephanie Searle, & Nic Lutsey, *Evaluation of State-Level U.S. Electric Vehicle Incentives*, INT'L COUNCIL ON CLEAN TRANSP. (Oct. 2014) (finding a positive correlation between state incentives and EV ownership compared to states that do not heavily incentivize EV ownership).

[17] *See* JENNIFER TODD, JESS CHEN, & FRANKIE CLOGSTON, INT'L ECON. DEV. COUNCIL, CREATING THE CLEAN ENERGY ECONOMY (2013), *available at* http://www.iedconline.org/clientuploads/Downloads/edrp/IEDC_Electric_Vehicle_Industry.pdf [http://perma.cc/KNX5-85W3] (citing the need to expand current charging infrastructure as well as educate consumer protection).

as the efficiencies) that may be gained by developing a regulatory framework for EV integration into the grid are worth addressing by federal and state governments. EVs may provide system-wide benefits and achieve important environmental and economic goals; principally, goals of mitigating global climate change contributions from the vehicle sector.[18] This Article focuses on developments in state electric regulatory policy relative to threshold issues of EV market growth, including customer awareness, rates, grid connection, and infrastructure. Based on how state public utilities commissions[19] ("PUCs" or "commissions") have initially tackled threshold issues of EV market barriers, we have developed the following recommendations as a road map for regulators to encourage EV market growth in the public interest:

1. Utilities[20] should develop collaborative and comprehensive customer outreach and education initiatives. A related critical policy is a notification method to inform utilities and regulators of EV ownership and charging station infrastructure.
2. Utilities should create an optional EV Time-of-Use ("TOU") tariff and standardize tariffs for residential and commercial EV connections.
3. Commissions should establish a competitive framework between Electric Vehicle Service Equipment ("EVSE"), third-party providers, and utilities.
4. Tariffs that mitigate or defer demand charges would foster initial EVSE infrastructure build-out.
5. Utilities and commissions must create known and achievable metering requirements for EV customers.
6. Commissions ought to encourage a discussion of the EV market in investor-owned electric utilities ("IOU") transmission and resource planning proceedings, including those related to grid modernization.

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[18] *See generally Benefits and Considerations of Electricity as a Vehicle Fuel*, U.S. DEP'T OF ENERGY, http://www.afdc.energy.gov/fuels/electricity_benefits.html [http://perma.cc/6UVP-NPQF] (last updated Jan. 2, 2015).

[19] The state agencies tasked with regulation of retail power.

[20] The term "utilities" as used in this Article refers to those electric utilities regulated by state commissions. This Article does not touch on the myriad of utilities, including rural electric cooperatives, that may not be under the jurisdiction of the state agencies.

7. The public would benefit from investigations of EVSE charging infrastructure strategies to synergize planning with departments of transportation ("DOT") efforts and to determine how to deploy EVSE charging in a manner that maximizes ratepayer benefits and encourages competition among providers.

This Article begins by describing the general categories that the Federal government and states are addressing to increase EV adoption. Secondly, we discuss threshold legal questions that commissions have faced or will soon face as EV markets grow. Third, we discuss issues relative to customer metering and the development of EVSE infrastructure. Finally, we discuss next steps.

I. THE CURRENT STATUS OF EV REGULATION BY THE STATES

A broad array of state statutes and regulatory oversight affect EV deployment. Forty-eight states have laws or regulations in place that implicate EV market barriers.[21] Many address financial incentives for EVs, such as tax credits or other grants.[22] Multiple states require that a specified percentage of state vehicle acquisitions be alternative fuel vehicles, including: electric, hydrogen, or natural gas powered.[23]

Though they reflect a potential boon to utility sales, EVs are not without industry concerns. The major challenge posed by EVs is the requirements for infrastructure to power and recharge load that travels in all directions from their owners' premises and between utility service

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[21] *All Laws and Incentives*, *supra* note 4.

[22] *See, e.g.*, AZ. REV. STAT. §§ 43-1090, 43-1176 (Arizona provides a tax credit of up to $75 for installation of an EV charging system in one's home); CAL. HEALTH & SAFETY CODE § 44274 (The Clean Vehicle Rebate Project in California offers rebates of up to $5,000 for the purchase or lease of qualified EVs); *see also Clean Vehicle Rebate Project*, ENERGY CENTER, http://energycenter.org/clean-vehicle-rebate-project [http://perma.cc/2JUT-PFLE] (last visited Jan. 22, 2016).

[23] *See, e.g.*, Az. Exec. Order No. 2010-14 (2010); AZ. REV. STAT. §§ 41-803, 49-573; Del. Exec. Order No. 2010-14 (2010) (light-duty vehicles purchased by the state must be hybrid electric, alternative fuel, fuel-efficient, or low emission vehicles); Ill. Exec. Order No. 11 (2009); IND. CODE ANN. § 5-22-5-8.5 (2009); IOWA CODE §§ 8A.362, 216B.3, 260C.19A, 262.25A, 307.21 & 904.312A; KY. REV. STAT. § 45A.625; LA. REV. STAT. ANN. §§ 33:1418, 39:364; Mass. Gen. Laws Ch. 7, § 9A; Mass. Exec. Order No. 388 (1996); MASS. EXEC. OFFICE OF ADMIN. & FINANCE ADMIN., Bulletin 10 (2010).

areas.[24] EV deployment may require on-site upgrades at customer premises for faster charging or new applications involving metering.[25] Further, EVs have complicating considerations, including the times and speed of charging that may affect electric demand.[26] At this point, research has not been sufficiently developed to draw universal conclusions about the impact of EVs on the distribution grid, characteristics of human behavior in charging, or optimal places of charging.

To achieve widespread adoption, fueling an EV will eventually need to be similar in ease to fueling a gasoline-powered vehicle. This accomplishment will not happen in a vacuum. Governments must plan for EV presence on their roads, and that necessarily will involve joint efforts of utilities, DOTs, drivers, and local governments, among other stakeholders. For example, rest stops along state-regulated highways could support EVSE.[27] Areas of state involvement may also include facilitating public access to EVSE infrastructure, for example making charging infrastructure available in commercial districts.[28] Other areas of state involvement include workplace charging, parking, building codes, and common interest communities.[29] Of

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[24] *See generally* U.S. DEP'T OF ENERGY, EVALUATING ELECTRIC VEHICLE CHARGING IMPACTS AND CUSTOMER CHARGING BEHAVIORS—EXPERIENCES FROM SIX SMART GRID INVESTMENT GRANT PROJECTS (Dec. 2010) [hereinafter EV CHARGING IMPACTS], *available at* http://www.energy.gov/sites/prod/files/2014/12/f19/SGIG-EvaluatingEVcharging-Dec2014.pdf [http://perma.cc/232X-M4WN].

[25] *See generally* ROLAND BERGER STRAT. CONSULTANTS, ELECTRIC VEHICLES IN AMERICA: THE QUESTION IS NO LONGER "WHETHER" THEY WILL COME, BUT "HOW FAST" AND "WHERE FIRST" (2010), *available at* http://www.rmi.org/Content/Files/Electric%20Vehicles%20in%20America.pdf [http://perma.cc/95EW-CP7A].

[26] EV CHARGING IMPACTS, *supra* note 24.

[27] *See, e.g.*, 220 ILL. COMP. STAT. §§ 5/16-128A, 5/3-105, & 5/16-102 (The Illinois State Toll Highway Authority must construct and maintain at least one EVSE along toll highways where it has entered into an agreement to provide motor fuel service stations and facilities, garages, stores, or restaurants. Fees may be charged for using these stations.); *see also* ILL. COMMERCE COMM'N, *Electric Vehicle Station Installation/Recertification*, http://www.icc.illinois.gov/electricity/EVCStationInstallerCert.aspx [https://perma.cc/2MR8-78NJ] (accessed by running the url through https://archive.org/web/("WayBack Machine")).

[28] WIS. STAT. § 93.07(26) (the Wisconsin Department of Agriculture, Trade and Consumer Protection must establish and maintain alternative fueling infrastructure at public retail outlets).

[29] *See, e.g.*, COLO. REV. STAT. § 38-33.3-106.8 (common interest communities must permit residents an opportunity to charge PEVs and not create prohibitions around the same); COLO. REV. STAT. § 38-12-601 (landlords also may not prohibit tenants from installing Level 1 or Level 2 EV charging systems at their own expense on or in leased premises); OR. REV. STAT. § 94.550 (discourages HOAs from prohibiting installation of EVSE by mandating that they approve an application for installation of a homeowner within sixty days unless "a reasonable request for additional information" is made and by statutorily placing

course, not all policies are friendly to industry.[30] A handful of states impose an excise tax on EVs.[31]

A crucial recommendation for regulators is to leverage this period of lower EV market penetration to develop a knowledge base to inform future policy decisions. Though each state will differ in its level of support for the EV industry, all states will face questions of EV integration into its transportation and electric grid systems because EVs are being sold in all jurisdictions, and EV owners will travel across all jurisdictions.[32] Looking at states that have begun to address EV issues at the regulatory level, there are discernable threshold topics to consider.[33] Chief among the emerging best practices for state utility commissions (with respect to economic regulation of utilities) are utility rate design and utility infrastructure development, as well as defining baseline information gathering and consumer education roles for utilities.[34]

II. ELECTRIC REGULATORY CONSIDERATIONS AFFECTING EV DEPLOYMENT

Common issues have arisen in early state proceedings established to consider implications of EV deployment, including: (1) how to address

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liability on the owner for all costs, including any cost of damage to common property); MD. ELECTRIC VEHICLE INFRASTRUCTURE COUNCIL ("EVIC"), EVIC INTERIM REPORT 7 (Jan. 1, 2014) (recommending that the state amend its mandatory building standard to require a percentage of parking in new and multi-family developments to be EV-chargeable); CAL. CIV. CODE § 1353.9 (prohibiting unreasonable restrictions on the installation or use of EVSE in any instruments affecting the sale or transfer in a common interest development).

[30] HAW. REV. STAT. § 196-7.5 (HOAs and cooperatives require approval of EV charging systems placed in common areas of multi-family dwellings, and may impose restrictions thereon (except they cannot charge a fee)); N.C. GEN. STAT. § 136-18.02 (DOT may install EVSE, but EV users must pay maintenance and construction costs).

[31] In Arkansas, West Virginia, and Pennsylvania, excise taxes on AFVs are imposed on a gasoline gallon equivalent basis. ARK. CODE ANN. § 26-62-101; W.V. CODE § 111-14C-2, -5, -6a, -13a, and -18b; Penn, Stat. Ch. 90, § 9004. In New Mexico and Missouri, AFVs are taxed once annually according to gross vehicle weight. N.M. STAT. § 7-16B-1 through 7-16B-10 (for example, $100 for vehicles between 6,001 to 16,000 lbs.); MO. REV. STAT. §§ 142.803, 142.869 (passenger vehicles less than 18,000 lbs. are $75 annually).

[32] *See, e.g.*, Jessica Caldwell, *Drive by Numbers—Tesla in all 50 states*, EDMUNDS.COM (Jan. 29, 2014), http://www.edmunds.com/industry-center/analysis/drive-by-numbers-tesla-in-all-50-states.html [http://perma.cc/CML5-KQWW].

[33] CTR. FOR CLIMATE AND ENERGY SOLUTIONS, AN ACTION PLAN TO INTEGRATE PLUG-IN ELECTRIC VEHICLES WITH THE U.S. ELECTRICAL GRID 35 (2014) [hereinafter EV Action Plan], *available at* http://www.c2es.org/docUploads/PEV-action-plan.pdf [http://perma.cc/JPR8-D4A3].

[34] *Id.*

EV charging within the context of public utility law, (2) utility rates and bill impacts, (3) utility marketing and customer education, and (4) infrastructure investment.[35] The California Public Utilities Commission ("CalPUC") has been the most active in this area. The agency is amidst a multi-faceted, years-long rulemaking process directed via statute "to ensure that investor-owned electric utilities are prepared for and support the projected statement market growth of plugin hybrid and electric vehicles."[36] The clear statement by the California legislature to incentivize EV adoption has helped to frame the issues for decision-making.[37]

But, California is not alone in this regard. In Minnesota, the major utilities received Commission approval to create residential EV rates, which rate offerings were required by Minn. Stat. § 216B.1614.[38] Other commissions have taken initial action. The New York Public Service Commission ("PSC")asserted jurisdiction over public EVSE stations.[39] The Arizona Corporation Commission is monitoring an experimental EV rate schedule offered by Arizona Public Service Company ("APS").[40] The Rhode Island Office of Energy Resources, just this past June, reported to the legislature on issues affecting EVs in order to facilitate and to prepare for "large-scale [EV] adoption in a manner that provides consumer and environmental benefits to the maximum extent possible."[41] Some commissions,

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[35] *See* ECOTALITY NORTH AMERICA, LESSONS LEARNED—THE EV PROJECT: REGULATORY ISSUES AND UTILITY EV RATES (Mar. 14, 2013), *available at* http://avt.inl.gov/pdf/EVProj/103425-835189.ri-2.pdf [http://perma.cc/PES4-SD9Z]; ENERGENTICS INCORPORATED, COMPILATION OF UTILITY COMMISSION INITIATIVES RELATED TO PLUG-IN ELECTRIC VEHICLES AND ELECTRIC VEHICLES SUPPLY EQUIPMENT 1–2 (Apr. 2013) [hereinafter COMPILATION PAPER], *available at* http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B222AFF10-78CC-42D4-A6FD-23422DEC4270%7D [http://perma.cc/4NWD-JFQ5].

[36] PUBLIC UTILS. COMM'N, RULEMAKING 09-08-009: PHASE 2 DECISION ESTABLISHING POLICIES TO OVERCOME BARRIERS TO ELECTRIC VEHICLE DEPLOYMENT AND COMPLYING WITH PUBLIC UTILITIES CODE SECTION 740.2 49-50 (July 14, 2011) [hereinafter PHASE 2 DECISION], *available at* http://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/139969.PDF [http://perma.cc/MMA2-7GLB]; *see also* Cal. Public Utils. Comm'n, Rulemaking 13-11-1007, Order Instituting Rulemaking (Nov. 14, 2013).

[37] *Id.*

[38] *In re* Electric Vehicle Charging Tariffs, Docket Nos. E002/M-15-111, E017/M-15-112, E015/M-15-120, E001/M-15-200, MINN. PUBLIC UTILS. COMM'N (June 22, 2015) (Order Approving Tariffs and Requiring Filings).

[39] *In re* Electric Vehicles Policies, Case 13_E_0199, N.Y. PUB. SER. COMM'N (Nov. 22, 2013).

[40] *In re* Arizona Public Service Company's Application for Approval of Proposed Electric Vehicle Readiness Demonstration Project, Docket No. E-01345A-10-0123, AZ. CORP. COMM'N (Sept. 15, 2011).

[41] RI H.B. Res. 7726 (2013); STATE OF RHODE ISLAND OFFICE OF ENERGY RES., RHODE ISLAND OFFICE OF ENERGY RESOURCES HOUSE RESOLUTION REPORT: ADDRESSING REGULATORY ISSUES AFFECTING ELECTRIC VEHICLES (June 2015), [hereinafter RI House Resolution

however, have halted investigations into the EV market pending further market growth.[42]

Yet, EV considerations present relevant issues for all commissions that are worth the investment of commission resources even in the absence of large market growth.[43] Areas to investigate for potential future EV impacts include utility revenue requirements, resource and load-balance planning, and transmission and distribution ("T&D") planning.[44] As a source of new load, the scope of potential growth for utilities represented by widespread adoption of EV technology is reminiscent of air conditioners.[45] As adoption became widespread, air conditioners caused massive load growth, and in particular peak load growth, which greatly affects utility resource planning, DSM efforts, demand response, and rates and revenue.[46] Regulators should be prepared to analyze these same types of impacts on utility revenues and operations potentially caused by EV market growth.

In the resource planning context, growth in EV deployment will not only factor in load balance projections, but also EVs' potential synergy with renewable energy deployment, demand response, and storage that may increase system efficiency. The last decade has included a growing percentage of new U.S. and Canadian grid-connected resources fueled by renewable energy sources, chiefly wind and solar facilities.[47]

Report] *available at* http://www.energy.ri.gov/documents/Transportation/House%20Resolution%20Report.pdf [http://perma.cc/HGV6-5RAP] (last visited Jan. 22, 2016).

[42] *See, e.g.*, Investigation of Issues Related to Energy Operated Vehicles, Decision No. C13-0132, Docket No. 11I-704EG Colo. PUB. UTIL. COMM'N (Jan. 29, 2013); Alternative Fuel Vehicles Forum on PUC Jurisdictional Issues, Docket No. M-2012-2287224, PA. PUB. UTIL. COMM'N. Several other states, including Illinois, Maryland, and Michigan have convened advisory councils for the purpose of investigating grid impacts and promoting charging infrastructure and deployment of EVs.

[43] EV Action Plan, *supra* note 33.

[44] *See generally* RICK PRATT, PACIFIC NORTHWEST NAT'L LAB., PEV/GRID INTEGRATION STUDY *available at* http://energy.gov/sites/prod/files/2015/07/f24/vss142_pratt_2015_p.pdf [http://perma.cc/HA6T-WUF2].

[45] *See generally* N.Y. STATE ENERGY RESEARCH & DEV. AUTH., ELECTRICITY PRICING STRATEGIES TO REDUCE GRID IMPACTS FROM PLUG-IN ELECTRIC VEHICLE CHARGING IN NEW YORK STATE 100 (June 2015) (stating that "approval of an off-peak PEV charging rebate program would be analogous to approval of other load control programs").

[46] *See* N.Y. INDEP. SYS. OPERATOR, POWER TRENDS 2014 EVOLUTIONS OF THE GRID (2014), *available at* http://www.nyiso.com/public/webdocs/media_room/publications_presentations/Power_Trends/Power_Trends/ptrends_2014_final_jun2014_final.pdf [http://perma.cc/TM9X-J3SW].

[47] *See generally* AM. COUNCIL ON RENEWABLE ENERGY ("ACORE"), THE OUTLOOK FOR RENEWABLE ENERGY IN AMERICA (2014), *available at* http://www.acore.org/files/pdfs/ACORE_Outlook_for_RE_2014.pdf [http://perma.cc/ZGQ2-ADUC] (outlining benefits from new clean energy producing technology).

Colorado, for example, has installed over 2 GW of wind energy since 2006,[48] and currently ranks 9th nationally for its installed solar capacity of 430 MW.[49] Texas leads the nation in wind production.[50]

Wind and solar resources with variable electric generation have patterns of strongest generation in the mid-afternoon (solar) and at night (wind).[51] However, utilities are often unable to take all available wind resources due to minimum loading constraints during the night.[52] This can cause curtailment payments to generators.[53] Regulators and utilities can incentivize EV charging around renewable resources by incorporating policies that encourage charging to occur coincident with renewable energy production. This would leverage the most productive generation pattern for renewable resources and provide a basis for further investment. On the other hand, if EV charging occurs mostly at peak demand hours, then market growth may cause inadequate resource availability, resulting in negative customer impacts.[54]

Whether to incentivize EV adoption depends upon valuation of its benefits to society and the relative cost to ratepayers. As with other distributed generation electric policy considerations (e.g., demand-side management) EV policies will affect both participants and non-participants in the market. Regulatory approaches may foster market development to reduce the impacts of non-participation. In addition, care must be taken to identify and to balance ratepayer impacts with ratepayer and societal benefits. In situations where non-participation is a factor, along with policy rate impacts, commissions often rely on the California Standard Practice Manual's cost-benefit tests.[55]

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[48] *Wind at Work: Colorado*, WIND ENERGY FOUND., http://www.windenergyfoundation.org/wind-at-work/case-studies/colorado [http://perma.cc/T6DU-RE2Z] (last visited Jan. 22, 2016) (stating that wind power capacity in Colorado increased from 291 MW in 2006 to 2,332 MW in September 2014).

[49] *Colorado Solar*, SOLAR ENERGY INDUS. ASS'N, http://www.seia.org/state-solar-policy/colorado [http://perma.cc/V756-TAXW] (last visited Jan. 22, 2016).

[50] *Texas Wind Energy*, AM. WIND ENERGY ASS'N ("AWEA"), http://awea.files.cms-plus.com/FileDownloads/pdfs/texas.pdf [http://perma.cc/G9DN-RWYP] (last visited Jan. 22, 2016).

[51] Debra Lew et al., *Wind and Solar Curtailment Conference Paper*, NAT'L RENEWABLE ENERGY LAB. 1 (2013), http://www.nrel.gov/docs/fy13osti/60245.pdf [http://perma.cc/4MVJ-5W7T] (last visited Jan. 22, 2016).

[52] *Id.*

[53] *See* discussion *infra* Part C.

[54] Jake Seligman, Comment, *Electric Vehicles and Time-of-Use Rates: The Impending Role of the New York State Public Service Commission in Regulating Our Transportation Future*, 28 PACE ENV'T L. REV. 568, 573 (2011).

[55] *See, e.g.*, CALIFORNIA STANDARD PRACTICE MANUAL: ECONOMIC ANALYSIS OF DEMAND-SIDE PROGRAMS AND PROJECTS (Oct. 2001), *available at* http://www.cpuc.ca.gov/NR

The Societal Cost Test in particular may be useful to guide policy recommendations for utility spending on EV incentives, especially with benefits calculated for GHG and criteria pollutant emission reductions.[56] Generally utilized in the context of demand-side management, the Societal Cost Test asks whether a program or measure creates a net economic benefit to society—in which case the utility investment should be pursued—or net cost.[57] Using the Societal Cost Test involves a measurement of non-energy benefits, including reductions in emissions or improvements in other areas of the economy.[58] EV benefits, especially reduced emissions in the transportation sector, could be analyzed in such an evaluation.

A. Threshold Questions Affecting Utility Regulation

In adopting policies that address the EV marketplace, regulators have often faced threshold issues concerning regulation of EVs. This section of the Article discusses these threshold issues and provides the authors' opinions on the same.

1. Exemption from Definition of "Public Utility"

There are two issues related to whether one who operates an EVSE charging station is a public utility. The first concerns the definition of a public utility for purposes of state economic regulation, and the other concerns defining the transaction between a charging station owner from both the perspectives of the utility and the EV/ratepayer.

By way of brief background, public utilities generally are regulated monopolies within a service territory granted by operation of state law and regulated by state commissions.[59] While states regulate retail sales, wholesale electric transactions in interstate commerce are subject

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/rdonlyres/004ABF9D-027C-4BE1-9AE1-CE56ADF8DADC/0/CPUC_STANDARD_PRACTICE_MANUAL.pdf [http://perma.cc/39KQ-Y3UB] (last visited Jan. 22, 2016).

[56] *Id.* at 18–19 ("A variant of the [Total Resource Cost] test is the Societal test. The Societal Test differs from the TRC test in that it includes the effects of externalities (*e.g.*, environmental, national security) . . ."). The Manual also discusses various examples of potential adders within the Societal Test, including adders for avoided environmental damage through reduced emissions; adders for avoided generation, distribution, and transmission costs; and certain non-energy benefits such as fuel diversity. These each could be considered in the benefits of EVs.

[57] *See id.*

[58] *Id.* at 19–21.

[59] *See* The Federal Power Act, 16 U.S.C. § 824(e).

to Federal Energy Regulatory Commission ("FERC") authority.[60] State commissions traditionally regulate as a public utility *any* entity selling electricity.[61] Because EV charging station owners sell electricity in a service territory of another monopoly utility as a business, it could be argued that EV charging station owners must acquire a certificate of public convenience and necessity ("CPCN") from a PUC and become subject to regulation as a public utility. This has the potential of being cost-prohibitive or legally impossible for third-party EVSE ownership, and therefore a barrier to competition and growth of EV charging infrastructure in new markets.

In order to address this market issue, states have enacted statutes to exempt EV charging stations from the definition of "public utility." For example, in Hawaii, the statutory definition "public utility" does not include: "Any person who owns, controls, operates, or manages plants or facilities primarily used to charge or discharge a vehicle battery that provides power for vehicle propulsion."[62] Similarly, Colorado, Florida, Illinois, Maryland, Minnesota, Utah, and Virginia exempt any entity that owns or operates a facility that supplies electricity for EVs.[63]

Alternatively, states have accomplished this through administrative rule. The CalPUC exempted charging station providers in its definition of public utility.[64] New York's PSC established via declaratory order that an EV charging station is not an electric plant, the owners and operators of which are "electric corporations" subject to the commission's jurisdiction.[65] Massachusetts and Oregon clarified through administrative interpretation that a charging service provider is not an electric utility that sells or distributes electricity.[66] Because a state has jurisdiction to grant

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[60] *What FERC Does*, FED. ENERGY REGULATORY COMM'N, *available at* http://www.ferc.gov/about/ferc-does.asp [http://perma.cc/SUX3-EKKY].
[61] *Id.*
[62] HAW. REV. STAT. § 269-1.
[63] COLO. REV. STAT. 40-1-101-104; FLA. STAT. § 366.94; 220 ILL. COMP. STAT. 5/3-105; 20 ILL. COMP. STAT. 627/10 (also applies to sellers of compressed natural gas for alternative fuel vehicles); MINN. STAT. § 216B.02 (same); MD. CODE ANN. § 10-101(a)) & MD CODE ANN., PUB. UTIL. COS. § 1-101(j)) (electric vehicle supply equipment owners and operators are deemed retail customers); H.B. 19, 2014, and UTAH CODE ANN. 54-2-1; VA. CODE ANN. 56-1.2, 56-232.2:1.
[64] CAL. PUB. UTILS. CODE § 216.
[65] *In re* Electric Vehicles Policies, *supra* note 39.
[66] Order on Department Jurisdiction Over Electric Vehicles, the Role of Distribution Companies in Electric Vehicle Charging and Other Matters, D.P.U. 13-182-A, MASS.DEP'T OF PUBLIC UTILS. 8–9 (Aug. 4, 2014) [hereinafter D.P.U. 13-182-A, Aug. 4 Order]; Oregon Public Utils. Comm'n Order 12-13, Docket No. UM 1461 (Jan. 19, 2012) [hereinafter Oregon Order 12-13].

a monopoly service territory to what it defines as a public utility,[67] either state statutes or electric regulations accomplish this aspect of charging station sales.

The second threshold question involves an analysis of EV charging sales as a market transaction as distinguishable from the traditional electric regulatory framework.[68] Some commentators have argued that because the regulation of wholesale sales of electricity is squarely within the authority of the FERC, charging stations purchasing electricity for resale to EVs is *ipso facto* a wholesale transaction.[69] By this logic, FERC jurisdiction will defeat state regulations and approvals of utility charging station tariffs unless FERC's empowering statute, the Federal Power Act, 16 U.S.C. § 824 et seq,. is amended. This argument may even apply where a state assembly or PUC finds that an EV provider charges for equipment use rather than the resale of electricity on its own.[70] This argument is based on the traditional concept of wholesale transactions.

FERC jurisdiction in the EVSE context, however, should depend upon the interpretation of sale for resale *as applied to moving vehicles* and their necessity for travel. A car must move, and a car must refuel when the tank is empty. This presents a different twist than previous consideration of the subject. Because necessity will require charging stations to be placed in public spaces in a manner comparable to gas station infrastructure, so long as there is some mechanism to control those rates, it may be done at either the PUC or FERC level.

The framework governing the exclusive yet concurrent jurisdiction of FERC and state PUCs on tariffs is established in a manner that is subjective in the following respect: FERC retains exclusive jurisdiction over the "transmission of electric energy in interstate commerce" and the "sale of electric energy at wholesale in interstate commerce," while states have exclusive jurisdiction over "any other sale of electric energy" and "facilities used in local distribution."[71]

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[67] *See generally* THE REGULATORY ASSISTANCE PROJECT, ELECTRICITY REGULATION IN THE U.S.: A GUIDE 9, 11 (March 2011) [hereinafter RAP GUIDE].

[68] States have punted on ths issue to date. *See, e.g.*, Oregon Order 12-13, *supra* note 66, at 5 (not addressing whether FERC may exert jurisdiction over EVSP).

[69] Brandon Hofmeister, *Electric Vehicle Charging Infrastructure: Navigating Choices Regarding Regulation, Subsidy, and Competition in a Complex Regulatory Environment*, 5 GEO. WASH. J. ENERGY & ENVTL. L. 42, 70 (2014).

[70] *Id*.

[71] *See* Calpine Corp. v. FERC, 702 F.3d 41, 43 (D.C. Cir. 2012); Southern Cal. Edison Co. v. FERC, 603 F.3d 996, 999 (D.C. Cir. 2010) ("Unless a transaction falls squarely within FERC's wholesale or transmission authority, it doesn't matter how FERC characterizes it").

The nature of EVs does not comport with the exclusive jurisdiction of the FERC. EVSE stations may be characterized as distribution-level infrastructure that service local loads which fluctuate based on EVs present and that may be required to serve load that is "native" to another utility's service area. EVSE tariffs exist to serve residential customers that require demand even when they leave home.

Other components of EVSE public charging stations differ widely from other traditional retail or wholesale transactions. First, some EVSE stations will only be allowed to purchase at retail rates and sell at a premium.[72] Ideally, however, there should be a mechanism to allow EVSE charging to occur at the customer's residential rate (or to remotely be charged even on their home bill regardless of where the vehicle is charged).

Secondly, the manner of the sale is new. Customers traveling anywhere and everywhere must *voluntarily* elect a charging station to power their vehicle load. In other words, a ratepayer must consent to pay a premium in order to charge a load subject to residential tariffs (when plugged in at home) or to a third-party meter (when traveling). As a result, there will be multiple rates paid by one customer for his or her EV load. The number and location of charging, however, are in the customer's control, and EVSE infrastructure is a public good to accommodate that movement.

EVSE equipment is a societal necessity everywhere vehicles drive. While EVSE rates may be purchased at wholesale and sold at retail, the transaction clearly covers distribution-level retail load using particular equipment that operates via a transaction that has wholesale elements—i.e., sale for resale—but also retail and distribution-system elements. This combination of characteristics brought on by the necessity to accommodate travel complicates the pure wholesale argument that would be required for FERC jurisdiction. As a result, EVSE rate oversight properly falls within the catch-all category of state regulation, allowing individual state PUCs and PSCs oversight over EVSE tariffs.

States that desire to see public charging stations with third-party competition should consider this question in the context of establishing a distribution-level tariff scheme to serve a public need. This policy may assist states in determining how EV infrastructure should be deployed and clarify the relationship between the utility and the charging provider. For example, because public utility regulation exemptions will enable charging service providers to set rates based on electricity used rather than a

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[72] Based on conversations between the author and EVSE company executives, several utility tariffs currently charge EVSEs at the applicable tariffed retail rate.

flat rate, regulators may require that utilities and EVSE stations provide cost signals to EV ratepayers concerning time-of-use and its resultant impacts on the electric system and demand. This is further discussed below.

2. Meter Issues

a. Single, Separate, or Submetering

As charging infrastructure is built out, interested stakeholders must partner with utilities and regulators to make EV charging easy to understand, available, and affordable. This is a societal-level learning exercise—how will EV owners tend to operate? This issue is critical to economic regulation because of the utilities' role as a power provider and their ability to disseminate widespread essential information to its ratepayer base about EV connections.[73] To compare again to air conditioners, utilities and regulators have developed robust knowledge of how and when the systems are used by their owners, which has greatly informed generation dispatch and resource planning.[74] Further, incentive rollout and rate design development will be hampered without a strong understanding of charging needs for consumers, utilities, and regulators.

The threshold question for electric policy regulation here is what metering scheme(s) may enable EV growth? If EV users are to follow pricing signals while charging either at home or on the road, how will utilities meter that energy? Will EV users be required to install separate meters? If states impose EV rates, should utilities track energy used for EVs versus for other purposes?

In its rulemaking, the CalPUC has considered metering options in the EV context, specifically: (1) single metering, (2) separate metering, and (3) submetering.[75] Single metering entails billing EV load as part of the customer's entire load, as measured by one pre-existing meter.[76] Separate metering requires an additional meter dedicated to measuring EV load, and thus allowing EV load to be billed separately from a customer's non-EV load.[77] Finally, submetering requires a separate meter dedicated to tracking EV load, but located on the customer's side and connected to the primary meter, rather than requiring a second primary meter.[78]

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[73] *See generally id.*
[74] *See id.* at 51.
[75] PHASE 2 DECISION, *supra* note 36, at 32.
[76] *Id.*
[77] *Id.*
[78] *Id.* at 32–33.

CalPUC Staff initially recommended that the Commission encourage single metering in the short term until submetering becomes more functional, but the Commission demurred to encourage any single technology.[79] The CalPUC also required regulated utilities to collaborate to craft a submetering protocol to "enable manufacturers and customers to be sure that the meters, whether purchased separately or included in the vehicle or as electric vehicle service equipment, are compatible with the utility billing and communication system."[80] The protocol was to be developed through a working group of utilities, Commission Staff, the Department of Food and Agriculture, automakers, and EVSE providers, and was intended to "incorporate emerging technologies and encourage innovation."[81]

The submetering protocol process resulted in a proposal by Commission Staff recommending two pilots, one each for: (1) single customer sites and (2) multiple customer/multi-dwelling and commercial units and mobile submeters.[82] During Phase 4 of its rulemaking, the CalPUC approved the two-phase pilot approach and gave additional guidance to the utilities on how to implement submetering pilots, for example capping each utility at 500 submeters per pilot.[83] Utilities were required to implement Phase 1 pilots by May 1, 2014, and Phase 2 pilots by May 1, 2015.[84] Recognizing that the two-phase pilots are instrumental to developing a sound submetering protocol, the CalPUC extended its deadline for a final submetering protocol report to February 1, 2016, at which point it will evaluate whether to require tariff sheets.[85] Accordingly, these ongoing pilots will produce useful information on implementation of submetering for single and multiple customers. To date, California customers have preferred the single, whole-house time of use ("TOU") meter.[86]

In Minnesota, consistent with Minn. Stat. 216B.1614, which requires utilities to offer a tariff that allows customers to purchase electricity

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[79] *Id.* at 36–37.
[80] *Id.* at 41–42.
[81] PHASE 2 DECISION, *supra* note 36, at 42, 44.
[82] Decision Modifying the Requirements for Development of Plug-In Electric Vehicle Submetering Protocol, Decision No. 13-11-002, R.09-08-009, CAL. PUB. UTILS. COMM'N 4, 15 (Nov. 14, 2013).
[83] *Id.* at 17–18, 25.
[84] *Id.* at 25.
[85] *Id.* at 44.
[86] Of Southern California Edison ("SCE") and San Diego Gas & Electric ("SDG&E") customers on an EV rate, ninety-two percent use whole-house TOU meters. SDG&E, 2014 JOINT IOU ELECTRIC VEHICLE LOAD RESEARCH REPORT, *available at* http://docs.cpuc.ca.gov/publisheddocs/efile/G000/M143/K954/143954294.pdf [https://perma.cc/XM86-WWT8] (last visited Jan. 22, 2016).

solely for charging an EV, the major utilities—Northern States Power, Minnesota Power, and Otter Tail Power Company—have received commission approval of their Residential EV Rates.[87] The utilities' tariffs vary with respect to treatment of a meter. NSP requires that all residential electric vehicle service be separately metered, and provides that the requirement may be satisfied by a submeter.[88] In contrast, Minnesota Power requires only a separate meter, without discussing submeters.[89] Otter Tail's tariffs reference only the use of Company-supplied metering and control equipment.[90]

b. Ownership of Meters

A secondary issue regarding meters concerns who is deemed to own the meter. The CalPUC reasoned that single and separate primary meters occur on the utility's side of the "customer-utility boundary" and thus are utility owned.[91] The Commission reasoned that the "customer-utility boundary . . . has generally been defined in the single-meter setting. The meter that is used to measure a customer's billable usage and the equipment on the utility's side of the meter is owned by the utility, while equipment located on the customer's side of the meter is owned by the customer."[92] The Commission left open to future examination whether customer ownership of a separate meter might be appropriate with technological advances.

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[87] Minn. Public Utils. Comm'n Order Approving Tariffs and Requiring Filings, Docket Nos. E-002/M-15-111, E-017/M-15-112, E-015/M-15-120, E-001/M-15-200 (June 22, 2015). By this same decision, the commission did not approve Interstate Power and Light Company's petition for approval of its EV tariff, as IPL sold its Minnesota electric distribution system in June 2015.

[88] NSP TARIFF, MINNESOTA ELECTRIC RATE BOOK—MPUC NO. 2, 14TH REVISED SHEET NO. 6 ("Metering may be installed as a sub-meter behind the customer's main meter, in which case consumption under this rate schedule will be subtracted from the main meter for purposes of billing customer's non-Electric Vehicle electricity usage.").

[89] MINNESOTA POWER ELECTRIC RATE BOOK—VOLUME 1, Original Section V, 8.1, *available at* http://www.mnpower.com/Customerservice/RateBook [http://perma.cc/L44N-8577].

[90] *Otter Tail Electric Rate Schedule*, OFF-PEAK ELECTRIC VEHICLE RIDER 3, *available at* https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7B301630C0-DAF4-458C-BA42-B1C5E331B82D%7D&documentTitle=20156-111917-01 [https://perma.cc/QT7D-7HYA].

[91] PHASE 2 DECISION, *supra* note 36, at 40.

[92] *Id.* at 38; *see also* Proposed Decision Modifying the Requirements for Development of Plug-In Electric Vehicle Submetering Protocol, R.09-08-009, 22 (Oct. 1, 2013) ("maintain the decision . . . regarding utility ownership of single and separate EV metering and customer ownership of submeters.").

For most state regulatory agencies, this rationale will result in utility ownership of primary meters. However, state commissions may view utility ownership of submeters differently. Consistent with its understanding of the customer-utility boundary, the CalPUC found that ownership of submeters, located on the customer's property, properly belonged with the customer. Although CalPUC considered potential benefits of utility ownership of submeters, which included "increased access and oversight of submeters, efficiency, and permitting access to the submeter market," CalPUC still found that the benefits of customer-ownership outweighed the benefit of utility ownership.

3. Utility Information Gathering

Consistent with the threshold questions of metering EVs and promoting EV adoption, a corollary issue is information sharing and privacy. Utilities benefit from sharing basic knowledge of where EVs are located and how they are being charged in order to plan for and incorporate EVs into system planning, distribution upgrades, and metering. This aids planning and load serving. However, access to and sharing of such knowledge must be balanced with consideration for consumer privacy.

Vehicle registration rules for EVs vary, but the information gathered by state and local jurisdictions is being leveraged in some utilities' planning efforts. Several states require that alternative fuel vehicles ("AFV") owners report whether their vehicles are AFV and what type.[93] AFV operators (including EVs) must pay registration fees in certain states.[94] They must also display special license plates or identification stickers in some states.[95] In California,[96] the department of motor vehicles

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[93] *See, e.g.*, NEB. REV. STAT. §§ 60-306, 60-3,191; REV. CODE OF WASH. § 46.17.323 (annual EV registration); N.C. GEN. STAT. § 20-87 (same); ORE. REV. STAT. §§ 803.415, 803.420 (biennial or annual EV registration); COL. REV. STAT. § 42-3-113 (type of AF); *see also* Ark. Code §§ 26-56-315, 26-62-214 (all converted AFVs must report within ten days of conversion).

[94] NEB. REV. STAT. §§ 60-306, 60-3,191 ($75); N.C. GEN. STAT. § 20-87 ($100); OR. REV. STAT. §§ 803.415, 803.420 (PEVs and HEVs register biennially for $43 per year); VA. CODE ANN. §§ 58.1-2217, 58.1-2249 (AFVs pay $64 annual license tax and EVs pay additional $50 annual license tax); WASH. REV. CODE ANN. § 46.17.323 (EVs pay an annual vehicle registration renewal fee of $100).

[95] ARIZ. REV. STAT. ANN. §§ 28-2511, 38-538.03B (special license plate); IOWA CODE § 321.41 (special fuel ID sticker); R.I. GEN. LAWS § 31-3-101 (special license plate).

[96] CAL. VEH. CODE § 1808.23, *available at* https://www.dmv.ca.gov/portal/dmv/?1dmy&urile=wcm:path:/dmv_content_en/dmv/pubs/vctop/vc/d2/c1/a3/1808.23 [https://perma.cc/439A-7WH5].

may disclose to an electrical utility: (1) EV owner addresses, and (2) vehicle types. The CalPUC directed utilities to "collaborate with automakers and other stakeholders . . . to address a notification process through which utilities can identify where EV charging will likely occur on their systems and plan accordingly."[97]

Another important consideration with EV information gathering is creating and enforcing standards of operation for EVSE equipment. Minnesota requires at a minimum that EVSEs: (1) be useful for any make, model, or type of EV, (2) comply with state safety standards and standards set by the Society of Automotive Engineers, and (3) be capable of bi-directional charging.[98] Illinois also has established mandatory certification requirements for entities or individuals that install EVSE equipment.[99] Oklahoma requires that all AFV technicians, including those that operate on EVs and EVSEs, receive state-mandated certification.[100]

California goes a step further and requires that EVSE service providers: (1) not charge a subscription fee for use of public charging stations, (2) disclose the actual charges for EVSE use at the point of sale, (3) accept at least two forms of payment, and (4) disclose to the National Renewable Energy Laboratory the EVSE location(s), fee schedule, accepted methods of payment, and roaming charges.[101]

4. Customer Education

Because EV technology is novel for customers raised on gasoline, the utility role in the promotion and education of its customer base on EV benefits is considered by the EV industry to be critical to overcome the barriers caused by 100 years of a gasoline-based transportation sector.[102] Through marketing and education, various market players (including vehicle dealers, charging providers, and utilities) can and should be a

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[97] PHASE 2 DECISION, *supra* note 36, at 59.
[98] MINN. STAT. §§ 325F.185, 326B.35 (2015).
[99] 220 ILL. COMP. STAT. 5/16-128A; 5/3-105; 5/16-102 (2013).
[100] OKLA. STAT. §§ 74-130.11 through 74-130.24 (2015).
[101] CAL. HEALTH & SAFETY CODE §§ 44268, 44268.2, *available at* http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=44001-45000&file=44268-44268.2 [http://perma.cc/H7WD-HK5Z].
[102] *See Feasability and Implications of Electric Vehicle (EV) Development and Infrastructure Development*, U.S. DEP'T OF TRANSP., http://www.fhwa.dot.gov/environment/climate_change/mitigation/publications_and_tools/ev_deployment/fhwahep15021.pdf [http://perma.cc/R8JT-N27A] ("Utilities . . . play a role beyond vehicle dealerships as a source of information on PEVs.").

driving force to disseminate information about EV options and the cost-benefit analysis in making a decision to purchase the same. Utilities are in a unique position to leverage their customer contact points, customer information, and role as an electric information provider to benefit EV market growth, which in turn may benefit their bottom line.

Several states have recognized the need to provide consumers information regarding EV deployment. The CalPUC rulemaking defined the role that utilities may play in education and outreach related to EVs.[103] The Commission specified that "customers should be aware of availability, cost, and environmental impact of [EVs] and available metering options, rate plans, and charging options," and noted that "proactive and targeted customer education" is necessary, including on load management communications.[104] However, the cost of marketing efforts was to be limited to "target customers with an interest in EVs" and done in a competitively neutral manner.[105] The Illinois Electric Vehicle Advisory Council ("EVAC") recommended a concerted effort by government, auto manufacturers and dealers, electricity providers, EVSE providers, environmental and public interest groups, public safety organizations, and educational institutions to inform the public about EV options, benefits, and safety.[106]

The Colorado Energy Office published a study on barriers to adoption in which it noted that the informational divide runs both ways—consumers lacking information on available credits or incentives, as well as a disconnect between EV adoption and the location of charging stations.[107] Currently, few states mandate utilities to disseminate information to EV owners or potential owners. In Arizona, motor vehicle dealers must make information about AFVs and Arizona-based incentives for purchasing or leasing AFVs available to the public, including EVs.[108] The California Energy Commission in partnership with the CalPUC is responsible for maintaining a website with EV consumer resources, including utility rate

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[103] PHASE 2 DECISION, *supra* note 36, at 65.
[104] *Id.*
[105] *Id.*
[106] ILLINOIS ELECTRIC VEHICLE ADVISORY COUNCIL FINAL REPORT 19–21 (Dec. 30, 2011), *available at* https://www.illinois.gov/dceo/AboutDCEO/ReportsRequiredByStatute/20111230EVACFinalReport.pdf [https://perma.cc/3395-FY2P].
[107] COLO. ENERGY OFFICE, ELECTRIC VEHICLE MARKET IMPLEMENTATION STUDY 54–55 (2015), *available at* http://www.refuelcolorado.com/market-developments/colorado-electric-vehicle-market-implementation-study [http://perma.cc/6ZF4-82KF].
[108] ARIZ. REV. STAT. ANN. § 28-4414.

options, charging circuit requirements and upgrade information, and load management techniques.[109]

As with other disruptive technology to markets with the dramatic potential economic and environmental benefits, it is important that utilities be engaged in educating its consumer base and have an opportunity to share in the benefits of market growth. Utility support for EV policies should be focused initially on managing customer expectations and informing customers of the benefits of EV ownership not only in terms of climate change and renewable integration, but also in terms of charging economics versus conventional gasoline engines.

B. EV Rate Design

The majority of jurisdictions engaged in EV issues are focused on development and implementation of rate structures designed to encourage off-peak EV charging and associated metering.[110] State regulators are also implementing pilot tariffs to inform EV rate design.[111] To date, few utilities have offered rates targeted to EV owners. Of those that have, these generally fall into two categories: (1) whole-house TOU rates, and (2) separate meter or infrastructure plans. Many TOU rate-designs require a separate or smart meter for EV-specific charging.[112]

1. Ratemaking Principles

To understand the importance of rate design in the context of EVs, it is necessary to discuss foundational public utility ratemaking principles. When a regulated utility wants to change its rates, it must prove to the state commission that the components of its total costs of service and its costs of investment, or its "revenue requirement," are valid and that its resulting rate design is just and reasonable across all ratepayer classes.[113] The revenue requirement includes the utility's operating expenses and

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[109] CAL. PUB. RES. CODE § 25227.
[110] *See, e.g.*, D.P.U. 13-182-A, Aug. 4 Order, *supra* note 66, at 14; PHASE 2 DECISION, *supra* note 36.
[111] *See, e.g.*, Arizona Docket No. E-01345A-10-0123 (commission monitoring utility pilot rate). Colorado has completed an EV charging pilot contained within PSC's DSM program plan.
[112] *See Ass'n of Bay Area Gov'ts, Ready, Set, Charge, California! A Guide to EV-Ready Communities* 62–63 (May 27, 2011), *available at* http://www.evchargernews.com/miscfiles/EV_Ready_Communities_Document-FULL-V3_5.27.11.pdf [http://perma.cc/T9F9-VK2A].
[113] RAP GUIDE, *supra* note 67, at 31–32, 38.

the rate of return a utility may earn on its assets.[114] If the PUC approves the revenue requirement (generally in Phase I of a rate case), it determines what each class of customers must pay in rates to generate this sum (Phase II).[115]

Generally, customers within a rate class have similar demand profiles and usage types.[116] Although consumers within the same class of service should be subject to substantially similar rates, the PUC may establish different classifications of service, and different rates for each class, based upon reasoned distinctions.[117] Classifications that neither impinge on fundamental rights nor affect suspect classes are not unlawfully discriminatory unless they do not have a rational relationship to a legitimate governmental purpose in the context of utility regulation.[118]

In his standard text, *Principles of Public Utility Rates*, economist James Bonbright developed criteria for evaluating a sound rate structure which generally stresses clarity, fairness, efficiency, and stability.[119] Regulators faced with a potential EV class of customers, or charging station customers, will evaluate proposals under these established principles with attention to efficiency, feasibility, and fairness in application.[120] More information will assist the development of accurate predictions (a hallmark of rate design) related to EV load.[121] Regulators will need to verify models of revenue derived from an EV rate or to develop cost causation of an EV class in conjunction with the policy objectives behind a given

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[114] *Id.* at 38.
[115] RAP GUIDE, *supra* note 67, at 46–47.
[116] Seligman, *supra* note 54, at 579.
[117] *Id.*
[118] CF&I Steel, L.P. v. Pub. Utils. Comm'n, 949 P.2d 577, 584 (Colo. 1997); *see also* Montrose v. Pub. Utils Comm'n, 590 P.2d 502, 506 (Colo. 1979) ("Where all relevant costs are computed and attributed to the respective customers responsible for them, different rates would adequately and fairly reflect the differences in costs of service.").
[119] JAMES C. BONRIGHT ET AL., PRINCIPLES OF PUBLIC UTILITY RATES 291 (2d. ed. 1988). These criteria are as follows: (1) "[S]implicity, understandability, public acceptability, and feasibility of application;" (2) "Freedom from controversies as to interpretation;" (3) "Effectiveness in yielding total revenue requirements under the fair-return standard;" (4) "Revenue stability from year to year;" (5) "Stability of the rates themselves, with a minimum of unexpected changes seriously adverse to existing customers;" (6) "Fairness of the specific rates in the apportionment of total cost of service among the different consumers;" (7) "Avoidance of "undue discrimination" in rate relationships;" and (8) "Efficiency of rate classes and rate blocks in discouraging wasteful use of service while promoting all justified types and amounts of use."
[120] *Id.*
[121] Seligman, *supra* note 54, at 582.

rate. Finally, cost-effectiveness evaluations may determine the benefits of a given rate design versus the costs to all ratepayers.

The gradual adoption curve of EVs leaves utilities and stakeholders in a position to adopt rate designs that test these questions of rate design when EVs do not represent a significant percentage of load growth or revenue.[122] As discussed in the next section, TOU rates are an effective tool to differentiate and leverage the characteristics of EV load in a manner that satisfies economic principles of ratemaking.[123] The CalPUC concluded that "rates for [EV] residential separately metered customers should be opt-in, non-tiered, and [TOU]."[124]

C. Time-of-Use Rates Policy Justifications

A EV TOU rate provides participating customers with an incentive to refuel their electric vehicles during off-peak hours, saving customers money, and shifting electricity demand away from peak periods. Given that EVs represent potential significant load, grid management presents both opportunities and synergies for developing rates responsive to EV policy. In terms of ratepayer impact, the primary benefit is similar to demand side management or distributed energy—to mitigate the need for the construction of additional power generation facilities and transmission and distribution ("T&D") infrastructure.[125] To that end, and also to mitigate EVs' environmental impact, it is important in today's market to specifically avoid the need to construct quick-starting dispatchable power resources to meet peak load, which often are relatively inefficient gas combustion turbine generators.[126] If charged at peak times, EVs may cause the firing of combustion turbines at the margin at a high heat rate, which is suboptimal from both an economic and environmental perspective.[127] A cost-effective strategy to counter that risk is to maximize the use of off-peak charging for EVs.

In addition, charging EVs primarily from renewable generation sources produces the maximum net environmental benefit between EVs

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[122] PHASE 2 DECISION, *supra* note 36, at 61–63.
[123] *Id.* at 14.
[124] *Id.* at 80.
[125] *Id.* at 70.
[126] *See id.*
[127] Michael Nyberg, *Thermal Efficiency of Gas-fired Generation in California,* CAL. ENERGY COMM'N 4 (2011), http://www.energy.ca.gov/2011publications/CEC-200-2011-008/CEC-200-2011-008.pdf [http://perma.cc/Y3JM-TZBD].

and gasoline-fueled vehicles.[128] A TOU rate may work in harmony with this goal by influencing customer charging behavior away from peak load periods.[129] Wind energy, in particular, in most markets of the United States is a nighttime peaking resource.[130] In markets with large wind installed capacity, this can result in curtailments due to load balancing that must occur to manage reduced off-peak load.[131] EVs, if charged overnight at home, leverage this stranded energy. Solar energy peaks in the middle of the day, often just before the afternoon peak load of many utilities.[132] If charged off-peak at the workplace (or at pre-peak), then solar energy resources can also meet marginal EV load.

However, EV owners may not naturally be inclined to charge during off-peak hours. In an analysis of a recent pilot on EVs in Colorado, the Electric Vehicle Charging Station Pilot ("EVCS"), it was found that two peaks of charging were at 11:00 p.m. and 9:00 a.m. The latter peak was due to the roughly 25% of pilot participants (of only 20 individuals) charging in the morning, likely when arriving to work.[133]

TOUs are a mechanism to incentivize EV owners to charge vehicles during off-peak hours.[134] To do so requires influencing ratepayer behavior and countering the easily available choice to plug-in at the peak of afternoon demand, when an EV user arrives home after work. Influencing customer electric behavior has been proven cost-effective in the DSM context.[135]

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[128] PHASE 2 DECISION, *supra* note 36, at 70.
[129] *Id.*
[130] Debra Lew et al., *supra* note 51, at 1.
[131] *Id.* at 1, 6.
[132] Ker Than, *As Solar Power Grows, Dispute Flares Over U.S. Utility Bills*, NAT'L GEOGRAPHIC (Dec. 25, 2013), http://news.nationalgeographic.com/news/energy/2013/12/131226-utilities-dispute-net-metering-for-solar/ [http://perma.cc/6DSV-SD23].
[133] ELECTRIC VEHICLE CHARGING STATION: PILOT EVALUATION REPORT 4 (May 2015), *available at* http://www.xcelenergy.com/staticfiles/xe-responsive/Admin/Managed%20Documents%20&%20PDFs/CO-DSM-2014-EV-Pilot-Evaluation.pdf [http://perma.cc/WK8N-R6JJ] (last visited Jan. 22, 2016).
[134] COLORADO ELECTRIC VEHICLE AND INFRASTRUCTURE READINESS PLAN 78 (2012), *available at* http://www.garfieldcleanenergy.org/pdf/transportation/EV/Colorado-PEV-Readiness-Plan.pdf [http://perma.cc/53RX-D68G].
[135] *See, e.g.*, Colorado Public Utilities Comm'n Decision No. C14-0731, Docket No. 13A-0686EG, 28–29 (July 1, 2014), *available at* http://swenergy.org/Data/Sites/1/media/documents/news/news/file/PUC%20Order%207-1-14.pdf [http://perma.cc/GC5N-3XLS] (approving continued implementation and expansion of residential behavioral change programs, finding such programming "has a track record of being cost-effective and producing measurable savings.").

The Public Utilities Regulatory Policy Act ("PURPA"), Section 2621(d)(3), reflects Congressional support for TOU rates as a cost-effective means of adjusting consumer behavior based on knowledge of the real-time cost of generating electricity:

> The rates charged by any electric utility for providing electric service to each class of electric consumers shall be on a time-of day basis which reflects the costs of providing electric service to such class of electric consumers at different times of the day unless such rates are not cost-effective with respect to such class, as determined under section 2625(b) of this title.[136]

Depending on how much load they can shift off-peak, TOU customers should see monthly savings. For customers that can shift their load, TOU rates are "cost-effective" under PURPA and further the broader goals of utility regulation.[137] TOU rates involve: (1) defining the peak and off-peak periods in a straight-forward fashion; (2) accounting for incremental costs; and (3) achieving an appropriate discount to incentivize ratepayers.[138]

D. TOU Implementation

TOU rates have been found to enable "the individual customer to contribute to the efficiency of the system and thereby achieve favorable rate treatment."[139] Over twenty utilities in twelve states currently provide a TOU rate for residential customers who own qualified EVs.[140] The four major California utilities offer a rate that is specific to EVs at all times.[141] In Oregon, utilities are required to offer all EV customers, regardless of

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[136] 16 U.S.C. § 2621 (2009).
[137] Seligman, *supra* note 54, at 574.
[138] *See id.* at 580–82.
[139] Seligman, *supra* note 54, at 581 (quoting Richard C. Cudahy & J. Robert Malko, *Electric Peak Load Pricing: Madison Gas and Beyond,* WIS. L. REV. 69 (1976). One question Seligman raises is "how do utilities and regulators, who represent the links between GEV owners and the wholesale generation market, smooth out the evening peak to mitigate these undesirable economic and environmental results?" *Id.* at 574.
[140] States include Alabama, Arizona, California, Georgia, Indiana, Maryland, Michigan, Minnesota, New York, Nevada, Oregon, and Virginia. *PEV Electricity Pricing by Time-of-Use*, CTR. FOR CLIMATE AND ENERGY SOLUTIONS, http://www.c2es.org/initiatives/pev/maps/pev-electricity-pricing-by-tou [http://perma.cc/BBX8-8WVH] (last visited Jan. 22, 2016).
[141] Christensen Study, *supra* note 10, at 15.

rate class, the following options: (1) any existing applicable flat rate; (2) a whole premise TOU rate; and (3) an EV TOU rate that mimics a utility's whole premise TOU (to the extent a utility already offers this rate) but applies only to a plug-in EV by submeter.[142] Each of the California utilities (Southern California Edison, Pacific Gas & Electric, and San Diego Gas & Electric) offers at least one EV charging rate.[143] Both Virginia's and Connecticut's legislatures have directed agencies to determine whether it is appropriate to require time-differentiated rates to encourage off-peak EV charging.[144] A number of utilities offer EV-rates on a voluntary basis.[145] Finally, over 200 utilities nation-wide offer residential TOU rates that could encourage off-peak EV charging.[146]

In 2014, Minnesota became the first state to require by statute that utilities offer special discount electricity rates for EV drivers.[147] In addition to mandating that each IOU provide an EV tariff for the residential customer class, the law also directs that utilities provide customers with the option of zero-emissions renewable energy tariffs, enabling EV owners to refuel with 100% renewable electricity.[148] Under the new law, Minnesota's largest utilities were required to adopt specific off-peak charging rates for electric vehicles.[149]

The Minnesota PUC approved utilities' rates and charging hours, to take effect in July 2015. The approved rates and charging hours vary as follows:

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[142] *See* 2012 Or. Pu. Order 12–13, Oregon PUC Docket No. UM 1461, p. 19 (Jan. 19, 2012).
[143] *See* Christensen Study, *supra* note 10, at 15 (providing current rates for the 3 major utilities).
[144] CONN. GEN. STAT. § 16-19(f)(b) (2015); *see* VA. CODE ANN. § 56-232.2:1 (2015).
[145] *See*, *e.g.*, ALA. POWER, BEVT TIME-OF-USE RATE 1 (2015), *available at* http://www.alabamapower.com/business/pricing-rates/pdf/BEVT.pdf [http://perma.cc/39CT-6GKV]; *Whole House Plan (RPEV 1) Pricing Details*, SACRAMENTO MUN. UTIL. DIST., https://www.smud.org/en/residential/environment/plug-in-electric-vehicles/PEV-pricing-plan.htm [https://perma.cc/L25J-SWK7] (last visited Jan. 22, 2016); *What Rate Plan Is Best For You?*, GA POWER, http://www.georgiapower.com/about-energy/electric-vehicles/what-rate-plan-is-best-for-you.cshtml [http://perma.cc/4R8Z-7WT7] (last visited Jan. 22, 2016); *Electric Vehicle Charging*, INDIANAPOLIS POWER & LIGHT, https://www.iplpower.com/Business/Programs_and_Services/Electric_Vehicle_Charging_and_Rates/ [https://perma.cc/3DHW-PWAH] (last visited Jan. 22, 2016); *PEV Rates*, CONSUMER'S ENERGY CO., https://www.consumersenergy.com/content.aspx?id=3367 [https://perma.cc/3988-5PCW] (last visited Jan. 22, 2016).
[146] EIA, Electric Power Sales Revenue & EE From EIA-861 (Oct. 21, 2015), *available at* http://www.eia.gov/electricity/data/eia861 [https://perma.cc/JY8T-RZ8N] (last visited Jan. 22, 2016).
[147] MINN. STAT. § 216B.1614 (2015).
[148] *Id.* at Subd. 2.
[149] *Id.* at Subd. 2(c)(1).

- Minnesota Power has a fixed monthly charge of $4.25. Its off-peak hours are between 11:00 p.m. to 7:00 a.m. The utility's summer and winter off-peak rates will be $0.04332 per kWh, and its all-renewables premium rate will be $0.025 per kWh.
- The Otter Tail fixed charge is $4.50 and its off-peak hours are 10:00 p.m. to 6:00 a.m. Its summer off-peak rate is $0.02962 per kWh, while the winter off-peak rate is $0.04661 per kWh, and its all-renewables premium is $0.013 per kwh.
- Northern States Power Company d/b/a Xcel ("NSP") will have a monthly charge of $4.95, its off-peak hours are 9:00 p.m. to 9:00 a.m., its summer and winter off-peak rates are $0.033 per kWh, and its all-renewables premium $0.0068 per kWh. Xcel will also offer a $25 gift card to EV owners who choose the all-renewables option.[150]

Under NSP's approved tariff, NSP offers EV customers a rate design similar to their current Residential Time of Day ("TOD") Service, but for the customers' EV load only.[151] An EV customer taking service under this rate will pay higher than average residential charges for peak times, defined as between 9:00 a.m.–9:00 p.m. on weekdays, and in exchange would receive a dramatically lower rate for off-peak times.[152] The ratio under the EV TOD of on- to off-peak energy charges is 2.6 to 1, as compared with the Residential TOD ratio of 3.5 to 1.[153] NSP claims that the charging rate provides an average discount of 43% for off-peak EV charging.[154] In order to take service from this tariff, a ratepayer will be required to verify possession of an EV, and the utility will install a submeter behind

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[150] Order Approving Tariffs and Requiring Filings, Docket Nos. E002/M-15-111, E017/M-15-112, E015/M-15-120, E001/M-15-100 (Minn. Dep't of Commerce, June 22, 2015); Herman K. Trabish, *Minnesota Regulators Approve Reduced Rates For Off-Peak EV Charging*, UTIL. DIVE (May 26, 2015), http://www.utilitydive.com/news/minnesota-regulators-approve-reduced-rates-for-off-peak-ev-charging/399702/ [http://perma.cc/H2E9-GBA2].

[151] N. STATES POWER CO., PETITION FOR RESIDENTIAL ELECTRIC VEHICLE CHARGING TARIFF 6 (Jan. 30, 2015), *available at* http://stmedia.startribune.com/documents/2EVrate013115.pdf [http://perma.cc/V6S4-X7QU].

[152] *Id.* at 1–2, 6–8.

[153] *Id.* at 7.

[154] *Id.* at 8.

the customer's main meter from which it will discern EV charging. The fixed monthly fee of $4.95 seeks to cover fixed customer-related costs, including additional metering requirements.[155]

Regulators should inquire of the lessons from these early moving states on TOU implementation to determine best practices, particularly on the topics of effectiveness of the pricing signals and the elasticity of owners' demand.[156] Indeed, the Minnesota PUC held, in approving the new EV rates:

> The Commission will not require the utilities to make their tariffs or cost recovery mechanisms more uniform. Variation among the tariffs will provide an opportunity for a range of experiences with a new program. The Commission will require the utilities to provide greater detail about their promotional plans and estimates to allow a closer look at these costs and their recovery from customers receiving service under these EV tariffs.[157]

As in Minnesota, it is appropriate for regulators to adopt TOU rates while the market is growing, not only to encourage adoption, but also to test rate structures and refine the same as the load grows.

1. Demand Charges and Line Extension

The nature of EVSE equipment, especially fast-charging (or DC-charging) EVSE equipment, has been argued to warrant a classic demand-charge rate design.[158] However, demand charges—most often employed for industrial load situations—represent a hurdle for the EV industry.[159] There is a "chicken and egg" barrier to EV adoption because consumers will require ubiquitous infrastructure to increase adoption, but there are not sufficient EV owners to manage the cost of doing so.[160]

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[155] *Id.* at 5.
[156] *See* Hofmeister, *supra* note 69, at 47.
[157] Order Approving Tariffs and Requiring Filings, *supra* note 150, at 4.
[158] *See* Jeffrey Wishart, *Utility Demand Charges and EVSE*, CHARGED ELECTRIC VEHICLES, Oct. 31, 2013, at 79.
[159] *Id.*
[160] Bobbie Mixon, *Improving Electric Vehicle Sales May Require Solving Unique Chicken and Egg Problem*, NAT'L SCI. FOUND. (Jan. 29, 2015), https://nsf.gov/discoveries/disc_summ.jsp?cntn_id=133947&org=NSF [https://perma.cc/5KWN-9EZG].

In order for EVs to be successfully charged at multitudinous locations, the charging experience must be analogous in cost, time, and effort to fueling a conventional gasoline vehicle.[161] One company, Tesla, has gone so far as to roll out its own charging network free of charge to its customers.[162] The question some regulators have begun to ask is how to balance this societal concern with the operation of charging stations?[163]

In its "Decision Establishing Policies to Overcome Barriers to Electric Vehicle Deployment and Complying with Public Utilities," the CalPUC evaluated policies specific to overcoming barriers related to EV infrastructure.[164] The "Phase 2 Decision" considered the utilities' need to make infrastructure upgrades to accommodate added load from residential EV charging.[165] The CalPUC held that, on an interim basis, the costs of distribution or service facility upgrades necessary to accommodate basic residential EV charging will be treated as system costs, thereby recoverable in rate base.[166]

The decision was rooted in principles applicable to distribution level upgrades, where cost recovery is based in part on whether an upgrade applies to multiple or single units.[167] The CalPUC found that due to the "similarity of EV load to the load created by other large residential appliances, such as large portable air conditioners, and based on the State's goal to reduce greenhouse gas emissions through the electrification of the transportation sector" that rate base recovery should apply.[168]

The CalPUC also provided ad hoc guidance regarding demand charges for fleet vehicles.[169] In 2012, the Commission addressed rate

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[161] Arun Banskota, *Convenient Charging Will Be Tipping Point for Electric Cars*, TIMES OF SAN DIEGO (July 30, 2014), http://timesofsandiego.com/opinion/2014/07/30/convenient-charging-will-tipping-point-electric-cars/ [http://perma.cc/5HFZ-CX3C].

[162] *See Supercharger*, TESLA MOTORS, http://www.teslamotors.com/supercharger [http://perma.cc/Z7NG-HDYA] (last visited Jan. 22, 2016).

[163] In addition to California and Connecticut, the Massachusetts Department of Public Utilities is also investigating treatment of demand charges as part of its rate design, and the Rhode Island Office of Energy Resources also advocated for evaluating other states' policies with respect to demand charges and interconnect fees for EV charging. *See* MASS. DEP'T OF PUB. UTILS., MEMORANDUM re: REQUEST FOR COMMENTS ON ELEC. VEHICLE DISTRIB. SYS. IMPACTS, PILOT PROGRAMS AND RATES 3 (Nov. 19, 2014); RI House Resolution Report, *supra* note 41, at 10–11.

[164] PHASE 2 DECISION, *supra* note 36; *see also* CAL. PUB. UTIL. § 740.2.

[165] PHASE 2 DECISION, *supra* note 36, at 7, 10, 50–63.

[166] *Id.* at 3, 59.

[167] *Id.* at 58–59.

[168] *Id.* at 54.

[169] S. Cal Edison Co., 2012 Cal. PUC LEXIS 742 (Cal. Pub. Utils. Comm'n Nov. 8, 2012).

issues for bus operators on a temporary basis.[170] In order to demonstrate and develop the market for Zero Emission Vehicle ("ZEV") electric buses, the Commission expanded the eligibility of a TOU tariff to government agencies that operate zero-emissions buses in Southern California Edison's service territory.[171] Within the three-year period, the commission eliminated the demand charge while retaining TOU rates to encourage bus demonstrations.[172] The CalPUC noted, however, that a long-term solution is needed to resolve issues related to elements of the tariffs applicable to electric transit fleets throughout the state.[173]

The Connecticut Public Utilities Regulatory Authority approved an interim EV Rate Rider pilot of Connecticut Light & Power ("CL&P").[174] One of purposes of the pilot is to temporarily reduce the demand charge for DC Fast-Charging stations.[175] Because these stations operate at their full capacity for only short periods of time, they have high demand charges associated with use by relatively few customers.[176] Recognizing that utilization will be low in the short term, resulting in high demand cost, CL&P implemented a DC Fast-Charging station rate subclass.[177] Each station is to be separately metered and all customers of that meter are billed their proportion of monthly electric service, provided that the demand charge of the applicable rate schedule will be converted into an equivalent kilowatt per hour ("kWh") charge (rather than a capacity-based per kilowatt charge) for all kWh utilized by the customer during each billing period.[178] In this way, the demand charge is reduced.

In Hawaii, the Hawaiian Electric Company ("HECO") offers commercial EV charging rates that may minimize demand charges. The Schedule EV-F consists of TOU per kWh rates, without any demand charges.[179]

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[170] *Id.* at *13, *19.
[171] *Id.*
[172] *Id.*
[173] *See id.* at *13–*15.
[174] Final Decision on Request of CL&P for Approval of Electric Vehicle Rate Rider Pilot, Docket No. 13-12-11, CONN. PUB. UTILS. REGULATORY AUTH.(June 4, 2014) [hereinafter PURA Final Decision].
[175] CL&P Request for Interim Decision Approving EV Rate Rider Pilot, Docket No. 13-08-39, CONN. PUB. UTILS. REGULATORY AUTH. (Oct. 7, 2013).
[176] *Id.* at 1.
[177] PURA Final Decision, *supra* note 174, at 2–3.
[178] *Id.* at 3.
[179] HECO EV Pilot Rates, *available at* http://www.hawaiianelectric.com/heco/_hidden_Hidden/Renewable-Energy/Commercial-EV-Pilot-Rates?cpsextcurrchannel=1 [http://perma.cc/T3C6-VHEU] (last visited Jan. 22, 2016).

Some commentators argue that cost causation principles should lead regulators toward requiring the EV industry to pay its own way, and rely on market forces rather than policy incentives.[180] Although the market would of course provide signals, it is not correct to treat EV demand at this stage the same as any other energy demand (*e.g.*, widespread refrigeration).[181] EVs are simply a different creature than other forms of customer use of electricity. They are a technology that will *replace* other fuel-based energy needs, not simply an *additional* demand on the system.[182] Part of the reason why these questions are arising is because, given improving overall emission rates of the U.S. power plant fleet, there is reason to believe that EVs can leverage improving electric sector emissions to carry over to the transportation sector.[183] Because the transportation sector is the second largest source of carbon emissions in the country, such a development would significantly further the societal goals of reduced emissions.[184] The technological advancements of EVs and the magnitude of the corresponding environment benefits should discourage a pure market approach.[185] Because the need for travel drives EVs requirement of multi-venue rate treatment, and because the initial goals must be to increase EV infrastructure while maintaining affordability, reduced or reconfigured interim demand charges may produce benefits on a grid-wide scale.

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[180] Hofmeister, *supra* note 69, at 47–49 (providing a caveat that it is "probably inappropriate to charge the 'last to the system' customer for the entire cost of an upgrade caused by many customers.").

[181] *Id.* at 48 (" a PUC should seek to treat EV charging demands the same as any other demand, be it for televisions or refrigerators, or lighting.").

[182] *See* Yoko Kubota, *Toyota Maps Out Decline of Conventionally Fueled Cars*, WALL ST. J. (Oct. 14, 2015 12:47 PM), http://www.wsj.com/articles/toyota-maps-out-decline-of-conventionally-fueled-cars-1444824804 [http://perma.cc/U7N5-33JC]. *But see* Chang-Ran Kim, *Top Toyota Executive Says Electric Cars Can't Replace Conventional Vehicles Long-Term*, BUS. INSIDER (Apr. 16, 2015, 4:29 AM), http://www.businessinsider.com/r-electric-cars-wont-spread-even-with-rapid-chargers-toyota-engineer-2015-4 [http://perma.cc/D882-8M9P].

[183] *Emissions from Hybrid and Plug-In Electric Vehicles*, ALTERNATIVE FUELS DATA CTR., U.S. DEP'T OF ENERGY, http://www.afdc.energy.gov/vehicles/electric_emissions.php [http://perma.cc/QQ7B-QAPT] (last visited Jan. 22, 2016).

[184] *See Transportation Sector Emissions*, EPA, http://www3.epa.gov/climatechange/ghgemissions/sources/transportation.html [http://perma.cc/PUS4-P7FQ] (last visited Jan. 22, 2016).

[185] *See, e.g.*, James H. Williams et al., *The Technology Path to Deep Greenhouse Gas Emissions Cuts by 2050: The Pivotal Role of Electricity*, SCI. 53, 56 (Jan. 6, 2012), *available at* http://www.sciencemag.org/content/335/6064/53.full [http://perma.cc/T5QJ-QW95] (finding that "smart" EV charging will be essential to reducing the cost of fuel switching to electricity).

E. Regulatory Approaches to Build-Out of EV Infrastructure

In addition to rate design, consideration of charging station–associated upgrades to the distribution grid affect the nature of EVs' ability to charge anywhere one can drive. In T&D planning, EV deployment bolsters the argument for transition to smart meter technology.[186] Smart meter technology assists interactions with the grid, and can also enable better information sharing.[187] Smart meters also cause utilities to increase their attention to distribution upgrades.[188] The CalPUC rulemaking has begun to consider these issues and its findings may present new policies that can be examined across the country.[189]

1. Public Utility Ownership of Charging Infrastructure

One decision point for incentivizing EV infrastructure build-out is whether to include utilities in the EV market by allowing utilities to own charging infrastructure or to undertake pilot programs concerning charging stations.[190] Such pilots may include providing incentives for buying or installing charging stations or leasing programs.[191] Supporters of allowing regulated utilities into the market for charging stations conclude that utilities will be more able to quickly, inexpensively, and safely install charging infrastructure.[192]

The rationale supporting such inclusion is first that utilities have substantial resources.[193] Second, utilities possess institutional knowledge of their grid and system operation, which may enable them to efficiently

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[186] *Id.* at 53–54.
[187] *See* SILVER SPRING NETWORKS, HOW THE SMART GRID ENABLES UTILITIES TO INTEGRATE ELECTRIC VEHICLES 2, 13 (2013); *The Benefits of Smart Meters*, CAL. PUB. UTILS. COMM'N, http://www.cpuc.ca.gov/PUC/energy/Demand+Response/benefits.htm [http://perma.cc/L64C-2VVC] (last visited Jan. 22, 2016).
[188] *See, e.g.*, ADAM LANGTON AND NOEL CRISOSTOMO, CAL. PUB. UTILS. COMM'N, VEHICLE-GRID INTEGRATION 12, 15 (Oct. 2013) ("As PEV penetration increases, it becomes more likely that distribution upgrades will be needed.").
[189] *See id.* at 12.
[190] COMPILATION PAPER, *supra* note 35, at 2, 26–29.
[191] *Id.*
[192] *See* CAL. PUB. UTILS. COMM'N, RULEMAKING 13-11-007, JOINT OPENING COMMENTS OF ALLIANCE OF AUTOMOBILE MANUFACTURERS, ASSOCIATION OF GLOBAL AUTOMAKERS, AND GENERAL MOTORS ON THE ASSIGNED COMMISSIONER'S SCOPING MEMO AND RULING OF JULY 16, 2014 TO CONSIDER ALTERNATIVE-FUELED VEHICLE PROGRAMS, TARIFFS, AND POLICIES 7 (Aug. 29. 2014).
[193] *See id.*; COMPILATION PAPER, *supra* note 35, at 26.

locate charging stations.[194] Third, utilities may be better positioned to provide service to underserved markets within its service territory, as compared to private profit-driven charging servicers.[195] Oregon's PUC decided that utilities should be allowed to invest in charging equipment and operate charging stations either "as a non-regulated, non-rate based venture" or "as a utility investment."[196] The inquiry for consideration of whether such investments could be recoverable in rates would depend on proving benefits to ratepayers generally, not solely to EV owners or to the public at large.[197]

Washington's legislature allowed that a utility may "offer battery charging facilities as a regulated service, subject to commission approval."[198] Arizona's commission approved a three-year "Revised EV-Ready Study" project proposed by APS in 2011, which includes an EV TOU rate, discussed *supra*, and public charging stations with point of sale rates.[199] As part of the latter proposal, APS sought approval to own the public charging stations.[200] The Commission ordered APS instead to work cooperatively with EV infrastructure contractors for the first year and to request approval of point of sale rates in the future if APS detected a deficiency.[201] As of May 2014, APS has not sought such approval.

Targeted policy choices may address some utility advantages over third-party-owned EVSE stations. Notification policies may decrease the advantage of utilities in locating necessary charging stations so long as the information is made publicly available.[202] State, federal, and local government grants or incentives could enable third-party service providers to serve underserved areas.[203] However, states could decide to prohibit utilities from owning or operating charging stations in order to stimulate customer choice and competition.[204]

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[194] *See* CAL. PUB. UTILS. COMM'N, *supra* note 192, at 7; COMPILATION PAPER, *supra* note 35, at 26.
[195] *See* COMPILATION PAPER, *supra* note 35, at 26–27.
[196] Oregon Order 12-13, *supra* note 66, at 6.
[197] *Id.* at 10. The Commission noted that requests for rate recovery would be "closely scrutinized." https://apps.puc.state.or.us/orders/2012ords/12-013.pdf [https://perma.cc/WXW2-QPKU].
[198] WASH. REV. CODE § 80.28.320 (2015).
[199] COMPILATION PAPER, *supra* note 35, at 27–28; Docket No. E-01345A-10-0123, *supra* note 111, at 2–6.
[200] Docket No. E-01345A-10-0123, *supra* note 111, at 2–6.
[201] *See id.*
[202] *See* COMPILATION PAPER, *supra* note 35, at 23–25.
[203] *Id.* at 26–27.
[204] *Id.* at 26.

Initially, California was one such state.[205] The CalPUC adopted a prohibition on utility ownership of EV charging equipment with the exception of charging infrastructure for the utilities' fleets.[206] The rationale was that utilities' claims that ownership would increase user safety, reduce costs, and support utility notification of EV location were speculative and did not outweigh the benefits of competition. However, the CalPUC reversed itself in 2014, citing a need for "an expanded role for utility activity in developing and supporting [EV] charging infrastructure."[207] The CalPUC will allow utility ownership of charging infrastructure on a case-by-case basis, using a balancing test to weigh benefits of utility ownership with competitive limitations. It also left open the issue of payment for such infrastructure, suggesting "certain programs [may not be] appropriate for either ratepayer funding or ratepayer funding without shareholder contribution."[208]

Since the CalPUC's Order, the three major utilities in California have all proposed plans to install charging stations in their territory, and recover costs in rates. The Pacific Gas and Electric Company ("PG&E") initially proposed installing 25,000 chargers at a cost of $654 million.[209] The CalPUC required PG&E to revise its application, to install only 2,510 in the first phase of development.[210] San Diego Gas and Electric ("SDG&E") proposed installing 5,500 charging stations at a cost of $103 million.[211] Applications are still pending before the CalPUC.

The Southern California Edison Company ("SCE") filed Application (A.) 14-10-014, seeking approval of its Charge Ready and Market Education Programs.[212] SCE proposed a two-part program, with Phase 1 consisting of a one-year pilot to deploy up to 1,500 electric vehicle ("EV") charging stations and expanded market education and outreach in support

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[205] PHASE 2 DECISION, *supra* note 36, at 49–50.
[206] *Id.*
[207] CAL. PUB. UTILS. COMM'N, PHASE 1 DECISION ESTABLISHING POLICY TO EXPAND THE UTILITIES' ROLE IN DEVELOPMENT OF ELECTRIC VEHICLE INFRASTRUCTURE, DECISION 14-12-079 (issued Dec. 22, 2014), *available at* http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M143/K682/143682372.PDF [http://perma.cc/6PA8-CXJY].
[208] *Id.* at 8.
[209] CAL. PUBLIC UTILS. COMM'N, PG&E'S (U 39 E) ELECTRIC VEHICLE INFRASTRUCTURE AND EDUCATION PROGRAM APPLICATION, APP. 15-02-009, (Feb. 9, 2015).
[210] CAL. PUBLIC UTILS. COMM'N, JOINT ASSIGNED COMMISSIONER AND ADMINISTRATIVE LAW JUDGE SCOPING MEMO AND RULING, A. 15-02-009 15 (Sept. 4, 2015).
[211] *See* CAL. PUBLIC UTILS. COMM'N, APPLICATION OF SDG&E FOR AUTHORITY TO IMPLEMENT A PILOT PROGRAM FOR ELECTRIC VEHICLE-GRID INTEGRATION, A. 14-04-014 (Apr. 11, 2014).
[212] CAL. PUBLIC UTILS. COMM'N, A. 14-10-014, (Dec. 15, 2015).

of electric transportation, with total costs of $18.5 million.[213] Its proposed Phase 2 would include deployment of up to a total of 30,000 EV charging stations and broader EV market education and outreach.[214] Although a final decision has not issued, the administrative law judge has proposed a decision approving Phase I and cost recovery of $22 million.[215]

Although Massachusetts's commission has not prohibited distribution companies within its state from owning or operating EV charging equipment, it has prohibited recovery of costs in most circumstances, with limited exceptions.[216] These exceptions include: (1) the companies' own fleets; (2) research and development as part of an approved pilot or grid modernization plan; and (3) as part of any other approved proposal.[217]

Overall, as evidenced by the California requests, there is reason to be cautious about permitting a regulated monopoly to own EVSE equipment. One critic has remarked that, unlike electricity distribution infrastructure, charging infrastructure "does not exhibit natural monopoly characteristics" because numerous charging stations could use the same grid but offer different prices, attributes, and locations.[218] Further, he argues, utilities are not providing an "extraordinary service" for offering access to EV charging, as opposed to the service provided for access to the electric grid as a whole.[219]

Other commenters, however, believe that charging stations are public goods, the infrastructure for which lends itself to a monopoly.[220] There may be an achievable middle ground on this issue. Public charging stations should be owned by a variety of players. In fact, having redundant charging systems may be better for consumers.[221] But there must be a mechanism to check that utilities do not unfairly leverage monopoly information to the exclusion of other market players. For now, states are allowing limited regulated utility entrance into the EVSE market, largely

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[213] *Id.*
[214] *Id.*
[215] *Id.*
[216] D.P.U. 13-182-A, Aug. 4, 2014 Order, *supra* note 66.
[217] *Id.* at 14.
[218] Hofmeister, *supra* note 69, at 49.
[219] *Id.* at 50.
[220] Tomás Gómez San Román et al., *Regulatory Framework and Business Models for Charging Plug-In Electric Vehicles: Infrastructure, Agents, and Commercial Relationships*, 39 ENERGY POL'Y 6360, 6362 (2011).
[221] Hofmeister, *supra* note 69, at 49 ("[A] number of different charging points could all use the same electricity distribution grid, but compete with each other on price, service, location, bundled features, and other attributes.").

based on its nascent state.[222] This is appropriate, given that states must be involved in a roll-out of a comprehensive EV charging network, because many states are starting from scratch.[223]

2. Distribution Impacts and Readying Infrastructure Upgrades

As discussed above, T&D impacts related to EV upgrades are a potential regulatory flashpoint for EVs. Distribution-level impacts are intertwined with utilities' ability to be notified of EV charging in homes and businesses to keep track of EV penetration in their service territories. Studies, including a recently completed pilot on charging infrastructure in Colorado, are trying to address location of needed infrastructure and charging patterns.[224]

A key issue to regulators is who should pay for T&D upgrades needed to accommodate EVSE.[225] The Oregon commission decided that at this time "there is no discernible reason . . . to treat EV charging load differently than any other load with regard to distribution system upgrades."[226] Customers in Oregon are required to apply for upgrades under utilities' existing line extension policies, under which a customer that requests a line extension is provided with a cost allowance.[227] Costs within the allowance are paid by the utility as an operation expense, while costs above the allowance are covered by the customer.[228] With respect to distribution upgrades resulting from the cumulative effect of multiple new loads, it remains to be seen how such upgrades will be treated; but such costs may be assigned to the shared distribution charge.[229]

In determining who pays for T&D upgrades, the CalPUC has been guided by state statutes mandating reductions in GHG emissions in

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[222] *See* Decision 14-12-079, *supra* note 207, at 4–5; D.P.U. 13-182-A, *supra* note 66, at 11, 13.

[223] Xcel Energy 2012/2013 Demand-Side Management Plan, Docket No. 11A-631EG (Aug. 2011), https://www.xcelenergy.com/staticfiles/xe/Regulatory/2012-2013%20Biennial%20DSM%20Plan.pdf [https://perma.cc/6CGK-JE6X]; Excel Energy 2014 Demand-Side Management Plan, Docket No. 13A-0773EG (July 1, 2013), https://www.xcelenergy.com/staticfiles/xe/Regulatory/Regulatory%20PDFs/2014-CO-DSM-Plan.pdf [https://perma.cc/GDG4-JCV4] (approving the Electric Vehicle Station Pilot).

[224] *Id.*

[225] Oregon Order No. 12-13, *supra* note 66.

[226] *Id.*

[227] *Id.*

[228] *Id.* at 15.

[229] *Id.*

stating its priority is to adopt rules to address "infrastructure upgrades necessary for widespread use" of EVs.[230] It also considered utilities' existing distribution extension tariff rules: (1) distribution line extensions that serve multiple customers are borne by the general body of ratepayers, and (2) service line extensions that benefit a single customer may be partially offset by an allowance (paid into rates by all ratepayers), with the remainder paid by the single customer, if they serve a "new and permanent load."[231] For example, a new transformer in a neighborhood is placed into rate base, while upgrades necessary to increase the voltage to individual homes fall into the latter category. In contrast, a temporary load must be paid entirely by the customer.

The CalPUC was persuaded that EVs should be designated a new and permanent load, upgrades for which would be allotted an allowance with any remaining costs that would normally be paid by the residential EV customer would also be covered by ratepayers in general.[232] In recognizing that this policy could result in ratepayers initially paying more for EV upgrades, CalPUC ("from a broader perspective") imparted its goal that EV charging facilitates endorse off-peak power usage, which could benefit all ratepayers in the future.[233]

In addition to T&D upgrades caused by customer load, there may also be recoverable costs to prepare targeted locations for charging infrastructure. In California, parties have referred to this concept as "make-ready."[234] To industry, the key gap in the EV infrastructure market is not in the provision of charging services, but in the installation costs and the development of electrical make-ready infrastructure to support these services. Together, make-ready and installation account for a significant portion of the cost of deploying an EV charging station.[235] This is particularly the case with respect to multi-unit dwellings and in public places, where the additional load from the charging stations may necessitate a new subpanel or other expensive upgrades.[236] High up-front investment

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[230] PHASE 2 DECISION, *supra* note 36, at 50–51 (citing PUB. UTIL. CODE § 740.2(a)).
[231] *Id.* at 52–53.
[232] *Id.* at 59.
[233] *Id.* at 55.
[234] *See, e.g.*, Assigned Commissioner's Scoping Memo and Ruling, Rulemaking 13-11-007 (filed July 16, 2014), http://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M098/K861/98861048.PDF [http://perma.cc/62EJ-ZT8S].
[235] Josh Agenbroad & Ben Holland, *EV Charging Station Infrastructure Costs*, CLEAN TECHNICA (May 3, 2014) http://cleantechnica.com/2014/05/03/ev-charging-station-infrastructure-costs/ [http://perma.cc/AS47-CXWS].
[236] *See* PHASE 2 DECISION, *supra* note 36, at 37.

costs can be a substantial hurdle to widespread deployment of EV infrastructure in certain segments.[237] Financing mechanisms to reduce these up-front costs would provide ratepayer and system benefits.

In its ruling in the Rulemaking to Consider Alternative-Fueled Vehicle Programs, Tariffs, and Policies, the Commission found that parties' comments on make-ready costs represent near unanimity that the utilities should have an expanded role in EV infrastructure support and development in order to realize the potential benefits of widespread EV adoption.[238] The Commission declined to make a broad ruling, but instead said such decisions must be made in the context of the balancing test of competitive markets versus benefits from ratepayer investment.[239] The CalPUC dismissed its previous conclusion that in order for utilities to invest in a given EV infrastructure, they must demonstrate market failure or underserved market existed or would continue in a given area.[240] The Commission found that it was too early in EV market growth to make such a determination and any criteria might be overly restrictive.[241]

One suggested alternative is to charge EV ratepayers as a separate customer class with its own distribution service rate to account for EV-derived upgrades.[242] However, critics of this approach have identified an underlying unfairness: it is "the aggregate electricity load that causes the need for new infrastructure, . . . not just EVs, but the entire existing load."[243] Thus, it is improper to attempt to wholly allocate to a single rate class the costs of system upgrades.

It is important to note, however, that at this time, distribution impacts by EVs are likely quite limited in most areas due to low attrition. One utility concluded in a recent study that it is ten or more years away from seeing any significant impact to mainline distribution feeders, substation transformers, or distribution transformers from electric vehicles. It also concluded that at a 5% EV penetration rate could increase additional substation transformer peak load 2–4% and could potentially overload 4% of the distribution transformer population serving residential customers, if charging occurred during peak load times.[244]

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[237] Assigned Commissioner's Scoping Memo and Ruling, *supra* note 234, at 5.
[238] Decision 14-12-079, *supra* note 207, at 5.
[239] *Id.*
[240] *Id.* at 8.
[241] *Id.*
[242] Hofmeister, *supra* note 69, at 48.
[243] *Id.*
[244] EVCS PILOT EVALUATION REPORT, *supra* note 133, at 5.

3. Storage Vehicle-Grid Integration

A frontier of EV deployment is the interaction with EV vehicles and the grid in a bi-directional format. Vehicle-Grid Integration ("VGI") includes strategic EV battery charging or discharging, which allows the EV battery to serve as a form of grid storage and demand response.[245] EV batteries may then be enabled to be electric storage devices capable of providing demand response or other ancillary services to the distribution grid.

Several pilot programs are underway in California to test VGI approaches, including how controlled charging may be used in the workplace and how vehicles can provide demand response.[246] The CalPUC initiated a new rulemaking, with the dual purpose of examining VGI options and addressing utilities' EV tariffs.[247] As part of that rulemaking, an application by SDGE for a large VGI pilot is being considered.[248] Vehicle-to-grid applications are enticing to many developers and among advocates of distributed generation.

RECOMMENDATIONS AND CONCLUSION

This Article's authors have argued that the potential benefits to society by widespread EV adoption, and the corresponding potential utility system impact of such widespread adoption, support commissions preparing now for EV market growth. The main roads to follow by regulators are to leverage utilities' unique position to educate their customer base, to address threshold regulatory issues such as exempting EVSE equipment from regulation, to enact rate reforms on at least a pilot basis, and to consider whether and how to encourage the roll out of EV infrastructure. Some of these policies, like TOU rates and metering protocols, have other applications and benefits for ratepayers other than EV owners. In general, this Article has not put forward ways to incentivize the purchase of EVs, but instead to facilitate the integration of EVs into the regulatory structure and to address market barriers that if addressed,

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[245] RULEMAKING 13-11-007, *supra* note 192, at 15.
[246] S. Cal. Edison Co., Advice Letter 2746-E (June 22, 2012), https://www.sce.com/NR/sc3/tm2/pdf/2746-E.pdf [https://perma.cc/MSS5-HZC3]; Pacific Gas and Electric Co. Advice Letter 4077-E-B (Mar. 5, 2013), *available at* http://www.pge.com/tariffs/tm2/pdf/ELEC_4077-E-B.pdf [http://perma.cc/Q5SV-427E].
[247] RULEMAKING 13-11-007, *supra* note 192, at 15–21.
[248] *Id.* at 10.

may lead to increased adoption of EVs, possibly more so than incentivizing production or purchase.

The environmental, economic, and foreign policy benefits that can be leveraged by increasing EV use and infrastructure show that the public interest favors investing ratepayer resources to the extent that utilities may cost-effectively pave the road to EV adoption. Positive environmental, economic, and foreign policy effects are very likely outcomes of increased EV penetration, and the potential only increases when paired with renewable energy development or distribution level generation and transmission improvements. It is therefore recommended that state commissions address consumer education, rates, and infrastructure topics as a comprehensive initial roadmap to address EV market barriers. The energy and non-energy benefits that EVs could potentially bring to the United States can be quantified and measured through the Societal Cost Test.

The fundamental notion that a vehicle is a non-stationary resource should result in a conclusion that EVs and associated infrastructure should be analyzed in a manner slightly different than conventional rate design and infrastructure design. In particular, moving towards a system that can interact with EVs and understand charging behavior is an important long term goal. In the short term, regulators should focus on best practices from early moving states to address residential charging, EVSE charging, and EV infrastructure build out to lay the ground work for determining how EVs may affect the grid as rates of adoption continue to grow. As with other alternative products in the electric space, care must be taken to assist technology that has the possibility to dramatically improve environmental and economic outcomes overcome market barriers without excessive cost. This is a strong argument to leverage the experience of early adopters and create a map for the road ahead.