

# Electric Vehicle Charging Infrastructure: Navigating Choices Regarding Regulation, Subsidy, and Competition in a Complex Regulatory Environment

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For decades, U.S. politicians have promised to reduce America's dependence on foreign oil.<sup>1</sup> For decades, the U.S. petroleum imports have increased.<sup>2</sup> Since the dramatic oil price spike in 2008, the promise of the electric vehicles for personal transportation has captured the imagination of many who support reducing petroleum dependence for economic, environmental, or national security reasons.<sup>3</sup>

The fueling infrastructure required for electric vehicles ("EV") differs significantly from the infrastructure

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1. NAT'L RESEARCH COUNCIL, TRANSITIONS TO ALTERNATIVE VEHICLES AND FUELS 11 (2013), available at [http://www.nap.edu/catalog.php?record\\_id=18264](http://www.nap.edu/catalog.php?record_id=18264). For an amusing look at America's failed promises to achieve energy independence, see *The Daily Show* (Comedy Central television broadcast June 16, 2010), available at <http://www.thedailyshow.com/watch/wed-june-16-2010/an-energy-independent-future>.
2. U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY REVIEW (2012), available at <http://www.eia.gov/totalenergy/data/annual/showtext.cfm?t=ptb0501b>. Only very recently have imports decreased, as vehicles become more efficient, and domestic oil production has increased. *id.* However, the new domestic oil production holds the promise of eventually making the U.S. a net oil exporter—even without significant increases in electric vehicle adoption. U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2013, at 2 (2013) [hereinafter U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2013].
3. Light vehicles used for personal transportation are responsible for approximately 50% of U.S. petroleum consumption and 17% of U.S. greenhouse gas emissions. See NAT'L RESEARCH COUNCIL, *supra* note 1, at 2.

required for traditional internal combustion engine vehicles ("ICE vehicle").<sup>4</sup> In the United States, a system of privately owned, often franchised, gasoline service stations has emerged to provide easy access to fuel for internal combustion engines.<sup>5</sup> Large, vertically integrated petroleum companies typically secure petroleum supplies, refine the petroleum into gasoline, and sell gasoline supplies to the individual service stations or groups of service stations.<sup>6</sup> The petroleum and gasoline are transported by complex networks of sea- and land-based transportation, including ships, pipelines, and trucks.<sup>7</sup>

The fueling infrastructure necessary for EVs is already partly in existence in the United States.<sup>8</sup> The electricity grid consists of a complex network of interconnected power plants and transmission and distribution wires owned by a wide variety of public and private entities.<sup>9</sup> A number of additional infrastructure investments will either be necessary or will greatly assist in making widespread adoption of EVs

4. An electric vehicle could be a pure electric vehicle powered solely by electricity stored in a battery, or a plug-in-hybrid electric vehicle, which operates primarily by electricity but has a back-up option of combusting gasoline to operate. For purposes of this Article, I will use the term electric vehicle ("EV") to include both battery electric vehicles ("BEVs") and plug-in-hybrid electric vehicles ("PHEVs").
5. The U.S. has more than 110,000 gas stations. AMORY LOVINS, ROCKY MOUNTAIN INST., REINVENTING FIRE 62 (2011). In many cases, the individual service stations earn profits not by selling gasoline, but by selling the food, beverages, cigarettes, lottery tickets, and other items. Scott Horsley, *Gas Stations Profit From More Than Just Gas*, NAT'L PUB. RADIO (June 5, 2007), <http://www.npr.org/templates/story/story.php?storyId=10733468>.
6. See generally MARC W. MELAINA ET AL., NAT'L RENEWABLE ENERGY LAB., U.S. DEP'T OF ENERGY, DOE/GO-102013-3710, TRANSPORTATION ENERGY FUTURES SERIES: ALTERNATIVE FUEL INFRASTRUCTURE EXPANSION: COSTS, RESOURCES, PRODUCTION CAPACITY, AND RETAIL AVAILABILITY FOR LOW-CARBON SCENARIOS 15–20 (2013).
7. *Id.*
8. Indeed, this is part of the appeal of electric vehicles compared with other emerging technologies such as vehicles fueled by natural gas, biofuels, or hydrogen.
9. See generally STAN MARK KAPLAN, CONG. RESEARCH SERV., R40511, ELECTRIC POWER TRANSMISSION: BACKGROUND AND POLICY ISSUES 1–9 (2009).

viable.<sup>10</sup> These investments include private high-speed charging outlets in residential homes, advanced electricity metering technologies to enable different prices based on the time a vehicle is charged, public charging outlets, upgrades to the electricity distribution system to enable additional demand, and additional electricity generation infrastructure.<sup>11</sup> State regulatory commissions that regulate infrastructure investments made by electric utilities (often referred to as state public utilities commissions or public service commissions, hereinafter “PUCs”), currently (or will shortly) face questions of whether and to what extent incumbent electric utilities should provide or subsidize these infrastructure investments. PUCs also face questions regarding the extent to which non-utility, third party providers of electricity for vehicles should be regulated.

These choices arise at a time of ongoing transition in American electricity regulation. For decades in the United States, sales of electricity to retail customers were provided primarily by vertically integrated utilities which were granted monopoly rights and primarily regulated by state agencies.<sup>12</sup> Since the late 1970s, more competition has emerged within the electricity generation market, particularly in the wholesale market for electricity generation.<sup>13</sup> Many have celebrated this move to competition as a victory for consumers and a superior structure for the industry.<sup>14</sup>

At the same time, however, entire segments of the electricity industry remain regulated as natural monopolies in a traditional cost-of-service manner. First, the move to wholesale competition in generation remains incomplete in the United States.<sup>15</sup> Many PUCs still regulate utilities as vertically integrated monopolies.<sup>16</sup> Second, even when electricity generation is subject to market competition, most who study the issue consider the wires and related infrastructure required for long-distance transmission and local distribution of electricity “natural monopolies.”<sup>17</sup> In the United States, the Federal Energy Regulatory Commission (“FERC”) regulates transmission infrastructure (analogous to the interstate highway system of electricity), while PUCs regulate the distribution infrastructure (analogous to the local road system).<sup>18</sup> Both transmission and distribution are generally regulated by traditional cost-of-service methods, whereby the regulator calculates the revenue requirement which a private company

needs in order to pay operating expenses and invest in capital stock, including a rate of return for its investors.<sup>19</sup> The regulator then attempts to fairly allocate these expenses among the company’s customers via electricity rates based on a number of rate-setting principles.<sup>20</sup>

Questions about infrastructure investments associated with EV charging arise in this context. Regulatory treatment of EV infrastructure presents a new front in the ongoing debate about the role competition should play in the sale of electricity. Cost recovery of infrastructure investments have been under-studied by the academic literature focused on the energy regulatory policy aspects of EVs. To date, the energy policy literature related to EVs has overwhelmingly focused on how energy regulators might create a regulatory system that would enable EVs to act as generation resources for the grid—a concept known as vehicle-to-grid (“V2G”).<sup>21</sup> Although V2G is theoretically interesting and potentially important in the long run, a system of widespread use of V2G is very unlikely in the short term.<sup>22</sup>

10. See *infra* Part I.

11. *Id.*

12. See LOVINS, *supra* note 5, at 173.

13. See JOSEPH P. TOMAIN & RICHARD D. CUDAHY, *ENERGY LAW* 386–87 (4th ed. 2011).

14. See, e.g., Richard Pierce, *The Past, Present, and Future of Energy Regulation*, 31 UTAH ENVTL. L. REV. 291 (2011); David B. Spence, *The Transformation of American Energy Markets and the Problem of Market Power*, 53 B.C. L. REV. 131 (2012).

15. See generally Richard Pierce, *Completing the Process of Restructuring the Electricity Market*, 40 WAKE FOREST L. REV. 451 (2005).

16. See generally TOMAIN & CUDAHY, *supra* note 13, at 165–219.

17. Spence, *supra* note 14, at 134.

18. See generally TOMAIN & CUDAHY, *supra* note 13, at 165–219.

19. *Id.*

20. See generally ALFRED E. KAHN, 1 *THE ECONOMICS OF REGULATION* 63–158 (2d ed. 1988.)

21. See, e.g., Christophe Guille & George Gross, *A Conceptual Framework for the Vehicle-to-Grid (V2G) Implementation*, 37 ENERGY POL’Y 4379 (2009); Benjamin K. Sovacool & Richard Hirsch, *Beyond Batteries: An Examination of the Benefits and Barriers to Plug-In Hybrid Electric Vehicles (PHEVs) and a Vehicle-to-Grid (V2G) Transition*, 37 ENERGY POL’Y 1095 (2009); Matthias D. Galus et al., *On Integration of Plug-In Hybrid Electric Vehicles Into Existing Power System Structures*, 38 ENERGY POL’Y 6736 (2010); S.L. Andersson et al., *Plug-In Hybrid Electric Vehicles as Regulating Power Providers: Case Studies of Sweden and Germany*, 38 ENERGY POL’Y 2751 (2010); Danielle Changala & Paul Foley, *The Legal Regime of Plug-In Hybrid Electric Vehicle Adoption: A Vermont Case Study*, 32 ENERGY L.J. 99 (2011); Tomas Gomez San Roman et al., *Regulatory Framework and Business Models for Charging Plug-In Electric Vehicles: Infrastructure, Agents, and Commercial Relationships*, 39 ENERGY POL’Y 6360 (2011); Brian Lamble, *Of Nesting Dolls and Trojan Horses: A Survey of Legal and Policy Issues Attendant to Vehicle-to-Grid Integration*, 86 CHI.-KENT L. REV. 193 (2011); Jonathan Mullan et al., *The Technical, Economic and Commercial Viability of the Vehicle-to-Grid Concept*, 48 ENERGY POL’Y 394 (2012); Davion M. Hill et al., *Fleet Operator Risks for Using Fleets for V2G Regulation*, 41 ENERGY POL’Y 221 (2012).

22. First, the economics of many types of V2G applications do not appear favorable. See generally Jay Apt, Scott B. Peterson, & J.F. Whitacre, *The Economics of Using Plug-In Hybrid Electric Vehicle Battery Packs for Grid Storage*, 195 J. POWER SOURCES 2377 (2010). Second, EV manufacturers often condition the warranties on their vehicles (and importantly, their vehicle batteries), providing that consumers who use their vehicles to deliver or sell electricity to the grid will lose the benefits of the warranty. See, e.g., TESLA MOTORS, MODEL S NEW VEHICLE EXTENDED WARRANTY 4 (2013), available at [http://www.teslamotors.com/sites/default/files/blog\\_attachments/model\\_s\\_new\\_vehicle\\_limited\\_warranty.pdf](http://www.teslamotors.com/sites/default/files/blog_attachments/model_s_new_vehicle_limited_warranty.pdf); FORD MOTOR COMPANY, 2013 MODEL YEAR FORD HYBRID AND ELECTRIC VEHICLE WARRANTY GUIDE 11 (2012) (describing “using the vehicle as a stationary power source” as a misuse of the vehicle which will void the warranty for resulting damages), available at <http://www.ford.com/resources/ford/general/pdf/2013HybridWarranty.pdf>. A Coasian analysis might suggest that if V2G was cost effective, manufacturers and owners would contract to find a solution to enable applications. However, the transaction costs of such transactions may prove insurmountable. Automakers are unlikely to become participants in the electricity markets themselves since it outside of their core expertise. Unless vehicle owners strongly demand the ability to participate in V2G applications and automakers feel desire in reduced demand for EVs, it seems likely that manufacturers will be conservative in maintaining strict battery warranties. In the biofuels context, automakers have been very hesitant to warranty their vehicles for

This Article considers more pressing and immediate practical regulatory concerns. Part I describes a number of key charging infrastructure investments related to EVs. Part II analyzes how PUCs should treat infrastructure investments related to EVs. In this context, Part II considers whether traditional energy regulatory policy goals should be broadened to consider additional policy goals in the context of EV related infrastructure. Part III considers the limitations placed on energy regulators under existing state and federal regulatory statutes.

Ultimately, the article concludes PUCs are probably not best suited to make decisions about subsidies for EV adoption, but they have important roles to play in ensuring that EV infrastructure investments are made in a sound manner. Utility regulators might also consider pro-EV policies as a tie-breaker when traditional regulatory principles do not provide a clear policy outcome. Because of the complex, overlapping regulatory authority governing the U.S. energy sector, state and federal utility regulators should work collaboratively with each other, as well as keep abreast of the energy and climate policy developments outside of the electricity sector that might influence EV policymaking. At this point in the history of the electric vehicle industry, regulators should generally adopt a light-handed approach to regulation, encouraging a national competitive market for EV charging services. Competition should promote lower prices within the EV charging market and incentives for service innovations that consumers might find attractive. Regulated utilities should not be prohibited from participating in the market for public charging, but they should not be given exclusive monopoly authority to provide public EV charging services. As we learn more about the technology, the economics, and the social costs and benefits of EVs, regulators should adapt their policies accordingly.

## I. Electric Vehicle Fueling Infrastructure

A number of electricity infrastructure investments could be characterized as necessary to the widespread adoption of EVs. A recent estimate calculated that the average total

cost per new EV is just under \$3,000 for necessary charging infrastructure in homes, workplaces, and in public.<sup>23</sup> This figure does not include other infrastructure, such as electricity distribution system upgrades and new electricity generating plants.<sup>24</sup> This part introduces five types of infrastructure related to EV charging: home charging stations, public charging stations, distribution system upgrades, electricity generation investments, and infrastructure to enable time-variable pricing for EV charging. Part II then examines the proper regulatory treatment of investments in each of these infrastructure categories.

### A. Home Charging Systems

To refuel, an EV will generally connect to the grid using either a plug operating on standard 120 Volt (“V”) outlet (“Level 1 charger”), or a higher voltage 240V sub-circuit (“Level 2 charger”).<sup>25</sup> Level 2 chargers allow vehicles to charge about four times as quickly as Level 1 chargers.<sup>26</sup> This difference can impact the convenience of charging for consumers. 240V circuits are common pieces of modern electrical equipment, often installed for large appliances such as electric dryers.<sup>27</sup> However, in most existing homes, there will be capital and labor costs associated with installing a Level 2 charger in a garage.<sup>28</sup> It is also theoretically possible to charge an EV with a direct current charging option (“fast charger”), which can charge a typical EV battery in a matter of minutes.<sup>29</sup>

gasoline blended with 15% ethanol, despite evidence that such blends do not put vehicles at significant risk. David Andress et al., *Status of Advanced Light-Duty Transportation Technologies in the U.S.*, 41 ENERGY POL’Y 348, 353, 363 (2012). Because battery cost constitutes a significant percentage of the total cost of an EV and lifecycle battery performance remains relatively unknown (particularly when compared with ICE vehicle performance), it is unlikely that EV owners will put their investment in an EV at risk by participating in V2G. See NAT’L RESEARCH COUNCIL, *supra* note 1, at 25–27. Some V2G applications exist that likely do not violate automakers’ warranties. For example, temporarily stopping a charge to participate in a demand response program or even a frequency regulation program would not likely violate a warranty (and would not put a strain on battery life) in the same way that using an EV battery to discharge electricity back on to the grid would. It is also possible that automakers seeking to promote EV sales will not aggressively enforce their warranties against V2G applications.

23. See NAT’L RESEARCH COUNCIL, *supra* note 1, at 45. This figure assumed that for each EVs one Level 2 home charger and 0.4 of a commercial-grade Level 2 charger would be necessary to build in the next decade. *Id.* at 319.

24. *Id.* at 319.

25. Cal. Pub. Utils. Comm’n, Rulemaking 09-08-009, Order Instituting Rulemaking on the Commission’s Own Motion to Consider Alternative-Fueled Vehicle Tariffs, Infrastructure and Policies to Support California’s Greenhouse Gas Emissions Reduction Costs (Aug. 20, 2009), available at [http://docs.cpuc.ca.gov/PUBLISHED/FINAL\\_DECISION/106042.htm](http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/106042.htm). [hereinafter Cal. Pub. Utils. Comm’n, Order Instituting Rulemaking]. The vehicles themselves include equipment that converts alternating current electricity from a standard electrical current into the direct current electricity necessary to power a vehicle. *Id.*

26. See NAT’L RESEARCH COUNCIL, *supra* note 1, at 54. The equipment within an EV itself will also determine how much electricity voltage the EV can accept. For example, a 2012 Chevy Volt will charge up to 3.3 kW with a Level 2 charger, while the Ford Focus Electric can charge up to 6.6 kW with the same Level 2 charger. CLEAN ENERGY COALITION, PLUG-IN READY MICHIGAN: AN ELECTRIC VEHICLE PREPAREDNESS PLAN 38 (2012), available at <http://cec-mi.org/wp-content/uploads/2011/11/Plug-In-Ready-Michigan.pdf> [hereinafter CLEAN ENERGY COALITION, PLUG-IN READY MICHIGAN].

27. HyperPhysics, Department of Physics & Astronomy, Georgia State U., *Household Electric Circuits*, GEORGIA STATE U. <http://hyperphysics.phy-astr.gsu.edu/hbase/electric/hsehd.html> (last visited Nov. 11, 2013).

28. Level 2 chargers may require upgrades to the home’s service panel and circuit breakers, additional wiring from the service panel to the actual charging point, and charging point itself. CAL. PUB. UTILS. COMM’N, STAFF ISSUES PAPER, THE UTILITY ROLE IN SUPPORTING PLUG-IN VEHICLE ELECTRIC CHARGING 5 (Aug. 30, 2010), available at <http://docs.cpuc.ca.gov/EFILE/RULINGS/122657.PDF> [hereinafter CAL. PUB. UTILS. COMM’N, THE UTILITY ROLE IN SUPPORTING PLUG-IN VEHICLE].

29. See NAT’L RESEARCH COUNCIL, *supra* note 1, at 54.

A recent study by the National Research Council estimated the following charging costs for this infrastructure as of 2011<sup>30</sup>:

Charging Station	Equipment: Range of Costs	Equipment: Typical Cost	Installation: Range of Costs	Installation: Typical Cost	Total Cost of Charging Station
Level 1 — Residential	\$450–995	\$479	\$0–500	\$200	\$679
Level 2 — Residential	\$490–1,200	\$892	\$300–2,000	\$1,300	\$2,192
Level 2 — Commercial	\$1,875–4,500	\$2,477	\$1,000–10,000	\$2,500	\$4,977
DC Fast Charge	\$17,000–44,000	\$34,200	\$7,000–50,000	\$20,000	\$54,200

In sum, the convenience of Level 2 charger comes with a cost—it is approximately three times more expensive to install a Level 2 charger than a Level 1 charger. Indeed, if a garage has an outlet already, there may be no new installation costs. The significant capital expenses associated with fast chargers makes them uneconomical for home charging stations, particularly given that an EV can often be recharged overnight.<sup>31</sup>

## B. Public Charging Systems

Some analysts believe that public charging stations are a necessary component of the infrastructure requirement to enable the widespread adoption of EVs.<sup>32</sup> These analysts credit the availability of public charging stations with mitigating “range anxiety,” the fear that the vehicle may run out of electric charge while driving, leaving the driver stranded.<sup>33</sup> According to data from the U.S. Department of Energy, approximately 8,500 public EV charging stations have been installed in the United States.<sup>34</sup>

Others disagree about the importance of public charging, arguing that the average vehicle spends the vast majority of its time parked at home or at work and that only a small fraction of the time at businesses where it could even use a charging station.<sup>35</sup> Perhaps more importantly, plug-in

hybrid EVs (“PHEV”), which offer owners a backup gasoline engine in case the battery depletes, may become the more dominant EV technology, at least in the short- and medium-

term. PHEVs would address the range anxiety problem, reducing the necessity of public charging stations and making them more a matter of convenience for owners. Additionally, once consumers gain experience in actually owning an EV, many will realize that charging at home covers the vast majority of their needs.<sup>36</sup>

Even though public charging stations may not be essential prerequisites to EV use, the widespread availability of public charging stations makes EV use more convenient and economical, which some believe is necessary to mainstream EV adoption.<sup>37</sup> Moreover, even if range anxiety is not a rational fear for PHEV owners, it nevertheless deters some consumers from purchasing PHEVs.<sup>38</sup> Accordingly, policymakers will continue to face the question of whether to support public charging stations for EVs in the coming years.

## C. Distribution System Infrastructure Upgrades

Additional upgrades to local neighborhood distribution systems may also be necessary to accommodate the heightened electricity needs that could arise if a number of people in the same neighborhood all owned EVs.<sup>39</sup> This may be a concern particularly early in the adoption of EVs, because early adopters of EVs may be likely to live in similar geographic areas.<sup>40</sup> The amount of distribution system infrastructure needed to accommodate EVs depends on a number of factors—including, most notably, the existing capacity of the distribution infrastructure, as well as the number of EV owners in a particular neighborhood, whether EV owners use Level 1 or Level 2 chargers, and the time of day during which EV owners choose to charge their vehicles. This last factor might be influenced by a utility rate design that encourages charging at times when the electricity system is not at peak demand.<sup>41</sup> An early estimate by a California utility concluded that distribution upgrade costs may be five to twenty times greater if vehicles charge during peak demand times than if they charge during off-peak times.<sup>42</sup>

30. *See id.* at 319.

31. Andreas Schroeder & Thure Traber, *The Economics of Fast Charging Infrastructure for Electric Vehicles*, 43 ENERGY POL’Y 136, 144 (2012) (noting there are not enough expected EV users in the near future to justify the expense of fast chargers).

32. ELECTRIFICATION COALITION, ELECTRIFICATION ROADMAP 94 (2009), available at [http://www.electrificationcoalition.org/sites/default/files/SAF\\_1213\\_EC-Roadmap\\_v12\\_Online.pdf](http://www.electrificationcoalition.org/sites/default/files/SAF_1213_EC-Roadmap_v12_Online.pdf); *see also* THOMAS STEVENS, ARGONNE NAT’L LAB., U.S. DEPT OF ENERGY, DOE/GO-102013-3709, TRANSPORTATION ENERGY FUTURES SERIES: NON-COST BARRIERS TO CONSUMER ADOPTION OF NEW LIGHT-DUTY VEHICLE TECHNOLOGIES 33 (2013), available at <http://www.nrel.gov/docs/fy13osti/55639.pdf>.

33. *See* ELECTRIFICATION COALITION, *supra* note 32, at 94 (ranking range anxiety as the most significant non-cost barrier to adoption of alternative fueled vehicles).

34. Alternative Fuels Data Center, *Alternative Fuel Station Locator*, U.S. DEPT. OF ENERGY, <http://energy.gov/maps/alternative-fueling-station-locator> (last accessed Oct. 22, 2013).

35. Nick Chambers, *Industry Insider Says Public Charging Infrastructure Not That Important*, PLUGINCARS (2011) <http://www.pluginCars.com/industry-insider-says-public-charging-infrastructure-not-important.html> (last visited May 31, 2013).

36. CLEAN ENERGY COALITION, PLUG-IN READY MICHIGAN, *supra* note 26, at 40.

37. *See, e.g.*, Alternative Fuels Data Ctr., *Charging Plug-In Vehicles in Public*, U.S. DEPT OF ENERGY, [http://www.afdc.energy.gov/fuels/electricity\\_charging\\_public.html](http://www.afdc.energy.gov/fuels/electricity_charging_public.html) (last visited May 31, 2013).

38. *See* ELECTRIFICATION COALITION, *supra* note 32, at 94.

39. CAL. PUB. UTILS. COMM’N, THE UTILITY ROLE IN SUPPORTING PLUG-IN VEHICLE, *supra* note 28, at 13–14.

40. *See id.*

41. CAL. PUB. UTILS. COMM’N, REVENUE ALLOCATION AND RATE DESIGN: FACILITATING PLUG-IN ELECTRIC VEHICLE INTEGRATION 10–12 (Sept. 10, 2010), available at <http://docs.cpuc.ca.gov/efile/RULINGS/123311.pdf> [hereinafter CAL. PUB. UTILS. COMM’N, REVENUE ALLOCATION AND RATE DESIGN].

42. *See id.* at 10.

## D. Electricity Generation Infrastructure

If a substantial number of EVs are sold in the United States, new generation capacity might become necessary to serve the additional electricity demand.<sup>43</sup> The need for additional generation capacity would be compounded if many EVs drew electricity from the system during peak demand times.<sup>44</sup> However, this need can be mitigated by encouraging owners to charge EVs at times when existing capacity is underutilized.<sup>45</sup>

## E. Infrastructure to Enable Time of Use Pricing

Managing the electric grid is a considerable technological challenge. To maintain stable and reliable electricity supply, the total demand on the system must be constantly balanced with supply.<sup>46</sup> To handle potential spikes in demand or losses in supply, grid managers keep substantial backup generation capacity either operating in reserve or ready to be operated at a moment's notice.<sup>47</sup> To this end, modulating the total amount of supply in the system is generally more cost-effective than relying on electricity storage.<sup>48</sup> As a result, much of the nation's generating capacity sits idle for the majority of the time.<sup>49</sup>

Efficiently integrating EVs into the electricity system provides a number of benefits for the entire system. Adding additional demand from EVs at times of reduced general demand (such as overnight) would more efficiently utilize the generating capacity of the electricity infrastructure system.<sup>50</sup> For example, EVs could provide demand for electricity generated by wind turbines in the middle of the night when there are few other sources of demand.<sup>51</sup> This situation would more efficiently use existing generation that is either intermittent (such as wind or solar power) or costly to bring into and out of service (such as nuclear power) and help integrate

additional intermittent renewable electricity generation.<sup>52</sup> Adding new electricity demand would also put downward pressure on utility rates for everyone because the revenues from increased electricity use could be spread to cover the full costs of the electricity system.<sup>53</sup>

At the same time, EVs can pose a reliability risk to the electric system. If EVs added significantly to peak demand, even more backup generation capacity would become necessary.<sup>54</sup> This necessity would add significant costs to the electricity generation system by requiring the acquisition of additional generation resources to serve high peak demand.<sup>55</sup> Moreover, higher voltage demand may require additional distribution infrastructure in order to prevent overloading of circuits.<sup>56</sup> Accordingly, thoughtful management of EV charging times is an important policy goal.

Thus, to avoid some of the potentially costly impacts of high-voltage charging on the electricity system, utilities and regulators may seek to influence the time when owners charge EVs. In general, it is economically efficient to set the retail price of electricity at its short-run marginal cost of production.<sup>57</sup> By allowing the price of electricity to fluctuate with its cost, consumers are given market signals that encourage them to use electricity at times when the cost of production is low. High prices discourage EV charging during periods of peak demand and low prices encourage EV charging during off-peak times when existing utility infrastructure is idle or when there is little demand for intermittent resources like wind power.<sup>58</sup> Because EVs charge easily overnight when parked and because this coincides with usual off-peak periods, a good opportunity exists for a large portion of the EV charging to occur off-peak. However, because some systems experience a mini-peak in the early evening when residential customers return home from work, EV charging may not necessarily occur at the most desirable times unless rate structures encourage this.<sup>59</sup> Variable rates allow customers to charge EVs during periods of peak demand if they want or need to do so, but price signals will discourage it. Variable rates can reduce the need for new generation investments to reach peak demand and can reduce the need to replace distribution infrastructure.<sup>60</sup> They can also incentivize more efficient use of existing generation infrastructure.<sup>61</sup>

43. NAT'L RESEARCH COUNCIL, *supra* note 1, at 54 (estimating that the additional demand from 100 million PEVs in 2050 would be about 286 billion KWh, requiring the construction of 90 new 1,000 MW power plants).

44. Cal. Pub. Utils. Comm'n, Rulemaking 09-08-009, Phase 2 Decision on Establishing Policies to Overcome Barriers to Electric Vehicle Deployment and Complying With Public Utilities Code Section 740.2, 14–15 (July 14, 2011) [hereinafter Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies].

45. *See id.* at 20–21.

46. N. AM. ELEC. RELIABILITY CORP., RELIABILITY GUIDELINE: TRANSMISSION SYSTEM BACKUP PROTECTION 20 (Dec. 2010), available at [http://www.nerc.com/pa/RAPA/rg/ReliabilityGuidelines/Backup%20Protection%20Systems\\_AEA%20to%20Post%20for%20Comment\\_20101208%20\(2\).pdf](http://www.nerc.com/pa/RAPA/rg/ReliabilityGuidelines/Backup%20Protection%20Systems_AEA%20to%20Post%20for%20Comment_20101208%20(2).pdf).

47. *See generally id.*

48. PAUL L. JOSKOW & CATHERINE WOLFRAM, DYNAMIC PRICING OF ELECTRICITY 2 (2012), available at <http://faculty.haas.berkeley.edu/wolfram/Papers/AEA%20DYNAMIC%20PRICING.pdf>.

49. STEVE PULLINS ET AL., NAT'L ENERGY TECH. LAB., U.S. DEP'T OF ENERGY, DOE/NETL-2010/1406, BACKUP GENERATORS: THE NEXT SMART GRID PEAK RESOURCE, 2 (2010), available at [http://www.netl.doe.gov/smartgrid/referenceshell/whitepapers/BUGS\\_The%20Next%20Smart%20Grid%20Peak%20Resource%20\(April%202010\).pdf](http://www.netl.doe.gov/smartgrid/referenceshell/whitepapers/BUGS_The%20Next%20Smart%20Grid%20Peak%20Resource%20(April%202010).pdf).

50. CAL. PUB. UTILS. COMM'N, REVENUE ALLOCATION AND RATE DESIGN, *supra* note 41 at 11–12.

51. Cal. Pub. Utils. Comm'n, Rulemaking 09-08-009, Decision in Phase 1 on Whether a Corporation or Person That Sells Electric Vehicle Charging Services to the Public Is a Public Utility 16 (July 29, 2010) [hereinafter Cal. Pub. Utils. Comm'n, Decision in Phase 1], available at [http://docs.cpuc.ca.gov/WORD\\_PDF/FINAL\\_DECISION/121450.pdf](http://docs.cpuc.ca.gov/WORD_PDF/FINAL_DECISION/121450.pdf).

52. *See id.*

53. CAL. PUB. UTILS. COMM'N, REVENUE ALLOCATION AND RATE DESIGN, *supra* note 41, at 13. This assumes that the increased contribution to fixed costs exceeds the new fixed costs needed to serve EVs. This, in turn, depends on whether rate structures encourage off-peak EV charging.

54. Kristien Clement-Nyns et al., *The Impact of Charging Plug-In Hybrid Electric Vehicles on a Residential Distribution Grid*, 25 IEEE TRANSACTIONS ON POWER SYSTEMS 371, 371 (2010).

55. Cal. Pub. Utils. Comm'n, Order Instituting Rulemaking, *supra* note 25, at 10–11.

56. Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 14.

57. *See Kahn, supra* note 20, at 66–67.

58. Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 14.

59. *See* NAT'L RESEARCH COUNCIL, *supra* note 1, at 53.

60. *Id.*

61. For a general description of the benefits of dynamic pricing of electricity, see generally JOSKOW & WOLFRAM, *supra* note 48.

Because retail electricity prices are still fully regulated by government agencies in many parts of the country, variable pricing for EV charging will often require regulatory approval. Fully variable real-time electricity retail rates that track the highly variable wholesale electricity markets have not been widely adopted in the United States to date.<sup>62</sup> Less variable rate structures can still be used to send price signals, however.<sup>63</sup> Consumers could receive a couple of different electricity rates that encourage them to charge EVs during off-peak periods and discourage them from charging EVs during periods of peak demand.<sup>64</sup> The effectiveness of this incentive would depend on the difference between the electricity prices and the elasticity of the EV owner's demand.<sup>65</sup> Utility regulators should experiment with different rate designs to encourage off-peak charging in the early years of EV adoption. The rates could also apply to an entire residential home or just to an EV charging station.<sup>66</sup>

To enable variable pricing, a "smart meter" that collects real-time electricity usage data is necessary.<sup>67</sup> Modern smart meters usually enable two-way digital communication between the meter and the grid manager, which is required for the more sophisticated rate variations.<sup>68</sup> The average smart meter costs about \$150.<sup>69</sup> Enabling variable billing functionality also requires hardware and software systems at utilities and other grid managers.<sup>70</sup> Utilities across the country are gradually introducing smart meters to residential households,<sup>71</sup> because they suggest that smart meters help them provide more efficient and reliable service by eliminating the need for manual meter-reading and by allowing quicker responses to electricity outages.<sup>72</sup> Many utilities are also experimenting with time-of-use rates for entire households.<sup>73</sup> All utility ratepayers typically share the general costs of these smart grid investments.<sup>74</sup>

Utilities could install one smart meter and put the entire home on a variable electricity pricing rate.<sup>75</sup> It may be pref-

erable, however, to provide a specific charging rate to EVs, distinct from the rest of the household. This may enable EV specific demand response programs and V2G functions.<sup>76</sup> In order to apportion electricity to an EV and bill it distinct from other electricity uses, however, either a dedicated second electric meter or a submeter is necessary.<sup>77</sup> A submeter located on an EV charging station or inside of an EV itself could track electricity use directly attributable to an EV by serving as a subpart of the master meter, dedicated solely to tracking additional usage attributable to the EV (as opposed to the addition of a new, separate meter just for the EV, which would be parallel rather than part of the existing series).<sup>78</sup>

## II. Regulatory Treatment of Infrastructure Investments

This part examines how PUCs should treat the different infrastructure investments related to EV charging. Each category of infrastructure should be analyzed independently. Distribution and generation infrastructure can easily use existing regulatory processes, while charging infrastructure might be better left unregulated by PUCs. As this discussion indicates, PUCs may make these decisions on the basis of traditional utility regulatory goals or may attempt to incorporate non-traditional goals such as reducing greenhouse gas emissions or national oil dependence. The latter goals are difficult to incorporate into the utility regulatory process, but might potentially serve as tie-breakers when the traditional regulatory goals do not provide a clear direction.

### A. Electricity Distribution Infrastructure

In general, distribution infrastructure investments related to EVs should be treated the same as any other distribution upgrade. Distribution infrastructure is primarily owned by investor-owned utilities, which are subject to price regulation by state agencies, though in some cases the distribution infrastructure is owned by municipal government entities or cooperatively-owned utilities.<sup>79</sup> Traditionally, price regulation of the electricity industry has been justified by its classification as a natural monopoly.<sup>80</sup> It would be wasteful and inefficient to have two completely separate competing systems of electricity distribution.<sup>81</sup> Rather, the government has deemed that consumers are better served by giving one system a monopoly but having an expert government agency set price limits to guard against the monopolists' abuse of pricing power.<sup>82</sup>

Accordingly, distribution lines are investments in shared infrastructure, paid for by all utility ratepayers.<sup>83</sup> As a gen-

62. *Id.* at 3.

63. *Id.*

64. For example, a customer might pay 15 cents to use electricity from 7 am until 10 pm, and 5 cents to use electricity from 10 pm until 7 am. Thomas Gomez San Roman et al., *Regulatory Framework and Business Models for Charging Plug-In Electric Vehicles: Infrastructure, Agents, and Commercial Relationships*, 39 ENERGY POL'Y 6360, 6366 (2011).

65. CAL. PUB. UTILS. COMM'N, REVENUE ALLOCATION AND RATE DESIGN, *supra* note 44, at 26.

66. *Id.* at 30.

67. CAL. PUB. UTILS. COMM'N, THE UTILITY ROLE IN SUPPORTING PLUG-IN VEHICLE, *supra* note 28, at 7.

68. This theoretically could be accomplished without a smart meter, but with just an ordinary timer, if the whole house received charging service based on a time of use.

69. CAL. PUB. UTILS. COMM'N, THE UTILITY ROLE IN SUPPORTING PLUG-IN VEHICLE, *supra* note 28, at 7.

70. *Id.* at 26.

71. Joel B. Eisen, *Who Regulates the Smart Grid?: FERC's Authority Over Demand Response Compensation in Wholesale Electricity Markets*, 4 SAN DIEGO J. ENERGY & CLIMATE L. 101, 126 (2013).

72. Joel B. Eisen, *Smart Regulation and Federalism for the Smart Grid*, 37 HARV. ENVTL. L. REV. 1, 8 (2013).

73. *Id.* at 19.

74. Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 52.

75. CAL. PUB. UTILS. COMM'N, THE UTILITY ROLE IN SUPPORTING PLUG-IN VEHICLE, *supra* note 28, at 12.

76. *Id.* at 14–15.

77. *Id.* at 13.

78. *Id.*; CAL. PUB. UTILS. COMM'N, REVENUE ALLOCATION AND RATE DESIGN, *supra* note 41 at 34.

79. See Spence, *supra* note 14, at 131.

80. See KAHN, *supra* note 20 at 119–21.

81. *Id.* at 2.

82. RICHARD POSNER, ECONOMIC ANALYSIS OF LAW 461–62 (8th ed. 2011).

83. Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 52.

eral rule, even though it is more costly to provide electricity distribution service to some utility ratepayers (those in rural areas, for example) than others, most states spread the costs of the distribution system relatively evenly among various ratepayers.<sup>84</sup> Thus, residential customers generally pay the same rate for electricity distribution consumed, regardless of the actual cost to deliver electricity to their homes.

The general practice followed by many PUCs is that extensions of distribution infrastructure caused by new customer load are spread throughout the rate base, if that infrastructure serves multiple customers.<sup>85</sup> So, if a transformer in a local neighborhood needed an upgrade to accommodate EV charging in that neighborhood, all ratepayers throughout the utility service territory would bear that cost as part of the shared infrastructure of the utility system.<sup>86</sup> On the other hand, upgrades necessary in the customer's home to enable the delivery of additional voltage, such as a Level 2 charger, would traditionally be borne by the customer.<sup>87</sup>

One of the primary goals of any electricity rate design is fairness.<sup>88</sup> Thus, the costs of the distribution system are differentiated broadly based on customer class.<sup>89</sup> Ratepayers often are separated into classes of customers—residential, commercial, and industrial—who generally are apportioned their “fair share” of the total utility revenue requirement.<sup>90</sup> Generally, PUCs try to allocate costs to customers on the basis that they should pay for infrastructure that benefits them.<sup>91</sup> In many states, industrial and commercial customers have lower per-kilowatt hour rates than residential customers, in part because the costs of distribution infrastructure necessary to serve an average industrial customer are lower than the costs necessary to serve an average residential customer.

Therefore, EV ratepayers could conceivably constitute a separate class of customers with their own distribution service rate, distinct from other rate classes. It would be possible (though difficult) to attempt to account for the incremental distribution costs caused by EV owners as a class and to charge them higher rates for this additional investment.<sup>92</sup> At the same time, proper rate design would “align revenue col-

lection with cost causation.”<sup>93</sup> The application of this principle might mean that rates for EV charging should cover the costs of distribution infrastructure associated with serving additional EVs.<sup>94</sup> However, rate design itself might impact the amount of new infrastructure that is actually needed. If rates encourage electricity consumption at off-peak times, less infrastructure will be necessary.<sup>95</sup> Moreover, in practice, the aggregate electricity load that causes the need for new infrastructure is not just EVs, but the entire existing load. Accordingly, it is probably inappropriate to charge the “last to the system” customer—EV owners—for the entire cost of an upgrade caused by many customers.<sup>96</sup>

When allocating cost recovery for distribution system costs, a PUC should seek to treat EV charging demands the same as any other demand, be it for televisions or refrigerators or lighting. This treatment would minimize the potentially costly administrative and transaction costs of precisely accounting for the distribution infrastructure attributed to EV ownership, as well as promote EV adoption for one or more additional policy rationales outside of the traditional utility regulatory rationales.<sup>97</sup>

## B. Electricity Generation Infrastructure

Likewise, any additional electricity generation infrastructure needed to supply EVs can be accommodated by existing regulatory methods without significant changes to the status quo, regardless of whether a particular state's regulatory system allows for retail competition in electricity generation or whether it remains traditionally regulated as a vertically integrated monopoly.<sup>98</sup> Either way, new demand from EVs will trigger investment in new generation in the same manner as any other source of new electricity demand.

In states where electricity generation remains traditionally regulated, PUCs approve reasonable investments in new generation by regulated utilities to meet future expected demand.<sup>99</sup> These investments are often made after the utility, the regulators, and other interested parties engage in a complex planning process that attempts to estimate future electricity demand growth.<sup>100</sup> This planning process will need to include the best estimates of likely EV demand growth and expected times when EVs will be charged.<sup>101</sup> The amount of generation infrastructure needed to serve EVs will be impacted by whether the system can send price signals to customers to encourage off-peak EV charging.<sup>102</sup> This does

84. Jim Rossi, *The Common Law “Duty to Serve” and Protection of Consumers in an Age of Competitive Retail Public Utility Restructuring*, 51 VAND. L. REV. 1233, 1252–57 (1998).

85. See, e.g., Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 52; see also Pub. Util. Comm'n of Or., Order No. 12-013, Proceeding UM-146: Investigation of Matters Related to Electric Vehicle Charging, 5 (Jan. 19, 2012), available at <http://apps.puc.state.or.us/orders/2012ords/12-013.pdf> (ordering utilities to make revised tariff filings) [hereinafter Pub. Util. Comm'n of Or., Order No. 12-013].

86. Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 52.

87. CAL. PUB. UTILS. COMM'N, REVENUE ALLOCATION AND RATE DESIGN, *supra* note 41, at 18.

88. *Id.* at 9.

89. *Id.* at 8.

90. CAL. PUB. UTILS. COMM'N, REVENUE ALLOCATION AND RATE DESIGN, *supra* note 41, at 28–31.

91. *Id.* at 9. At the same time, rates can also be designed to incentivize certain behavior that benefits all rate cases—such as improving energy conservation, generally, or shifting energy use to times when infrastructure is generally less used. *Id.* at 16.

92. The difficult accounting challenges associated with this task would likely require a number of assumptions which might be challenged—potentially creating significant new transaction costs in utility rate-making proceedings.

93. Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 14.

94. CAL. PUB. UTILS. COMM'N, REVENUE ALLOCATION AND RATE DESIGN, *supra* note 41, at 33.

95. Cal. Pub. Utils. Comm'n, The Utility Role in Supporting Plug-In Vehicle, *supra* note 28, at 5.

96. Pub. Util. Comm'n of Or., Order No. 12-013, *supra* note 85, at 15.

97. See Part II.C.2.

98. See, e.g., P. Jason Stephenson & Claudia Earls, *Can MISO Attract Investment?*, INFRASTRUCTURE (2012), available at [http://www.americanbar.org/publications/infrastructure/2012\\_13/fall/can\\_miso\\_attract\\_investment.html](http://www.americanbar.org/publications/infrastructure/2012_13/fall/can_miso_attract_investment.html).

99. See *id.*

100. See *id.*

101. Pub. Util. Comm'n of Or., Order No. 12-013, *supra* note 85, at 16–18.

102. NAT'L RESEARCH COUNCIL, *supra* note 1, at 53.

not necessarily require any special treatment of EV caused generation as opposed to generation caused by any other type of demand.<sup>103</sup> In general, all new demand will force new infrastructure investments in generation in the same manner.

In states that allow for competitive suppliers of electricity, new demand for EVs should also be treated like any other source of new demand. If EV demand merits new investment in generation, market forces will theoretically drive market participants to invest in new generation.<sup>104</sup>

### C. Public Charging Stations

Public charging stations present more difficult questions of ownership and cost-allocation for PUCs. There are a number of broad options for structuring ownership and cost-recovery for this infrastructure. Public charging stations could be: (1) owned by a government entity, with the costs borne by taxpayers or by EV users;<sup>105</sup> (2) owned by a private but regulated monopoly utility, with the costs shared by all utility ratepayers or allocated specifically to EV owners who use the stations;<sup>106</sup> or (3) owned by private entities not subject to retail price regulation.<sup>107</sup>

A combination of these options also is also possible. For example, private utilities could own and regulate public charging stations, while other market entrants could also sell electricity in competition with the utilities.<sup>108</sup>

### I. Traditional Utility Regulatory Policy Norms and Public Charging Stations

As Alfred Kahn has remarked, “[t]he determination of whether unregulated competition is the best device for

achieving economically efficient pricing and, if not, what controls ought to be imposed can be made only on the basis of an appraisal of the particular technological and economic circumstances of each individual case.”<sup>109</sup> The existence of a natural monopoly constitutes the primary justification for a regulated utility’s ownership of an asset.<sup>110</sup> A group of researchers recently argued that in certain instances, public charging stations should be considered natural monopolies and therefore owned by electricity distribution utilities.<sup>111</sup> They claim that charging stations in public parking areas and public streets are public goods that should be universally available to all EV owners.<sup>112</sup> Accordingly, they do not believe that an unregulated company should be able to monopolize such limited resources.<sup>113</sup> Their justification is that:

Charging stations and charging points being a crucial part of the infrastructure, the same justification for regulating these as monopolies applies as for other parts of the distribution and transmission networks. Once being installed, charging infrastructure in connection with low voltage or medium voltage distribution networks, the investment for parallel infrastructures is economically unattractive for any potential competitors.<sup>114</sup>

They also assert that charging stations in public spaces will be more expensive than other charging stations and that this favors cost-recovery by regulated utilities.<sup>115</sup>

This natural monopoly argument is ultimately unconvincing. Although electricity distribution infrastructure is properly considered a natural monopoly, charging infrastructure alone does not exhibit natural monopoly characteristics.<sup>116</sup> Building a public charging point is not a network industry with infrastructure costs so high that it would be inefficient to have redundant systems.<sup>117</sup> To the contrary, 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, or other attributes.<sup>118</sup> The lack of a natural monopoly over charging stations becomes particularly evident when one considers EV charging stations as merely one type of option in the broader vehicle refueling market. A PHEV owner can choose to fuel her vehicle at a charging station, but can also choose a gasoline service sta-

103. *Id.*

104. See, e.g., Stephenson & Earls, *supra* note 98.

105. Some municipalities have built publicly owned charging stations that either provide electricity for free or for sale to EV owners. For example, Ann Arbor, MI installed EV charging stations and provides electricity service for free, while Grand Rapids, MI installed EV charging stations and charges an additional \$0.50 per hour surcharge in addition to regular parking fees. CLEAN ENERGY COALITION, PLUG-IN READY MICHIGAN, *supra* note 26 at 85–91.

106. Even in states which make electricity sales competitive to retail customers, distribution infrastructure is still regulated in a traditional cost-of-service manner. Charging stations could be deemed to be part of the electricity distribution infrastructure.

107. Private businesses may provide electricity to their employees or customers—either for sale or for free. For example, Walgreens announced in mid-2011 that it would add charging stations at over 800 store locations around the U.S. Leslie Guevarra, *Walgreens to Install EV Charging Stations at 800 Stores*, GREENBIZ (July 21, 2011), <http://www.greenbiz.com/news/2011/07/21/walgreens-install-ev-charging-stations-800-stores>. Specialized charging infrastructure firms may also contract to provide charging stations. For example, a private company called Coulomb Technologies has created a franchised system that provides charging management services to independently owned charging stations. *Program Info*, CHARGEPOINT AMERICA (2013), <http://chargepointamerica.com/program-info.php>. Typically, a portion of the fees collected per session will go to ChargePoint, while the rest will go to the owner such as the private entity or the municipality. For example, the City of Novi, Michigan charges \$3.00 per charging session at city-owned charging stations. Of this, \$0.73 goes to ChargePoint for authorization and processing fees. *Agenda Item H, Regular Hearing of the Council of the City of Novi* (June 6, 2011), available at <http://www.cityofnovi.org/Resources/Library/Minutes/Council/2011/110606/H-ApprovalofresolutiontoseffeesforElectricVehicleChargingStations.pdf>.

108. REGULATORY ASSISTANCE PROJECT, *ELECTRICITY REGULATION IN THE U.S.: A GUIDE* 13 (2011).

109. See KAHN, *supra* note 20, at xxxii, 177.

110. REGULATORY ASSISTANCE PROJECT, *supra* note 108, at 3–4.

111. Thomas Gomez San Roman 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) (the authors do see a role for third-party electricity service stations on privately owned property).

112. *Id.*

113. *Id.*

114. *Id.* at 6367 n. 17.

115. *Id.* at 6363.

116. Whether something is deemed a natural monopoly or an industry where competition can provide efficiency will always be a matter of degree. No industry is a complete natural monopoly. Even the electricity distribution system is subject to competition from electricity which can be generated by customers themselves or from non-electric sources of energy.

117. See generally KAHN, *supra* note 20, 119–21.

118. *Id.* at 95–96.

tion and possibly even a biofuel service station if the vehicle is capable of burning biofuel.<sup>119</sup>

In addition, monopoly utilities' special duty to serve all customers in a defined geographic area does not provide a basis for utility ownership of EV charging stations. The duty to serve is an important requirement traditionally placed on regulated utilities in exchange for their monopoly status.<sup>120</sup> It requires utilities to provide service to every residence and business, regardless of whether or not it is profitable for the utility to do so.<sup>121</sup> It has been justified based on the notion that access to grid-based electricity is fundamentally important for every citizen and business.<sup>122</sup> The duty also grows from the nature of the "regulatory compact," which grants a monopoly to a private corporation partly in exchange for extraordinary service requirements.<sup>123</sup> Although one could argue that access to vehicle fuel is also important, there is no problem of inability to access EV fuel. An EV by its nature can travel to a number of distribution locations to refuel. Electricity is ubiquitous in the United States. Fuel can be made available in a number of manners: by third-party charging stations, at the EV owners' residence, or through gasoline stations for PHEV owners.<sup>124</sup> This distinguishes access to an EV fueling point from access to an electric distribution grid altogether.<sup>125</sup>

Once the natural monopoly rationale is rejected, the case for exclusive utility ownership of public charging stations becomes much more difficult to make. Oregon utilities have argued that the EV charging stations are analogous to public street lighting—a broad public good, the costs for which are appropriately shared among the entire rate base of a utility.<sup>126</sup> This analogy is inappropriate because unlike streetlights, EV charging stations are unlikely to be used by the majority of utility ratepayers in the near future.<sup>127</sup> It is true that street lighting systems might disproportionately benefit some residents who live or work near the lights than others, but the benefits of streetlights are much more broadly shared than the benefits of EV charging infrastructure.<sup>128</sup> Perhaps more importantly, it is very difficult to allocate the costs of streetlights to an individual consumer in any manner other than

an equal share per broad geographic area.<sup>129</sup> In the case of EV charging stations, however, an individual vehicle owner can easily be independently billed for the electricity services she uses to charge her vehicle.<sup>130</sup>

Utilities may argue that they can save costs by bulk purchasing charging equipment, but so could large third party charging service providers.<sup>131</sup> This is an empirical question on which there exists little direct evidence.<sup>132</sup> In general, a market mechanism for reducing costs is probably more appropriate than a price regulated model in the absence of a natural monopoly.<sup>133</sup> Utility ownership generally tends to reduce competitive cost pressures and innovation in comparison to a competitive EV charging market.<sup>134</sup>

California utilities have argued that utility ownership of charging equipment might promote safer use given the utility's expertise in electricity systems,<sup>135</sup> but this rationale is not ultimately convincing. If safety is otherwise sufficiently regulated by building codes and licensing requirements for installers, the safety expertise of utilities is superfluous.<sup>136</sup> Utilities do not own every piece of electricity charging infrastructure in private homes and businesses, and it operates with a seemingly sufficient level of safety.

One might argue that providing public charging stations benefits the electricity system overall because they enable and encourage more EVs and electricity demand, which theoretically benefits all utility ratepayers. The increased demand from EVs enables shared fixed infrastructure investments to be spread among more users.<sup>137</sup> Indeed, adding new customers for electric utilities has long been a policy goal for PUCs.<sup>138</sup> These benefits could be estimated, though, and it is unlikely in the near-term that it would be cost beneficial for the entire electricity rate base to bear the cost of investing in public EV charging stations.<sup>139</sup> Indeed, the net benefits to non-EV owners may not even outweigh the additional investment needed to meet potentially new peak demands caused by EVs.<sup>140</sup> If anything, public charging stations are more likely to exacerbate the peak demand infrastructure issues that EVs might

119. *Id.* It also is not clear that space in public places (presumably city centers) is extraordinarily scarce. There are a number of potential locations where an EV could be charged in a manner that is open to the public. Even in very crowded city centers, there are many privately owned options for locating charging infrastructure—in garages, in employee parking lots, on city streets, etc. In addition, parking locations that are publicly owned by government entities can be leased to provide EV charging equipment, which is owned and maintained by private, non-utility providers. See CAL. PUB. UTILS. COMM'N, DECISION IN PHASE 1, *supra* note 51, at 18–20.

120. Rossi, *supra* note 84, at 1244–52.

121. *Id.* at 1239.

122. *Id.* at 1249.

123. *Id.* at 1269 (describing how monopolies would have market power to charge extraordinary rates unless required to serve all at regulated rates).

124. Some tenants may not be able to access, but this doesn't seem to warrant utility ownership of public charging stations.

125. There may be some individuals—such as renters in large apartment complexes—who have significant difficulty charging at their place of residence. But EV owners in such situations would still have options to contract with someone who has access to electricity for a plug.

126. Pub. Util. Comm'n of Or., Order No. 12-013, *supra* note 85, at 9.

127. *Id.* at 9–10.

128. *Id.*

129. *Id.*

130. Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 32–33.

131. *Id.* at 49.

132. *Id.*

133. See KAHN, *supra* note 20, at 160. (“[T]he important stimulus that price competition imparts to keeping companies on their toes, energetic in cutting costs, enterprising in experimenting with price reductions, innovative in service.”)

134. See Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 49.

135. *Id.*

136. See *id.*

137. CAL. PUB. UTILS. COMM'N, REVENUE ALLOCATION AND RATE DESIGN, *supra* note 41 at 13.

138. Sometimes regulators even approve discounted economic development electric rates that are below the costs of service for large industrial ratepayers, on the theory that some new load (and revenue) is better than none. This rationale does not appear to be as relevant in the EV context. It does not seem likely that EV purchasing decisions will ultimately depend on whether or not a slight electricity rate discount may be provided.

139. Cf. Thomas P. Lyon et al., *Is “Smart Charging” Policy for Electric Vehicles Worthwhile?*, 41 ENERGY POL'Y 259, 266–67 (2012) (estimating that the savings to the electricity system from smart charging of electric vehicles do not currently justify subsidies for advanced metering infrastructure or Level 2 charging stations).

140. *Id.*

cause.<sup>141</sup> Public charging stations seem most likely to be used during the work day, which in many parts of the country coincides with times of peak demand, particularly when the weather warrants air conditioning usage.<sup>142</sup>

The ability to influence the time of EV charging through price signals may be easier if a single monopoly provided all retail electricity.<sup>143</sup> The ability to manage EV charging times is in all ratepayers' interests—it encourages a more efficient use of fixed infrastructure and foregoes the need to build new peaking capacity.<sup>144</sup> Utility ownership of public charging stations could therefore provide a higher degree of direct regulatory control over retail EV charging rates than merely allowing third parties to compete to provide charging services.<sup>145</sup> If electricity is provided by third party service stations or other businesses, they may not seek to pass high on-peak prices or low off-peak prices to consumers. Some entities may provide a flat fee for charging. Others may provide charging services at no fee as a way of attracting business.

This presents a relatively weak potential justification for monopoly ownership, however, and it does not ultimately justify moving to a system of mandatory retail price regulation of public charging infrastructure. The new electricity demand added by EVs during periods of peak load is not likely to be significant unless EVs become significantly widespread.<sup>146</sup> This is because even very high concentrations of EVs will ultimately still be a relatively small source of demand on the electricity grid overall.<sup>147</sup> Accordingly, even though there may be some argument for requiring regulated time-of-use pricing for EVs, the scale of the benefit is not sufficient to justify this intervention. Just as PUCs do not generally require time-of-use electricity pricing for other high-electricity appliances such as air conditioning units or electric dryers,<sup>148</sup> it is probably not necessary to single out EVs for required time-of-use pricing.

Ultimately, at this early stage of the EV charging industry, it is probably better to allow experimentation with different electricity pricing models, both for wholesale and retail supply, than to allow restrictive government control of rates. This is true even if it might lead to some inefficient uses of electricity generating resources. As Stephen Breyer advised in his well-known book, *Regulation and Its Reform*,

141. *See id.*

142. Moreover, the system-wide benefits of EVs will presumably accrue no matter what entity actually owns and operates a public charging station. If third-party operators build charging stations rather than utilities, ratepayers everywhere will still benefit from the increased ability to spread fixed costs.

143. *Electric Vehicle Charging Rates*, INST. FOR LOCAL SELF-RELIANCE (Jan. 19, 2010), <http://www.ilsr.org/rule/plug-in-electric-vehicles/2942-2/>.

144. If V2G becomes economically viable, EVs may also be able to serve valuable frequency regulation and demand response functions—lowering the costs of balancing supply and demand and enabling even more intermittent generation resources like wind and solar power to be integrated into the system.

145. It may also be true that utility ownership of public charging stations makes aggregating a large number of EVs easier for V2G purposes. Because, however, most V2G applications seem uneconomic or unlikely due to manufacturing warranty issues, this is not an overwhelming factor in favor of utility ownership.

146. NAT'L RESEARCH COUNCIL, *supra* note 1, at 53 (estimating that "the peak loading issue until 2035 is unlikely to be a problem overall.").

147. *See MELAINA, supra* note 6, at 54.

148. *How Does a Time-of-Use Program With the Power Company Work?*, TLC, <http://tlc.howstuffworks.com/home/question305.htm> (last visited July 21, 2013).

It should be painfully apparent that whatever problems one has with an unregulated status quo, the regulatory alternatives will also prove difficult. Before advocating the use of regulation, one must be quite clear that the unregulated market possesses serious defects for which regulation offers a cure. . . . [C]lassical regulation ought to be looked upon as a weapon of last resort. The problems accompanying classical regulation would seem sufficiently serious to warrant adopting a "least restrictive alternative" approach to regulation. Such an approach would view regulation through a procompetitive lens. It would urge reliance upon an unregulated market in the absence of a significant market defect. Then, when the harm produced by the unregulated market is serious, it would suggest first examining incentive-based intervention, such as taxes or marketable rights, or disclosure regulation, bargaining, or other less restrictive forms of interventions before turning to classical regulation itself. It would urge the adoption of classical regulatory methods only where less restrictive methods will not work.<sup>149</sup>

At this point, the development of the EV infrastructure market is better left to an unregulated approach than to a regulated market. The virtues of the competitive marketplace, in Breyer's words,

include the market's tendency to minimize economic waste by allowing for continuous individual balancing of economic costs and benefits by consumers and producers, the carrot-and-stick incentive the market provides for greater efficiency in production methods, and the incentives it provides for innovation and the channeling of innovation into socially desirable directions. In achieving these ends, competitive markets reduce the need for the central collection of information. Price signals allow producers and consumers to adapt quickly to change. The impersonality of the decision-making process in competitive markets prevents those injured in the process (because, for example, their goods are no longer in demand) from obstructing change. To these advantages may be added a competitive market's tendency to decentralize power and to make decision that are "fair" in the sense of being impersonal.<sup>150</sup>

Perhaps the most cost effective way to provide EV charging will ultimately be to bundle it with other services, such as gasoline stations providing fast charging stations, or perhaps it will be best provided at workplaces. At this point, a system of regulated utility ownership of a resource that is not a natural monopoly would likely do more harm than good.<sup>151</sup>

In addition, if EV charging is offered by non-utilities, the price signals from higher peak periods in wholesale electricity markets are still likely to be felt to some degree within the broad electricity market.<sup>152</sup> This is particularly true if the

149. STEPHEN BREYER, *REGULATION AND ITS REFORM* 184–85 (1982).

150. *Id.* at 186 (1982); *see also* KAHN, *supra* note 20, at 160 ("The important stimulus that price competition imparts to keeping companies on their toes, energetic in cutting costs, enterprising in experimenting with price reductions, innovative in service.").

151. *See id.* at 112.

152. *See* FED. ENERGY REGULATORY COMM'N, *ENERGY PRIMER: A HANDBOOK OF ENERGY MARKET BASICS* 37 (2012).

rates charged to EV service providers are set by contract or by reference to competitive wholesale markets, but it is even true if the rates charged to EV service providers are regulated.<sup>153</sup> For example, in non-residential areas, the California Public Utilities Commission (“CA PUC”) has authorized non-utility EV charging service providers to pay the rates generally applicable to commercial customers.<sup>154</sup> In California, commercial rates are generally variable by the time of use, which sends a price signal to encourage off-peak consumption and discourage on-peak consumption.<sup>155</sup> Commercial rates also include a demand charge that helps pay for the costs of peak generation infrastructure.<sup>156</sup> When considering whether to further regulate retail EV charging rates, the CA PUC balanced a number of factors, including the needs to recover costs of providing the service, to keep rates simple, to enable customer choice with respect to rate options and metering arrangements, and to ensure a price signal existed that reflected the higher cost of service for providing on-peak vs. off-peak power.<sup>157</sup> Ultimately, it determined that the third-party provider could balance the time-of-use charging prices however it wanted.<sup>158</sup> It could pass through some or all of the costs, but the price signal should still ultimately impact charging behavior.<sup>159</sup> Moreover, allowing freedom to set prices encourages experimentation with rates as the EV charging industry develops.<sup>160</sup> The market might therefore help to determine optimal charging-rate structures.<sup>161</sup>

The California solution of allowing non-utility sellers of electricity to experiment with retail-rate structures is probably a sound one at this early stage of EV development, but it still has potential risks that PUCs should monitor. Efficient price signals may not reach retail EV owners because not all parties in the electricity market necessarily have incentives to encourage efficient use of infrastructure. Traditional rate regulation creates an incentive structure, known as the Averch-Johnson effect, which leads utilities to seek to over-invest in capital expenditures for which they earn a rate of return.<sup>162</sup> Supporters of widespread EV charging stations

might welcome this incentive for other policy reasons,<sup>163</sup> as it may encourage utilities to invest in capital infrastructure like charging stations themselves.<sup>164</sup> This incentive, however, might also have other distortions with respect to EV charging stations. For example, it might mean that regulated utilities will choose to build overly capital-intensive charging stations, or acquire overly expensive land for charging stations.<sup>165</sup> This might lead to charging services (or electricity service more broadly, depending on how PUCs allocate the rates) that are more expensive than they need to be.<sup>166</sup> The Averch-Johnson effect also creates a disincentive for the utility to provide service to competitive EV chargers with whom the utility might be competing to provide public charging services.<sup>167</sup> If sales to EV charging stations are regulated as monopoly retail rates, utilities still have a duty to serve all customers. However, utilities may seek to propose rate structures which disadvantage competitors. If sales to EV charging stations are regulated as wholesale rates, a competitive EV charging station would likely have the option to purchase electricity from other providers in wholesale electricity markets. Even if a utility sold electricity to a non-utility EV charging station, the utility may desire to use a rate that does not differentiate based on time of use, if the utility believes that doing so might create an incentive for the utility to eventually build more generating capacity.<sup>168</sup> It would then be up to the utility regulator to determine whether that non-time differentiated rate is justified.<sup>169</sup>

The Averch-Johnson tendencies raise the question of whether regulated utilities should be prohibited from owning EV charging stations altogether. On the one hand, vertical integration of different aspects of the value chain of electricity provision may bring efficiencies and promote competition if utilities can effectively compete in the EV charging market.<sup>170</sup> For example, large integrated companies generally have superior ability to raise inexpensive capital in capital markets.<sup>171</sup> Utilities likely can borrow money to build charging station networks at lower interest rates than a small startup could, potentially lowering the costs of charging stations for customers. On the other hand, when competition exists in the presence of a preexisting monopoly power, there is a chance that the monopoly will use its position to unfairly compete with new entrants.<sup>172</sup> In some cases, mixed systems that have

153. *See id.*

154. Cal. Pub. Utils. Comm’n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 26. The legality of this rate order is in question. Most wholesale transactions of electricity in the U.S. are regulated exclusively by FERC. *See* Part III.B.

155. Cal. Pub. Utils. Comm’n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 28.

156. *Id.*

157. *Id.* at 26.

158. *Id.* at 26–27.

159. *Id.* at 27–28.

160. However, because the U.S. system currently includes so many different regulated utilities in different states, as well as non-regulated municipal utilities, a significant amount of rate experimentation may occur even if EV rates were regulated fully. *See, e.g.,* ALANA CHAVEZ-LANGDON & MAUREEN HOWELL, U.S. DEPT OF ENERGY, AWARD #DE-EE0002194, ECOTILITY NORTH AMERICA, LESSONS LEARNED—THE EV PROJECT: REGULATORY ISSUES AND UTILITY EV RATES (Oct. 16, 2013), available at <http://www.theevproject.com/cms-assets/documents/103425-835189-ri-2.pdf> (detailing a wide variety of EV rate structures currently being implemented by regulated utilities).

161. Cal. Pub. Utils. Comm’n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 27–28.

162. Regulated utilities earn authorized rate of return on capital investments such as distribution wires or power plants that are deemed reasonable and prudent by regulators. Because regulated utilities are typically granted monopoly status, this financial incentive to make capital investments allegedly gives utilities an

incentive to over-invest in capital projects from an optimal perspective. KAHN, *supra* note 20, at 49–54.

163. *See infra* Part II.C.2

164. That is, so long as utilities believe their regulators will approve those costs and roll them into general utility rates.

165. KAHN, *supra* note 20, at 53.

166. *Id.*

167. *Id.* at 54, 263–64.

168. KAHN, *supra* note 20, at 50 (noting “[t]he resistance of many public utility companies to full peak-responsibility pricing, which would tend to hold down the expansion of demand at the peak and the consequent justification for capacity” and a utility’s “willingness to maintain a large amount of standby capacity, in excess of peak requirements”).

169. *Id.* at 56–57 (discussing the effectiveness of such regulatory actions in limiting the Averch-Johnson effect).

170. *Id.* at 260–61.

171. *Id.* at 261 n.22.

172. *Id.* at 257–58.

competition between regulated and non-regulated service providers “may be the worst of both possible worlds.”<sup>173</sup>

Alfred Kahn has described some of the “host of distortions” this situation presents.<sup>174</sup> Some of these distortions can hamper price-regulated utilities from effectively competing with unregulated competitors.<sup>175</sup> These distortions can be mitigated by allowing regulated utilities more flexibility to set prices for EV charging.<sup>176</sup> But many distortions in markets with mixed competition and regulation might unfairly favor the regulated utilities.<sup>177</sup> What is truly unfair is obviously a normative consideration. Utilities might attempt to use their monopoly position to charge unfairly high rates to certain consumers who are unlikely to choose a competitive supplier.<sup>178</sup> This might be particularly concerning for residential EV charging. At the same time, regulated utilities also have incentives to provide very low prices (perhaps even unprofitable prices in a narrow sense) to customers more susceptible to using competitive suppliers.<sup>179</sup> This might be the case with public EV charging stations. This might be a positive result for consumers or society at large; it may lower the costs of providing service for everyone in some circumstances.<sup>180</sup> However, this kind of pricing can also act

as a merely predatory way to drive out competitors and then raise prices, which would have a negative long-term impact on consumers.<sup>181</sup>

At the current stage of the EV charging market, it is probably too early to say *a priori* what will likely occur in a mixed competitive marketplace. Utility regulators and policymakers should keep a close eye on the market as it emerges, but perhaps the best way to understand the market, and any potential market failures or distortions, is to let the market operate.<sup>182</sup>

Accordingly, at this point it is not prudent to *prohibit* a potential supplier of charging services like an electric utility from providing public charging services, just as it is not prudent to require utilities exclusively to provide these services. At the same time, the provision of EV charging stations might be better structured as a non-regulated subsidiary business of a holding company that owns a public utility.<sup>183</sup> This would allow utility holding companies to participate in the market if they can effectively compete and charge whatever price they prefer,<sup>184</sup> but would mitigate some of the distortions that might arise if charging station infrastructure passed through into the general utility rate base.<sup>185</sup> If utilities begin to unfairly use their market power, competitors can seek the protection of antitrust law.<sup>186</sup>

Ideally, charging service providers will receive price signals from the wholesale electricity market that correspond to the short-term marginal cost of production of electricity.<sup>187</sup> But practically, it may be difficult to pass through these costs indiscriminately to retail consumers. Marginal production costs vary from minute to minute, creating costly transaction costs of ever-changing price schedules, and adding significant information-gathering costs on potential buyers to minimize prices.<sup>188</sup> Accordingly, simplifying prices may make a retailer more attractive to consumers. Competition is prob-

173. KAHN, *supra* note 20, at xxxv.

174. *Id.*

175. *Id.* The author notes that regulated utilities typically

- set prices on the basis of average system-wide costs—which means in some markets above cost, and therefore, subject to competitive invasion, and in some others below, in a continuing effort to practice internal subsidization;
- sell both old and new services only under preapproved, posted tariffs, from which they are forbidden to depart except with the permission of the regulatory agency, while their competitors are subject to no such constraints;
- price on the basis of original or book costs that often far exceed the short- and long-run marginal costs of both the regulated companies themselves and their unregulated rivals, because they contain a very large component of capital carrying charges on investments grossly overvalued on their books—whether because of inadequate past depreciation rates . . . or because of the recent entry into rate base of generating stations whose costs far exceed the minimum cost of duplicating the service and/or that have saddled the companies with excess capacity, [. . . and]
- price their competitive services on the basis of full cost distribution or allocations that have nothing to do with their marginal costs[.]

*Id.*

176. *See supra* note 112 and accompanying text.

177. *See KAHN, supra* note 20, at xxxiv–xxxv.

178. *See id.* at 159 (“The fact that most public utility companies are physically linked to their customers in the supply of an essential service—the very fact that makes monopoly ‘natural’ because it is usually inefficient to have more than one company linked in this way to customers in a particular area and because increasingly intensive use of that link involves decreasing unit costs—ties customers to them and makes those customers potentially victims of exploitatively high prices.”).

179. *Id.* at 162 (“As long as a public utility can take business away from its competitors at rates that cover long-run incremental costs for that business, both efficiency in the performance of the public utility function and the interest of all rate-payers recommend its being permitted to do so, all other things being equal.”).

180. *Id.* at 174. (“Where the competitive necessity for the selective rate reductions to particular customers merely reflects the latter’s ‘natural advantages,’ the reductions should be permitted, even though customers less well situated may have to pay higher rates relative to the marginal costs of serving them and some inefficiency may be introduced. Examples of such natural advantages would be those enjoyed by customers located on a river route, where the average total costs of water transportation are less than the average total costs of rail; or by customers supplied by a local producer (for example, of brick) whose costs of production can be successfully competed with by distant suppliers (for instance, of building stone) if the latter are charged transport rates below average total but above LRMC; or perhaps by homeowners in the process of deciding on a new heating system, who have the opportunity to install oil at favorable

rates; or by large users of communications services who have a choice of installing their own, private microwave systems.”).

181. *Id.* at 176.

182. *Id.* at 176–77 (2d ed. 1988) (“There remains the possibility that although it may be more efficient for society, in the static sense, to permit a public utility company to take the business away from its rivals by reducing rates on competitive services to marginal costs, there may be some dynamic loss if the result is the elimination of those competitors. . . . Yet it remains a possibility that preserving the competitor and the stimulus to [the utility’s] performance of its continued presence might in the long run contribute sufficiently to a greater and more varied innovation, to continual improvements in the industry’s service and efficiency to outweigh the static welfare loss in keeping it alive. This assessment could only be made in each particular instance, considering all the alternatives available to customers . . . and the presence of other sources of competitive pressures and innovation. However, economists would probably agree that anyone arguing merely to protect a competitor from extinction would have to sustain a very heavy burden of proof before they would be convinced that the way to preserve competition and its advantages is to restrict it.”).

183. *See Pub. Util. Comm’n of Or., Order No. 12-013, supra* note 85, at 7.

184. If a utility attempts to provide non-rate regulated EV charging services, it might require a statutory change to state public utility code. *See, e.g., id.*

185. If utility ownership of EV charging stations was regulated by state commissions, it would probably behoove commissions to ensure that the rate was a mere *maximum*, as opposed to minimum rate. This would allow utilities to lower prices if they like, and might even serve as an anchor to the market in a way that protected consumers from excessive rates.

186. *See* 15 U.S.C. §45 (1982).

187. *See KAHN, supra* note 20 at 66–67.

188. *Id.* at 84.

ably the best mechanism determine the optimal method for this simplification.<sup>189</sup>

## 2. Consideration of Non-Traditional Utility Regulatory Policy Goals

Thus far, the analysis of how public charging stations should be regulated has focused on the traditional goals and analysis used in the economic price regulation of electric utilities.<sup>190</sup> Public utility regulation, as it has developed in the United States over the past one hundred years, focuses primarily on balancing the interests of utility shareholders to earn rates of return on their investment in capital expenses with the interests of utility ratepayers in low electricity prices.<sup>191</sup> Rather than directly considering and balancing externalities like environmental damage caused by electricity generation, PUCs generally defer to environmental regulators and pass through the costs of mandatory environmental regulations to utility ratepayers.<sup>192</sup>

In addition to their traditional regulatory goals of equitably balancing the interests of utility shareholders against utility ratepayers in setting electricity rates, however, PUCs might also consider additional policy goals with respect to their EV-related policy.<sup>193</sup> For example, the CA PUC, in a recent decision on EV infrastructure, explicitly stated that a number of policy goals guided its discretion:

- (1) “Ensure that consumer experiences with Electric Vehicles are overwhelmingly positive;”
- (2) “Promote Electric Vehicle cost reductions such that they are cost competitive with conventional vehicles;”
- (3) “Integrate Electric Vehicle charging smoothly into an increasingly clean, efficient, reliable, and safe electricity grid;”
- (4) “Advance energy security, air quality, climate change, and public health goals;”
- (5) “Take early strategic action to promote Electric Vehicle-related job creation and economic benefits in California;”
- and (6) “Facilitate mainstream adoption of Electric Vehicles.”<sup>194</sup>

Some of the goals the CA PUC considered are direct policy goals, such as combating climate change.<sup>195</sup> Others are more indirect, such as ensuring that consumer experiences

189. *Id.* at 133.

190. *See supra* Part II.

191. TOMAIN & CUDAHY, *supra* note 13, at 173–74, 181–84.

192. Externalities like environmental impacts are usually considered by utility regulators only to the extent they pose financial risks to utility investments. *Grand Council of the Crees (of Quebec) v. Fed. Energy Regulatory Comm’n*, 198 F.3d 950, 957 (D.C. Cir. 2000).

193. This may require amendments to state legislation. *See, e.g.*, California Public Utilities Code §740.3, which requires the Commission to “evaluate and implement policies to promote the development of equipment and infrastructure needed to facilitate the use of electric power and natural gas to fuel low-emission vehicles.” The Commission is required to ensure that the costs and expenses of any authorized programs are not passed through to electric or gas ratepayers unless the commission finds and determines that those programs are in the ratepayers’ interest. California Public Utilities Code §740.2 directs the Commission to establish rules to enable the widespread use of electric vehicles consistent with the state’s statutory climate change mitigation goals.

194. Cal. Pub. Utils. Comm’n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 5–6. The Commission also noted, “Of course, we also weigh prospective policies for Electric Vehicles in the context of our responsibility to ensure just and reasonable utility rates.” *id.* at 6.

195. *Id.* at 34.

with EVs are positive—which, in the eyes of the CA PUC (or perhaps the California legislature), must lead to some sort of benefit for Californians.<sup>196</sup> It is conceivable that if these goals are considered, PUCs might reach different decisions regarding whether EV charging stations should be regulated as traditional utility infrastructure or subsidized by general electricity rates.<sup>197</sup> For example, a utility regulator might seek to broadly subsidize the EV industry because the existing market does not account for some of the positive externalities of EVs. That regulator may seek to take advantage of the Averch-Johnson incentive and allow utilities to put charging station infrastructure into general rates, paid for by all electricity ratepayers. Alternatively, the regulator seeking to promote EVs might find that a robust EV charging network is best served by allowing free competition at this stage. Accordingly, PUCs should determine whether and how they wish to weigh these considerations.<sup>198</sup>

Before considering whether PUCs should attempt to incorporate these policy goals in their decisions relating to EV infrastructure, this Article will first examine the most often-cited direct benefits of EVs. A widespread shift from internal combustion engine to EVs would obviously result in a substitution of electricity for gasoline as a vehicle fuel.<sup>199</sup> This shift could have a number of potential benefits for the United States.

### a. Economic Impacts of Reduced Petroleum Imports

Reducing the amount of gasoline Americans consume would likely significantly reduce wealth transfers from the United States to foreign nations. In recent years, the United States has imported approximately half of its petroleum needs.<sup>200</sup> These imports comprised approximately \$327 billion in 2011, or 58% of our nation’s total trade deficit.<sup>201</sup> Electricity, by contrast, is produced overwhelmingly in the United States with domestic fuels such as coal, natural gas, and renewable fuels.<sup>202</sup>

Second, retail electricity prices have been more stable than gasoline prices, so a switch to EVs could significantly reduce fuel price volatility. Oil prices have fluctuated widely in recent years.<sup>203</sup> The oil market has recently been operating with minimal spare capacity, which means there is little

196. *Id.* at 57.

197. *Id.* at 59.

198. Depending on the interpretation of the utility regulatory statutes in any given state, it may not be permissible for a state utility regulator to weigh these non-traditional goals. Accordingly, doing so would require a legislative change.

199. NAT’L RESEARCH COUNCIL, *supra* note 1, at 1.

200. U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2013, *supra* note 2, at 96.

201. DIPLOMATIC COUNCIL ON ENERGY & SECURITY & SECURING AMERICA’S FUTURE, OIL AND THE TRADE DEFICIT: RISING ENERGY EXPENDITURES AND U.S. ENERGY SECURITY 5 (2012), available at <http://www.secureenergy.org/sites/default/files/DCES-Oil-and-the-Trade-Deficit.pdf>.

202. Ronald Minsk et al., *Plugging Cars Into the Grid: Why the Government Should Make a Choice*, 30 ENERGY L.J. 317, 360 (2009). Petroleum is no longer widely used to produce electricity in the United States. U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2013, *supra* note 2, at 148.

203. *See* Minsk et al., *supra* note 202, at 318.

back-up supply that can be quickly ramped up in the event of a supply stoppage. Thus, if supply goes offline because of extreme weather or geopolitical events, prices could spike quickly.<sup>204</sup> Political discord in oil exporting countries like Libya and Iran, or countries that border significant oil transportation “choke points” such as Egypt, can lead to dramatic spikes in global oil prices.<sup>205</sup> Oil prices have remained very volatile since 1974, often shooting up or down more than 10% in a single month.<sup>206</sup> Because most consumers are unable to quickly reduce their gasoline use, demand for gasoline tends to be highly inelastic in the short term.<sup>207</sup> Each dollar increase in the price of gasoline reduces the average U.S. household’s discretionary spending budget by approximately 10%.<sup>208</sup> Many businesses face similar challenges when gasoline prices spike significantly.<sup>209</sup> This inability to quickly adapt to significant changes in oil price produces economic adjustment costs that can reduce the nation’s gross domestic product, in addition to increase trade deficits driven by higher fuel costs.<sup>210</sup>

Average retail electricity prices, on the other hand, have been remarkably stable in the recent past, and government economists project them to remain stable in the future.<sup>211</sup> A large portion of the total cost of electricity is fixed capital investment in electricity generating plants and distribution lines.<sup>212</sup> Unlike gasoline, electricity is produced from a number of different fuel types including coal, natural gas, uranium in nuclear reactors, and renewable sources, and can be transported over long distances relatively cheaply, making it a stable energy source.<sup>213</sup> This fuel diversity helps ensure that a price increase in any particular type of fuel does not result in an overall spike in electricity prices.<sup>214</sup> Although wholesale electricity spot markets can widely vary in the course of any 24-hour period, retail electricity rates are typically set through a rate-regulated system that levels out price variations.<sup>215</sup> To extent EV owners are exposed to these wholesale price fluctuations—perhaps with the use of variable pricing—this benefit of electricity as a transportation fuel could be reduced.

ing—this benefit of electricity as a transportation fuel could be reduced.

Finally, a switch to EVs would significantly lower fuel costs for vehicle operation in the United States. Retail electricity is currently much cheaper than gasoline per unit of energy.<sup>216</sup> In addition, EVs use fuel more efficiently than ICE vehicles; EVs can travel farther than ICE vehicles on the same amount of energy.<sup>217</sup> Unfortunately, the increased up-front costs of EVs would offset these fuel savings.<sup>218</sup> The batteries required for EVs make EV production costs more expensive than those for ICE vehicles.<sup>219</sup> Although battery prices are decreasing, recent estimates show that the increased up-front costs may not make EVs cost competitive with ICE vehicles on a life-cycle basis for many decades with currently projected oil prices.<sup>220</sup> One recent estimate found, however, that if gasoline prices increase to the range of \$4.50–\$5.50, EVs would become cost-competitive with ICE vehicles.<sup>221</sup>

The economic benefits of reducing gasoline consumption thus depend heavily on both the price of oil and the amount of oil that the U.S. imports. Both of these are difficult to predict, as supply trends can change quickly. The boom in unconventional oil recovery in the U.S. has caused some to predict that the U.S. might actually become a net oil exporter in 30 years.<sup>222</sup> Dramatic substitution of electricity for gasoline will put downward pressure on oil prices. Depending on which suppliers can produce oil at the lowest marginal price, this may have an impact on trade flows or national security. One can imagine, for example, that the Saudi Arabian national oil company might have the lowest marginal oil production prices, while the recent boom in U.S. production in oil from shale has higher marginal costs. Accordingly, a drop in oil prices could have a number of impacts—it may actually shift even more oil production and revenues to foreign countries, reducing economic activity in the United States. Gasoline vehicles may become more attractive by lowering fuel prices, but this is complicated by the OPEC cartel’s ability to manipulate prices. These factors underscore how difficult it is to make long-term projections and policy judgments about international commodities like oil.

204. *Id.* at 324–25.

205. DIPLOMATIC COUNCIL ON ENERGY & SECURITY, *supra* note 201, at 6; INT’L ENERGY AGENCY, OIL MARKET REPORT 38 (July 2013) (identifying Suez Canal as a choke point and discussing effects of unrest in Egypt). A choke point is a key geographic place in the system of delivering oil—such as a vital canal passage—which, if interrupted, could create a bottleneck that would significantly impact world oil markets.

206. *See* Minsk et al., *supra* note 202, at 331–34.

207. *Id.* at 329–30.

208. *Id.* at 335.

209. *Id.* at 336.

210. *Id.* at 335. “First, changes in oil prices alter the budgets of households, businesses and governmental entities, generally resulting in a loss of economic output as the optimal mix of inputs shifts. Second, and closely related to the first category, price spikes can shift consumer demand for products and services, both because consumers may have less disposable income as a result of higher spending on oil and because goods or services may be more expensive if oil (or products derived from oil) was among their inputs. Third, ongoing uncertainty about the future price of oil reduces economic output below what it would be otherwise.” *Id.*

211. *Id.* at 360–62.

212. *Id.* at 361.

213. Jaap C. Jansen & A.J. Seebregts, *Long-Term Energy Services Security: What Is It and How Can It Be Measured?*, 38 ENERGY POL’Y 1654, 1663 (2010).

214. *See* Minsk et al., *supra* note 202, at 359.

215. *Id.* at 361–62.

216. *See* NAT’L RESEARCH COUNCIL, *supra* note 1, at 44.

217. *Electric Vehicles*, FUEL ECONOMY, <http://www.fueleconomy.gov/feg/evtech.shtml>. “Electric vehicles convert about 59–62% of the electrical energy from the grid to power at the wheels—conventional gasoline vehicles only convert about 17–21% of the energy stored in gasoline to power at the wheels.” *Id.*

218. Martin Weiss et al., *On the Electrification of Road Transport—Learning Rates and Price Forecasts for Hybrid-Electric and Battery-Electric Vehicles*, 48 ENERGY POL’Y 374, 383–84 (2012).

219. *Id.* at 384.

220. *Id.* at 383–84. “BEVs . . . reach cost break-even only at gasoline prices of \$4.50–\$5.50 per gallon . . . in the USA.” (citing H. Lee & G. Lovellette, *Will Electric Cars Transform the U.S. Vehicle Market? An Analysis of the Key Determinants* (Harvard Kennedy School of Government, Discussion Paper 2011-08, 2011), available at <http://belfercenter.ksg.harvard.edu/files/Lee%20Lovellette%20Electric%20Vehicles%20DP%202011%20web.pdf>).

221. Weiss et al., *supra* note 218, at 384.

222. U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY OUTLOOK 2013, *supra* note 2, at 2.

### b. National Security Impacts

Access to affordable oil supplies is critical to the modern American way of life. The United States consumed 21% of global oil production in 2012.<sup>223</sup> The United States spends significant taxpayer sums annually to protect our nation's oil supply lines, though precise calculations prove difficult.<sup>224</sup> Securing access to petroleum supplies has long been a crucial national security interest of the United States.<sup>225</sup> This is exemplified by the so-called Carter Doctrine, announced by Jimmy Carter's 1980 State of the Union Address, which provided that a foreign attempt to gain control of the Persian Gulf region is a violation of vital U.S. national interests, which the United States would defend by any means necessary, including military force.<sup>226</sup>

Presidents Reagan and George H.W. Bush affirmed and expanded the doctrine, making it clear that disruptions of oil supplies from the Middle East would be repelled by military force if necessary.<sup>227</sup> A primary mission of the U.S. Navy's Fifth Fleet is to ensure that vital oil shipping supply lines in the Persian Gulf remain uninterrupted.<sup>228</sup> Some point to the two wars in Iraq, fought in the last two decades, as examples of U.S. military forces taking action to secure oil supplies, adding the billions of dollars and thousands of U.S. lives lost in those wars as part the cost of oil.<sup>229</sup> This attribution is probably an oversimplification of the cause of the Iraq wars—which also included a myriad of other potential rationales—but securing oil supplies likely played some role in the U.S. decisions to use military force in Iraq.<sup>230</sup>

The economic impacts of reducing gasoline use overlap with U.S. national security interests. Reducing wealth transfers to foreign countries as a result of oil imports could be classified as a national security interest as well as an economic interest, particularly with respect to wealth transfers to nations whose interests conflict with U.S. interests.<sup>231</sup> Although support for energy independence is widespread among U.S. politicians, some energy experts question whether this is truly a wise policy goal. Richard Pierce, for example, has argued that “[i]t makes no sense to pursue energy independence as a goal.”<sup>232</sup> Pierce argues that Americans depend on many imports and energy dependence should not raise any special worry.<sup>233</sup> He

further asserts that there is no evidence that national security spending would be reduced if we became less dependent on oil imports, noting that we do not import oil from places like Iran.<sup>234</sup> Pierce acknowledges that because oil is traded on a global market, any decrease in supply could lead to an increase in price, which could hurt the United States economically.<sup>235</sup> But he does not see this as a special national security interest.<sup>236</sup>

Pierce is certainly correct that “independence” as a solitary goal has little inherent value to the U.S. In today's global economy, the United States imports a number of goods, and it often serves consumer interests to do so because such goods can be produced at lower costs overseas. When oil is imported from Canada, for example, it does not necessarily pose a special security risk. The goal of reducing petroleum imports for economic reasons, however, still has some value. Moreover, although there may not be hard evidence that reducing U.S. oil imports would reduce military spending, if U.S. transportation shifted significantly away from oil it seems likely that protecting oil transport routes in the rest of the world would become a far less compelling military goal.<sup>237</sup>

In addition, foreign governments directly control a vast quantity of the world's petroleum supply.<sup>238</sup> These governments should not always be expected to act as profit-maximizing actors when it comes to petroleum production and sales. Nations also have geopolitical interests that affect their behavior.<sup>239</sup> Russia, for example, has become a significant supplier of the world's petroleum.<sup>240</sup> Russia has already shown its willingness to use its economic power over natural gas supplies to assist its geopolitical goals.<sup>241</sup> It is true that oil is a commodity sold in a competitive international market, but it is also true that certain national actors like Russia have the market power to significantly impact that market.<sup>242</sup> Ultimately, the externalities of so-called energy security are difficult to measure and impossible to objectively quantify.<sup>243</sup> Nonetheless, they still do exist in some manner and justify consideration when formulating a national energy policy.<sup>244</sup>

Some have suggested that a shift to EVs will merely shift American dependence on foreign oil to dependence on foreign batteries, or more specifically foreign lithium, the element

223. Global oil supply was approximately 89.1 million barrels per day in 2012. *International Energy Statistics: Petroleum Production*, U.S. ENERGY INFO. ADMIN., <http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=5&pid=53&aid=1> (last visited Sept. 21, 2013). U.S. consumption was approximately 18.6 million barrels per day in 2012. *International Energy Statistics: Petroleum Consumption*, U.S. ENERGY INFO. ADMIN., <http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=5&pid=5&aid=2> (last visited Sept. 21, 2013).

224. *Id.*

225. See Minsk et al., *supra* note 202, at 341.

226. *Id.*

227. *Id.* at 341–42.

228. *U.S. Fifth Fleet*, U.S. NAVAL FORCES CENTRAL COMMAND, <http://www.cusnc.navy.mil/about.html> (last visited July 21, 2013).

229. Minsk et al., *supra* note 202, at 344.

230. *Id.*

231. Jansen & Seebregts, *supra* note 213, at 1662.

232. Richard Pierce, *The Past, Present, and Future of Energy Regulation*, 31 UTAH ENVTL. L. REV. 291, 296 (2011).

233. *Id.*

234. *Id.*; Richard Pierce, *Energy Independence and Global Warming*, 37 ENVTL. L. 595, 596 (2007).

235. Richard Pierce, *supra* note 234, at 596.

236. *Id.*

237. See Minsk et al., *supra* note 202, at 341.

238. Ian Bremmer, *The Long Shadow of the Visible Hand*, WALL ST. J., May 22, 2010, at W3, available at <http://online.wsj.com/article/SB10001424052748704852004575258541875590852.html> (“State-owned companies now control more than 75% of all crude oil production.”).

239. See generally DANIEL YERGIN, *THE QUEST* (2011).

240. *Id.* at 40–41. Venezuela and Iran also control significant portions of the world's oil supplies. Bremmer, *supra* note 238.

241. YERGIN, *supra* note 239, at 47.

242. See Bremmer, *supra* note 238.

243. Jansen & Seebregts, *supra* note 213, at 1662. The International Energy Agency has proposed two indicators that give countries relative rankings of energy supply security based on access to fossil fuels, but these focus only on fossil fuels and not other fuels or demand-side resources such as energy efficiency. *Id.* at 1658.

244. See Minsk et al., *supra* note 202, at 341.

used in most EV batteries today.<sup>245</sup> Academic studies differ in their projections for whether global lithium supplies will be able to support widespread EV adoption.<sup>246</sup> One recent study found that there is sufficient lithium supply to meet the demands of widespread adoption of EVs through the year 2100.<sup>247</sup> The known world supply of lithium is located primarily in South America (49%) and the United States (26%), while China accounts for 14% of world's supply.<sup>248</sup> If a significant market for lithium develops, there will no doubt be further exploration and discoveries of the element. New discoveries of currently unknown deposits are hard to project.<sup>249</sup> Moreover, although dependency on imported lithium may be a concern, the scale of any negative effect caused by import dependency is likely to be smaller for an imported vehicle component than it is for the ongoing fuel needed to operate the vehicle.<sup>250</sup> Once the vehicle is manufactured and sold, there is no significant ongoing dependence on lithium.<sup>251</sup>

### c. Environmental Impacts

EVs have often been championed as “green” vehicles that have the potential to dramatically reduce the greenhouse gas (“GHG”) emissions that cause climate change.<sup>252</sup> If this claim is true, it would be a significant reason to promote EVs and their related infrastructure.<sup>253</sup> EVs are not unambiguously better for the environment than ICE vehicles, however.<sup>254</sup> Although EVs emit no tailpipe pollutants while operating in electric mode, the methods used to create the electricity used to power the vehicles does emit GHGs and other pollutants.<sup>255</sup> There have been a large number of lifecycle analyses of the emissions characteristics of EVs compared with ICE vehicles in recent years.<sup>256</sup> Many of these studies have found that EVs have GHG benefits over existing ICE vehicles.<sup>257</sup>

The analysis is complicated and the ultimate conclusions vary based on a number of assumptions about the nature of the electricity that fuels EVs.<sup>258</sup>

For example, the relative GHG-intensity of EVs can vary significantly based on factors like:

1. The region where the EVs are charged (California's electricity supply is considerably less GHG-intensive than Michigan's, for example);<sup>259</sup>
2. The time of day when the vehicles are likely to be charged (which may correspond to different generating technologies);<sup>260</sup>
3. Whether the GHG emissions attributed to EV use are the average of all electricity generating resources in the grid or whether they are calculated from the marginal generating resource used at the time of charging;<sup>261</sup>
4. The number of vehicles on the grid and the availability of charging infrastructure, which might drive the need for additional electricity generation capacity;<sup>262</sup>
5. Projections of the drop in carbon-intensity of the electricity grid over time, based on speculative projections of future fuel prices and future public policy;<sup>263</sup>
6. Projections of how relatively new batteries will perform under various conditions (for example, batteries get lower range in cold weather);<sup>264</sup> and
7. Projections of average driving speeds and passenger loads (driving scenarios with higher speeds and heavier passenger or cargo loads both reduce the relative GHG emissions of ICE vehicles compared with EVs).<sup>265</sup>

Accordingly, the projected benefit of using EVs can change significantly based on the assumptions used in the model.

245. See, e.g., Richard Harris, *Trading Foreign Oil For Foreign Electric Car Parts?*, NAT'L PUB. RADIO (Nov. 21, 2008), <http://www.npr.org/templates/story/story.php?storyId=97295913>.

246. Paul G. Gruber et al., *Global Lithium Availability: A Constraint for Electric Vehicles?*, 15 J. INDUS. ECOLOGY 1, 2 (2011).

247. *Id.* at 13.

248. *Id.* at 7–8.

249. *Id.* at 13.

250. See Press Release, Am. Chem. Soc'y, *Understanding the Life of Lithium Ion Batteries in Electric Vehicles* (Apr. 10, 2013), available at <http://www.acs.org/content/acs/en/pressroom/newsreleases/2013/april/understanding-the-life-of-lithium-ion-batteries-in-electric-vehicles.html> (stating that the average life of a lithium battery pack could range from five to twenty years).

251. See *id.*

252. See, e.g., Lamble, *supra* note 21, at 197; GREGORY KEOLEIAN ET AL., *CTR. FOR SUSTAINABLE SYS., UNIV. OF MICH., ENVIRONMENTAL ASSESSMENT OF PLUG-IN HYBRID ELECTRIC VEHICLES IN MICHIGAN: GREENHOUSE GAS EMISSIONS, CRITERIA AIR POLLUTANTS, AND PETROLEUM DISPLACEMENT* i (2011), available at [http://css.snre.umich.edu/css\\_doc/CSS11-01.pdf](http://css.snre.umich.edu/css_doc/CSS11-01.pdf).

253. Passenger vehicles emitted approximately 11% of total worldwide energy-related carbon dioxide emissions in 2010. See Weiss et al., *supra* note 218, at 374.

254. For example, EVs use likely increases sulfur dioxide emissions compared with ICE vehicles because of the sulfur pollution created through electricity generation. KEOLEIAN ET AL., *supra* note 252 at 8.

255. See, e.g., KEOLEIAN ET AL., *supra* note 252, at 2.

256. Hongrui Ma et al., *A New Comparison Between the Life Cycle Greenhouse Gas Emissions of Battery Electric Vehicles and Internal Combustion Vehicles*, 44 ENERGY POL'Y 160, 166 (2012); KEOLEIAN ET AL., *supra* note 252, at 14.

257. See, e.g., KEOLEIAN ET AL., *supra* note 252, at i; RYAN MCCARTHY, INST. OF TRANSP. STUDIES, UNIV. OF CAL. AT DAVIS, *ASSESSING VEHICLE ELECTRICITY DEMAND IMPACTS ON CALIFORNIA ELECTRICITY SUPPLY* 166 (Recent Work,

2009) (dissertation); Enver Doruk Ozdemir & Niklas Hartmann, *Impact of Electric Range and Fossil Fuel Price Level on the Economics of Plug-In Hybrid Vehicles and Greenhouse Gas Abatement Costs*, 46 ENERGY POL'Y 185, 185–89 (2012).

258. Ma et al., *supra* note 256, at 166.

259. MCCARTHY, *supra* note 257, at 8–13;

260. Jarod C. Kelly et al., *Time-Dependent Plug-In Hybrid Electric Vehicle Charging Based on National Driving Patterns and Demographics*, 94 APPLIED ENERGY 395, 404 (2012).

261. MCCARTHY, *supra* note 257, at 166; Ma et al., *supra* note 256, at 161–63. At any given time, electricity supply might be provided 50% by coal, 25 % by nuclear, 10% by wind, and 15% by natural gas. But if demand increases, that next increment of demand might actually be met by natural gas. So, should the GHGs attributed to EVs be the overall supply average, or just natural gas? The marginal generating technology in some U.S. electricity markets is natural gas-fired generation, which may be more carbon-intensive than the total grid average, depending on the mix of coal, nuclear, or renewable power plants in that particular grid.

262. KEOLEIAN ET AL., *supra* note 252, at 1.

263. *Id.* at 10–11.

264. Stephen Brown et al., *Electric Vehicles: The Role and Importance of Standards in an Emerging Market*, 38 ENERGY POL'Y 3797, 3802 (2010).

265. Ma et al., *supra* note 256, at 164. Ma et al. also suggest including vehicle manufacture in lifecycle emissions comparisons of ICE vehicles with EVs, claiming battery manufacturing “tends to be energy and GHG emissions intensive.” *Id.* at 163. However, because modern vehicles often have lives of fifteen years, any emissions associated with vehicle manufacture are likely to be negligible. See NAT'L RESEARCH COUNCIL, *supra* note 1, at 16, n.3.

Most importantly, however, is that many of the analyses to date have compared EVs to the existing generation ICE vehicles, rather than the future ICE vehicles that will likely enter the U.S. and European Union markets in the next decade.<sup>266</sup> For example, in January 2011, a team of researchers at the University of Michigan performed a detailed analysis of the environmental attributes of EVs under a number of different scenarios, finding that PHEVs generally had positive GHG mitigation benefits.<sup>267</sup> The researchers, however, used projections for likely future fuel economy from ICE vehicles that did not include the required fuel economy standards recently promulgated jointly by the U.S. Environmental Protection Agency and the Department of Transportation.<sup>268</sup> The United States and the European Union have both promulgated aggressive new emissions standards for passenger vehicles through the year 2025.<sup>269</sup> The new U.S. standards eventually require auto manufacturers to reach a fleet-wide average of 54.5 miles per gallon, or 163 grams of carbon dioxide per mile, by 2025.<sup>270</sup> The University of Michigan study estimates that “GHG emissions of a PHEV, per mile driven, range from 262 to 252 gCO<sub>2</sub>e per mile in 2030 depending upon the allocation method using baseline grids and charging methods.”<sup>271</sup> Accordingly, PHEVs may not actually be beneficial in terms of GHG-reductions in the short-to-medium term when compared with the ICE vehicles that will likely be manufactured over the next decade.<sup>272</sup>

Despite this possible medium-term comparative GHG mitigation disadvantage with ICE vehicles, EVs may none-

theless have significant GHG-mitigation advantages over ICE vehicles in the long-term. A dramatic reduction of the GHG-intensity of the electricity grid would make EVs substantially less GHG-intensive than ICE vehicles in the long term.<sup>273</sup>

Indeed, dramatic reductions in GHG emissions from both the electricity sector and the personal transportation sector will likely be required to reach the climate mitigation goals agreed to by the majority of scientists and nations.<sup>274</sup> In the 2009 Copenhagen Accord, over 120 nations agreed that in order to combat the threat of climate change, the world’s average temperature should not increase by more than two degrees Celsius.<sup>275</sup> To reach this goal, reductions on the scale of 80% of emissions by the year 2050 from the baseline year of 1990 have been proposed for some developed countries.<sup>276</sup> An 80% reduction in emissions would likely require emissions from the personal transportation system to reach nearly zero, given the need for some fossil fuel emissions in other sectors of the economy. Zero or near-zero transportation emissions are unlikely for the future of ICE vehicles.<sup>277</sup> Theoretically, zero emission transportation could be achieved if the personal transportation fleet was primarily electrified and fueled by a nearly carbon-free grid.<sup>278</sup> Therefore, if long-term emissions reductions are the goal, short-term incentives for EVs may still be desirable to promote large-scale manufacturing, which might lead to a tipping point or technological breakthrough in reducing battery cost.<sup>279</sup>

In sum, accurately analyzing the environmental benefits of EVs is a complex undertaking, and it is not clear EVs actually produce environmental benefits at all when compared to cleaner ICE vehicles, depending on the time frame analyzed. While EVs may have long-term environmental advantages to ICE vehicles if U.S. electricity generation becomes cleaner, more efficient ICE vehicles designed to meet recent regulatory requirements may be cleaner than EVs in the medium term. This complexity raises the question of whether this type of analysis should be performed at all by PUCs.

#### d. The Benefits of Considering Non-Traditional Goals

To achieve maximum overall societal benefits at the lowest costs, policymakers should consider all relevant costs and benefits of their actions.<sup>280</sup> For example, there is a growing call in the academic literature for a merger of energy and

266. Ma et al., *supra* note 256, at 169–70; Christian Berggren & Thomas Magnusson, *Reducing Automotive Emissions—The Potentials of Combustion Engine Technologies and the Power of Policy*, 41 ENERGY POL’Y 636, 638–39 (2012).

267. KEOLEIAN ET AL., *supra* note 252, at 7.

268. *Id.* at 5 (“Fuel economy improvement factors for [ICE vehicles] were taken from the 2009 Energy Information Agency (EIA) Annual Energy Outlook,” which does not account for the recently promulgated 2012–2025 fuel economy standards.).

269. OFFICE OF TRANSP. & AIR QUALITY, U. S. ENVTL. PROT. AGENCY, REPORT NO. EPA-420-F-11-038, EPA AND NHTSA PROPOSE TO EXTEND THE NATIONAL PROGRAM TO REDUCE GREENHOUSE GASES AND IMPROVE FUEL ECONOMY FOR CARS AND TRUCKS 3 (Nov. 2011), available at <http://www.epa.gov/oms/climate/documents/420f11038.pdf>; Commission Regulation 443/2009, 2009 O.J. (L 140) 12.

270. *Id.* The comparison between EVs and ICE vehicles complying with the new fuel economy standards is complicated by a couple of additional factors. First, EVs are granted zero emissions for purposes of complying with the new U.S. and EU emissions standards. Nicholas Lutsey & Daniel Sperling, *Regulatory Adaptation: Accommodating Electric Vehicles in a Petroleum World*, 45 ENERGY POL’Y 308, 308 (2012). In addition, in the U.S. “EVs would be double-counted with ‘multiplier’ factors (e.g., each PEV is counted as two vehicles at 0 g/mile) to provide even greater incentive for automakers to sell them and consumers to buy them.” *Id.* at 309. Europe has similar “super credits.” *Id.* These regulatory incentives may promote EV sales and essentially reduce the emissions requirements on ICE vehicles. A recent study by the National Research Council used a figure of 46 mpg as a more realistic 2025 standard. NAT’L RESEARCH COUNCIL, *supra* note 1, at 13. Moreover, the EPA fuel economy estimates are often much higher than actual “real world” fuel economy achieved by drivers. *Id.* at 93 (applying a discount of 17% from EPA estimates to account for actual “on road” fuel economy).

271. KEOLEIAN ET AL., *supra* note 252, at 7. Increased penetration of biofuels may also make ICE vehicles less GHG dependent. See Ma et al., *supra* note 256, at 170.

272. See also Hong Huo et al., *Projection of Energy Use and Greenhouse Gas Emissions by Motor Vehicles in China: Policy Options and Impacts*, 43 ENERGY POL’Y 37, 48 (2012) (concluding that in China more GHG savings would be obtained with policy of improving fuel economy standards for ICE vehicles than a policy of vehicle electrification).

273. See Ma et al., *supra* note 256, at 164.

274. See *id.* at 161.

275. U.N. Framework Convention on Climate Change, *Report of the Conference of the Parties on its Fifteenth Session*, 5, 37–40, U.N. Doc. FCCC/CP/2009/11/Add.1 (Mar. 30, 2010), available at <http://unfccc.int/resource/docs/2009/cop15/eng/11a01.pdf>.

276. See *Appendix I—Quantified Economy-Wide Emissions Targets for 2020*, UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, [http://unfccc.int/meetings/copenhagen\\_dec\\_2009/items/5264.php](http://unfccc.int/meetings/copenhagen_dec_2009/items/5264.php) (last visited July 28, 2013) (showing developed countries as “Annex I” countries).

277. See NAT’L RESEARCH COUNCIL, *supra* note 1, at 3–4.

278. *Id.* at 5, Figure 2.6.

279. See *id.* at 6.

280. See *id.*

environmental regulation in the United States.<sup>281</sup> Environmental protection has not traditionally been a goal of public utility regulation.<sup>282</sup> This division, in and of itself, is not necessarily problematic if the environmental regulatory systems adequately perform their respective functions. The costs of environmental regulations are generally approved and passed through to customers by PUCs.<sup>283</sup> In addition to approving cost recovery for expenses mandated by environmental regulations, PUCs occasionally take unregulated environmental concerns into account if there is a substantial likelihood of future environmental regulation.<sup>284</sup> If there is a significant risk of future regulation of GHGs, for example, PUCs might seek to mitigate it, not necessarily because environmental benefits are a policy goal themselves, but because minimizing financial risks to ratepayers is a regulatory goal.<sup>285</sup> Under this model of consideration of future regulatory risks, however, the environmental costs of ICE vehicle emissions do not pose direct financial risks to utility ratepayers or shareholders, because electric utilities are not currently selling gasoline to drivers.<sup>286</sup> Accordingly, PUCs may be less inclined to mitigate vehicle emissions from vehicles than from utility operations. Thus, a switch to EVs would bring PUCs a step away from their traditional roles as utility regulators and into a new role that encompasses transportation policymaking.<sup>287</sup> Even though this is not a traditional role for electricity regulators, considering GHG reductions from the transportation sector might be important for regulators to consider in the context of EV-related infrastructure.

Likewise, the potential positive externalities of economic and national security might be, and indeed often are, policy drivers for EV charging infrastructure investments.<sup>288</sup> Public utility commissioners as policy makers are in a position to increase EV use by adopting policies favorable to EV infrastructure investments.<sup>289</sup> To the extent that some externalities—both positive and negative—are not factored into the costs of a product like EV charging equipment, regulation might play a role in helping to account for these exter-

nalities.<sup>290</sup> Accordingly, PUCs might seek to analyze the potential environmental, economic, and national security benefits of EV charging equipment when they set policy.<sup>291</sup> Doing so might constitute an attempt to incorporate all of the relevant costs and benefits of EV infrastructure into their policy decisions.<sup>292</sup>

In addition, PUCs might even consider whether utility regulatory policy can aid the “chicken or the egg” problem with regard to the existence of EV charging stations and the purchase of EVs.<sup>293</sup> The purchase of EVs may partially depend on a robust charging infrastructure to deter range anxiety, yet market forces will likely not drive substantial private investment in charging stations until there is a critical mass of EV charging demand.<sup>294</sup> By promoting a technology with subsidies early in its cycle, PUCs might give a push to the development of the EV market.<sup>295</sup>

## e. Problems With Considering Non-Traditional Goals

### 1. The Difficulty of Multi-Factor Balancing

Although PUCs might theoretically make more efficient decisions if they considered all of the relevant costs and benefits of EV infrastructure policy, in practice, this type of analysis will prove extraordinarily difficult. Stephen Breyer has described some of the problems of making a decision with many difficult-to-compare standards: “The effect of many standards . . . is virtually the same as having none at all. There is no clear indication of which standards are more important, how they are to be individually applied, or how varying degrees of conformity are to be balanced.”<sup>296</sup> Even if policymakers attempt to explicitly quantify the costs and benefits, these quantifications will likely be so heavily dependent upon debatable assumptions that they will not bring much analytical clarity.<sup>297</sup>

Accordingly, attempting to account for difficult-to-estimate future benefits related to oil import reductions, national security, and GHG emission reductions may lead to unmanageable procedures, subjectivity, and inconsistency in decision-making.<sup>298</sup> Indeed, if considered, these goals may not be precisely measured or deeply analyzed, but instead cited as a form of policy trump card to justify an already favored regulatory decision.<sup>299</sup> The recent EV infrastructure proceed-

281. See generally Lincoln Davies, *Alternative Energy and the Energy-Environment Disconnect*, 46 IDAHO L. REV. 473, 491 (2010); Amy Wildermuth, *The Next Step: The Integration of Energy Law and Environmental Law*, 31 UTAH ENVTL. L. REV. 369 (2011); Brandon Hofmeister, *Roles for Energy Regulators in Climate Change Mitigation*, 2 MICH. J. ENVTL. & ADMIN. L. 67 (2012).

282. See, e.g., *Grand Council of the Crees (of Quebec) v. Fed. Energy Regulatory Comm'n*, 198 F.3d 950, 957 (D.C. Cir. 2000) (stating that “[t]he Supreme Court has never indicated that the discretion of an agency setting ‘just and reasonable’ rates for sale of a simple, fungible product or service should, or even could, encompass considerations of environmental impact (except, of course, as the need to meet environmental requirements may affect the firm’s costs) . . . . Although rates have environmental consequences (increases in the price of electricity, for instance, may at the margin lead to substitution of fuel oil), it seems pointless to weave such issues into setting ‘just and reasonable’ rates for electric power. The environmental issues posed by construction and operation of energy facilities will invariably be reviewed under other provisions; if those reviews (or other forces such as liability risks or firm commitment to environmental quality) cause the utility to incur costs, such costs would feed into the Commission’s normal rate calculation.”).

283. See *id.*

284. Hofmeister, *supra* note 281, at 71.

285. *Id.*

286. See NAT’L RESEARCH COUNCIL, *supra* note 1, at 5.

287. See *Grand Council of the Crees*, 198 F.3d at 957.

288. See NAT’L RESEARCH COUNCIL, *supra* note 1, at 6.

289. See *id.* at 4.

290. See Guido Calabresi, *Some Thoughts on Risk Distribution and the Law of Torts*, 70 YALE L.J. 499, 500–03 (1961).

291. See NAT’L RESEARCH COUNCIL, *supra* note 1, at 6.

292. See *id.* at 6.

293. See *id.* at 9, 54–55.

294. *Id.* at 9, 55.

295. See *id.* at 9.

296. BREYER, *supra* note 149, at 79.

297. See *id.* at 79–80.

298. *Id.* at 81, 86.

299. See KAHN, *supra* note 20, at 195. (“[T]he mere identification of external benefits does not suffice to justify unlimited, or, indeed, any, subsidies to consumption. . . . Since external benefits are ubiquitous, the conclusion that each calls for a subsidy involves concluding that more of almost everything should be produced—hardly a solution to the problem of the optimum allocation of scarce resources.”).

ing in California is an illustrative example.<sup>300</sup> The purported environmental benefits of EVs, particularly with respect to GHG reduction, were often ambiguously and vaguely cited in support of the policy decisions the CA PUC made.<sup>301</sup> As noted above, however, it is not at all clear that EVs actually provide significant GHG benefit in the short- or medium-term, particularly in states whose electricity supply is more GHG-intensive than California's.<sup>302</sup> What if it would be a better GHG mitigation strategy to actually discourage EV use in some places? Because these situations may exist, PUCs should not attempt to incorporate policy goals that are generally out of their area of expertise. On the other hand, much of the CA PUC's analysis derived from traditional energy regulatory analysis.<sup>303</sup> In promoting EVs, the CA PUC seemed to use the environmental policy goal as either mere rhetorical support, or possibly as a tiebreaker when the utility regulatory policy didn't point in a clear direction.<sup>304</sup> Perhaps this is an appropriate way to use this policy goal.

Promoting indirect goals such as reducing range anxiety may be particularly difficult to manage because they require attenuated logical chains of causation.<sup>305</sup> For example, there is some evidence that even though most EV charging will likely occur at home, the introduction of visible public charging stations can increase consumer confidence in EVs.<sup>306</sup> Therefore, a policy that subsidizes or otherwise promotes public charging stations may have the impact of increasing the likelihood of EV purchase, regardless of whether it is the most cost-effective method of providing charging services to consumers.<sup>307</sup> For example, public charging stations may not be used often, yet but the sight of them may inspire confidence in consumers who do not know that public charging stations are often unnecessary. Accordingly, investing in such infrastructure may not pass traditional cost-benefit analysis tests, but if PUCs assume that public charging stations are necessary to overcome irrational consumer fears, they may still decide to promote investment in them.

These value judgments about human psychology and consumer acceptance are difficult to make. Is addressing range anxiety with public charging stations necessary for adaptation? Or merely helpful? Will consumers adapt their expectations as they learn more about EVs and gain more experience with them? Should adding EV infrastructure to assuage or meet irrational consumer needs be a valid policy goal for PUCs to consider? Perhaps addressing range anxiety may relate back to some of the other policy goals related to EVs, such as promoting more efficient use of existing electricity

infrastructure, or even reducing GHG emissions.<sup>308</sup> But the impact of reducing range anxiety is difficult to quantify.<sup>309</sup>

Despite the quantification difficulties, an attempt at incorporating these goals into the decision-making process may be better than ignoring them altogether. If a panel of appellate judges exercising common law authority can consider a variety of different economic policy goals in reaching a decision regarding tort or contract law, why can't a PUC likewise weigh a variety of goals in a multi-factor balancing test? One answer may be that enabling PUCs to use broad discretion in evaluating policy goals without easy quantification or comparability might raise the concern that their decisions are based not on sound policy principles, but instead on the influence of powerful interest groups.<sup>310</sup> Depending on the institutional arrangements insulating PUCs from such influence, it may or may not be a good idea to grant them such discretionary policy tools.

## 2. Geographic Scope

In addition to the difficulty in balancing multiple policy goals, regulators situated at the state level might not be best suited to consider externalities with impacts felt primarily at the national level, such as reducing oil imports or promoting national security.<sup>311</sup> Indeed, to the extent EV infrastructure policy is framed as a GHG mitigation tool, the externality is global in nature. A state regulator may be particularly ineffective at attempting to mitigate a global problem.<sup>312</sup> Perhaps to the extent that EVs reduce localized pollution risks, those benefits are better considered by state regulators, but national or global factors are better left to be dealt with by the federal government.<sup>313</sup> FERC, or another federal policymaking body such as Congress itself, are likely better positioned than state PUCs to consider the broad national benefits of EV infrastructure and develop corresponding subsidy or regulatory policies.<sup>314</sup>

The economic impacts of EV infrastructure and the EV industry generally may also impact how different PUCs consider investments in EV infrastructure.<sup>315</sup> A state's interest in subsidizing EV infrastructure might vary depending on whether a state has an actual or perceived ability to economically benefit from the manufacture or design of EVs.<sup>316</sup> Michigan, for example, is home to a significant cluster of EV-related research, design, and manufacturing, both for EVs and the advanced batteries that are crucial components

308. *Id.* at 29–30.

309. *Id.*

310. See Jon D. Hanson et al., *The Situation: An Introduction to the Situational Character, Critical Realism, Power Economics, and Deep Capture*, 152 U. PA. L. REV. 129, 202 (2003–2004).

311. See Hofmeister, *supra* note 281, at 102–03.

312. *Id.*

313. *Id.* at 120–21.

314. However, if the federal government is insufficiently considering these factors, there may be a role for states to play. *Id.* at 70.

315. See, e.g., Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 5–6.

316. See, e.g., Alayna DeMartini, *Groups Say Ohio Missing an Opportunity on Electric Cars*, MIDWESTENERGYNEWS (July 15, 2013), <http://www.midwestenergynews.com/2013/07/15/groups-say-ohio-missing-an-opportunity-on-electric-cars/>.

300. See generally Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44.

301. *Id.*

302. See *supra* notes 252–79 and accompanying text.

303. Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 27–28.

304. *Id.*

305. See CLEAN ENERGY COALITION, PLUG-IN READY MICHIGAN, *supra* note 29, at 26.

306. *Id.*

307. See *id.*

of EVs.<sup>317</sup> If EVs become more widespread in Michigan and nationally, this may lead to the creation of more wealth and jobs in the state.<sup>318</sup> In turn, the Michigan Public Service Commission may take more aggressive action to promote EV infrastructure in its state, both to propel the industry and to develop model policies for other states.<sup>319</sup> Other states might be unlikely to see similar EV-related research, development, and manufacturing clusters develop, and therefore may not benefit as much as Michigan could from EV subsidies.<sup>320</sup> Sometimes states and nations compete with each other to attract emerging industries by providing subsidies or mandates for the products that those industries produce.<sup>321</sup> Accordingly, economic development motivations may play a role in utility regulatory decision-making.<sup>322</sup> Although this might make for good politics, it is often debatable whether such subsidies make for good utility regulatory policy.<sup>323</sup>

### 3. Institutional Competence

State PUCs are unlikely to have significant expertise to analyze the international political economy of oil markets or GHG mitigation policy in the transportation sector.<sup>324</sup> Accordingly, it may be better for them to defer to other specialized regulatory agencies than to fumble attempts to account for policy goals that they are ill equipped to analyze.<sup>325</sup> For example, in its determinations of how to integrate EVs into its regulatory policies, the CA PUC was clearly motivated by an environmental concern to mitigate GHGs and other air pollutants in California.<sup>326</sup> However, as the discussion above has indicated, there is a plausible case that EVs might actually increase GHG emissions in the next decade when compared with the new models of ICE vehicles.<sup>327</sup> At the very least, the

analysis is much more complex than the CA PUC suggested in its decisions. Should we expect PUCs or their staffs to develop expertise in this kind of analysis? Perhaps they could hire independent consultants<sup>328</sup> or rely on the findings of other agencies that have more expertise in these areas.<sup>329</sup> For example, the CA PUC seemingly deferred to the findings of the legislature and California Air Resources Board, an expert environmental agency, in determining that EVs will enable California to meet its GHG reduction goals.<sup>330</sup>

PUCs are probably not the ideal institutions to balance all of these policy goals. Legislative bodies may be the most appropriate choice for balancing the multiple policy goals related to EVs.<sup>331</sup> On the other hand, a regulatory agency with deep expertise in economics like a PUC might be able to engage in a more nuanced analysis of regulatory policy than a state legislature could, even in areas outside its traditional realm of expertise.<sup>332</sup> Perhaps these multiple goals are better balanced not by independent agencies, but by agencies more directly accountable to statewide or national elected officials, which might best be positioned to make broad policy trade offs.<sup>333</sup>

If PUCs believe that the other institutions of state or federal government are not accurately including externalities in the costs of EV infrastructure, however, they may have a role in filling that gap. Rather than deferring to a national energy policymaking process that is failing to deliver sound policy, perhaps an all-hands-on-deck approach would better serve important national goals.<sup>334</sup> In other words, if addressing climate change or energy security are important goals but are not being addressed by better situated federal policymakers, perhaps PUCs should attempt to address them despite the difficulties. It might be preferable to implement imperfect and inefficient policies where they are politically feasible, rather than focusing solely on difficult-to-implement policies.<sup>335</sup> Energy is an extraordinarily complex and cross-cut-

317. See, e.g., *Michigan: Advanced Energy Storage Capital of North America*, MICHIGAN ADVANCED ENERGY STORAGE, <http://www.chargeupmi.org/why-michigan/>.

318. Though it may also be true that some of the jobs related to ICE vehicles might be put at risk, Michigan seems well positioned to retain a number of automotive jobs regardless of changes in vehicle technologies. The state's burgeoning advanced battery, however, seems unique to EV development.

319. See, e.g., *Consumers Energy Comp*, Case No. U-17210 (Mich. Pub. Serv. Comm'n Mar. 15, 2013), available at [http://www.dleg.state.mi.us/mpsc/orders/electric/2013/u-17210\\_3-15-13.pdf](http://www.dleg.state.mi.us/mpsc/orders/electric/2013/u-17210_3-15-13.pdf).

320. Consumers in other states might benefit from subsidizing Michigan manufacturing to the extent scale reduces battery costs and improves battery quality, but this is a shared international benefit for all EV consumers.

321. For example, many states passed renewable energy mandates for their utilities based partly on goals to attract renewable energy manufacturing to their states. Barry Rabe, *Race to the Top: The Expanding Role of U.S. State Renewable Portfolio Standards*, 72 SUSTAINABLE DEV. L. & POL'Y, 10, 10 (2007).

322. *Id.*

323. The viability of this strategy depends on whether manufacturing jobs follow the development of local end-use markets, which may or may not be accurate in any given industry, depending on product transportation costs and other factors.

324. See Cal. Pub. Utils. Comm'n, Decision in Phase 1, *supra* note 51, at 14–17, 36.

325. *Id.*

326. *Id.* (The "Policy Discussion" section of the order begins with a detailed analysis of GHG emissions from passenger vehicles. The order later noted that "[t]he Commission's belief that the growth of electric and natural gas transportation can help to reduce the environmental impacts of energy use in California is a primary motivating factor for initiating this rulemaking" and "[e]lectrification of the transportation sector in California will reduce greenhouse gas emissions and petroleum consumption and improve ambient air quality.")

327. See *supra* notes 252–79 and accompanying text.

328. Hofmeister, *supra* note 281, at 85.

329. *Id.* at 88–91 (describing how the Michigan environmental regulator worked with the Michigan Public Service Commission to analyze the need for energy and methods of meeting that need in air permit proceedings).

330. Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 2–4.

331. See KAHN, *supra* note 20, at 87 (The regulatory process "proceeds on a case-by-case basis, on issue usually framed and a record made up by contesting parties, rather than on occasions and issues formulated by the government itself in terms of its own, independent judgment of the public concern.

The function of the regulator therefore becomes primarily adjudicatory rather than executive or legislative. Commissions come to be set up as courts, constrained by elaborate rules of evidence designed, principally, to protect the interests of the private litigants rather than for the formulation of general policy by expert bodies. This leads in turn to vexatious restrictions that deny commissioners the right to consult informally with industry representatives or with their own staff, who are treated in the same way as other litigants, when such *ex parte* contacts would be conceived of as prejudicial infringements on the impartiality of the commissioner-judges.

This case-by-case adjudication tends often to degenerate into pragmatic, timid compromises between the contending private interests.")

332. Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 2–4.

333. See generally Elena Kagan, *Presidential Administration*, 114 HARV. L. REV. 2245, 2331–46 (2001).

334. Cf. Hofmeister, *supra* note 281, at 70.

335. See Jonathan Gilligan & Michael Vandenbergh, *Accounting for Political Feasibility in Climate Instrument Choice* 1 (Vanderbilt Univ. L. Sch., Pub. L. &

ting sector with enormous impacts on the environment and the economy.<sup>336</sup> Thus, PUCs must remain narrowly focused on specific policy goals when their decisions likely have many cross-cutting impacts.

#### 4. Limits on the Legislative Authority of PUCs to Consider Alternative Policies That Could More Effectively Address Externalities

Some of the alternative methods of achieving non-traditional utility policy goals will be outside the scope of the authority and expertise of PUCs.<sup>337</sup> This might lead to inefficiencies if the utility regulator makes a decision to promote EV infrastructure despite the existence of more cost-effective solution outside of its authority. For example, reducing GHG emissions might be cost-effectively accomplished by pursuing policies outside of the electricity industry, like changing land use patterns or agricultural practices.<sup>338</sup> But there is very little a PUC can do to change these things; it likely does not have the proper regulatory tools or expertise. Theoretically, a PUC might monitor other regulatory decisions and react accordingly, but this would come with significant monitoring costs and would require it to analyze the effectiveness of policies outside of its traditional expertise. Accordingly, there may be a mismatch of both regulatory authority and expertise that makes PUCs ill-suited or unable to adequately balance these non-traditional policy goals. Thus, if these non-traditional policy goals are to be considered by PUCs at all, their options to address these goals will be bounded by their regulatory authority and expertise.

Even within the field of vehicle technology policy, there are a number of different types of technologies that could address the goals of reducing petroleum use and GHGs: vehicles powered by hydrogen, biofuels, and natural gas and more efficient ICE vehicles.<sup>339</sup> Some efficiency measures for vehicles will make all of these technologies more fuel efficient, such as the enhanced use of lightweight materials.<sup>340</sup> At this point, any of these individual technologies may ultimately be the lowest cost way of achieving individual policy goals. Advanced biofuel vehicles, for example, might ultimately be more promising than EVs in terms of GHG reductions.<sup>341</sup> Biofuels, like EVs, have significant infrastructure requirements.<sup>342</sup> In particular, E-85, a fuel that is primarily composed of ethanol and currently the most widely used bio-

fuel in the United States, requires specially designed vehicles with different storage tanks and pumps than those which are used to store gasoline.<sup>343</sup> Large-scale use of this form of biofuel might require an entirely new pipeline system.<sup>344</sup> When determining whether to subsidize electric vehicle charging infrastructure, biofuel pumps, or both, a policymaker who can simultaneously consider policies related to both biofuels and electricity might be in better position than a policymaker who considers just one. Again, a PUC could *consider* biofuels, which might be a challenge for it, but if it deemed biofuels a preferable option to EVs, it often would have little ability to do anything to promote biofuel adoption. Accordingly, it may be faced with a choice of doing nothing at all or doing something inefficient.

The same is true of other types of vehicle technologies that might reduce oil consumption or GHGs. Indeed, one advantage that EVs have over other forms of alternative transportation vehicles—particularly compressed natural gas and hydrogen vehicles—is that the fueling infrastructure for electricity, the electric grid, is already widely developed.<sup>345</sup> Widespread adoption of vehicles powered by hydrogen fuel cells or compressed natural gas would require extensive and expensive new infrastructure networks for refueling.<sup>346</sup> However, investing in a broad network of EV public charging stations may be more expensive than investing in new infrastructure for biofuels or even compressed natural gas.<sup>347</sup> To further add to the complexity, some forms of alternative vehicles might promote some of the policy goals noted above, but not others.<sup>348</sup> For example, vehicles powered by compressed natural gas may be an economical way to reduce oil imports, but may not be effective at reducing GHG emissions.<sup>349</sup> Accurately predicting which type of consumer vehicle will most effectively lead to reductions in petroleum imports and GHG emissions is an extraordinarily complex task.<sup>350</sup>

This complexity has led many policy analysts to call for a portfolio approach that is flexible enough to support a number of different vehicle technologies.<sup>351</sup> Policymakers may seek to implement policies that will not lead to overinvestment in infrastructure that may become obsolete if another vehicle technology becomes more cost-effective or otherwise favored by markets or policy.<sup>352</sup> This may be particularly true in the context of public utility regulation, which has historically allowed private companies to recover stranded costs of

343. *Id.* at 46–47.

344. *Id.* at 50.

345. See MELAINA, *supra* note 6, at 13.

346. See NAT'L RESEARCH COUNCIL, *supra* note 1, at 4.

347. See MELAINA, *supra* note 6, at 70.

348. NAT'L RESEARCH COUNCIL, *supra* note 1, at 8.

349. NAT'L RESEARCH COUNCIL, *supra* note 1, at 8.

350. See MELAINA, *supra* note 6, at 11 (noting the difficulties of “quantifying non-cost barriers, uncertainties surrounding technology change and policy effectiveness, and the difficulty of formulating, analytically, interactions between industry and government stakeholder behavior and consumer decisions or preferences” as well as “the high degree of uncertainty surrounding the future cost of low-carbon, petroleum, and unconventional fuels[, and] cross-sector market effects of increasing market demand for low-carbon energy resources such as biomass”).

351. NAT'L RESEARCH COUNCIL, *supra* note 1, at 7; Other analysts reject this approach. See, e.g. Minsk et al., *supra* note 202, at 359–60.

352. NAT'L RESEARCH COUNCIL, *supra* note 1, at 9.

Legal Theory, Working Paper 13-7; L. & Econ., Working Paper 13-4, 2013), available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2220788](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2220788).

336. See, e.g., Andreas Goldthau & Benjamin Sovacool, *The Uniqueness of the Energy Security, Justice, and Governance Problem*, 41 ENERGY POL'Y 232, 232 (2012) (noting four “dimensions of difference: vertical complexity, horizontal complexity, higher entailed costs, and stronger path dependence”).

337. See Jonathan Armiger, *Judicial Review of Utility Commissions*, 86 IND. L.J. 1163, 1167 (2011).

338. See generally ORG. FOR ECON. CO-OPERATION AND DEV., REDUCING TRANSPORT GHG EMISSIONS: OPPORTUNITIES AND COSTS (2010).

339. See generally See NAT'L RESEARCH COUNCIL, *supra* note 1.

340. *Id.* at 6.

341. *Id.* at 4.

342. *Id.* at 50.

investments that were prudently made but ultimately unsuccessful.<sup>353</sup> The recovery of costs of unsuccessful investments from customers distinguishes the electricity industry from other industries, where those losses are more likely to be borne by investors than customers. The important environmental and national security policy goals might, however, require swift and aggressive action to make a significant difference in time to reduce GHG emissions or avoid locking in old technologies.<sup>354</sup>

What does implementing a portfolio approach mean for state PUCs? At one level, it again suggests that state regulators may not be the appropriate government agency to consider whether to directly subsidize EVs or EV charging infrastructure.<sup>355</sup> Perhaps Congress or a federal agency with broad authority to consider alternatives is best suited to efficiently design subsidy programs through tax breaks or other loan or grant programs.<sup>356</sup> PUCs, however, will still likely play a role in regulating investments in infrastructure in both the electricity and natural gas industries. Energy infrastructure regulators need not take the position that their inability to singlehandedly address energy and environmental policy goals means they should attempt to do nothing at all. Rather, it is important for PUCs to work closely with other state and federal regulatory agencies, at times implementing complimentary policies within their respective domains.<sup>357</sup> Governor's offices or the National Association of Regulatory Utility Commissioners may appropriately bring together task forces and help ensure communication across government agencies.<sup>358</sup> The need for collaboration will require policymakers to be flexible, discerning, and aware of developments outside of their traditional areas of expertise.<sup>359</sup> This may be a tall order for a regulatory body.<sup>360</sup> It may nonetheless be the best option.

## f. Conclusion

There are strong arguments both for and against utility commission consideration of goals such as GHG mitigation and reducing oil consumption when setting EV infrastructure regulatory policy. It is probably best to consider all important policy goals in a transparent manner that reflects the

difficulty and lack of general expertise the agency may possess. It is also prudent at this time to allow for flexibility and easy changes of course in utility regulatory policy if circumstances change or regulators learn new information.<sup>361</sup> All of this points to a relatively light-handed approach to direct intervention in the emerging EV charging market.<sup>362</sup> Ultimately, a robust retail charging market may tend to hold down prices,<sup>363</sup> increase service quality,<sup>364</sup> and promote the reduction in oil dependence and possibly the long-term mitigation of GHGs. If it does not, PUCs and other policymakers can react accordingly.<sup>365</sup>

## D. Level 2 Charging Stations for Residential Use

The case for utility ownership or subsidy of Level 2 charging stations for personal residential use is even weaker than the case for ownership of public charging stations, at least from a traditional economic regulatory lens.<sup>366</sup> First, residential home charging is not part of a natural monopoly.<sup>367</sup> The charging point—analogue to an outlet in a private home—has not traditionally been considered part of the regulated utility system.<sup>368</sup> The monopoly over infrastructure ends at the connection point to the home.<sup>369</sup> As seen in the analysis of public charging stations, there is some case to be made that EV charging might have some benefit for all utility ratepayers to the extent that it allows sharing of fixed infrastructure costs.<sup>370</sup> However, these benefits likely do not justify utility ownership of charging infrastructure such as Level 2 chargers.<sup>371</sup> This equipment is primarily a convenience, not a

361. Pub. Util. Comm'n of Or., Order No. 12-013, *supra* note 85, at 9.

362. KAHN, *supra* note 20, at 325–26 (“Regulated monopoly is a very imperfect instrument for doing the world’s work. It suffers from the evils of monopoly itself—the danger of exploitation, aggressively or by inertia, the absence of pervasive external restraints and stimuli to aggressive, efficient and innovative performance. Regulation itself tends inherently to be protective of monopoly, passive negative, and unimaginative. The concentration of commissions on the rate base and rate of return has been far disproportionate to their importance compared with other dimensions of performance, has weakened incentive, and introduced distortions. Regulation is ill-equipped to treat the more important aspects of performance—efficiency, service innovation, risk taking, and probing the elasticity of demand. Herein lies the great attraction of competition: it supplies the direct sput and the market test of performance.”).

363. *Id.* at 112 (“Competition is far more powerful than regulation in forcing businesses to explore the slope of their cost functions and elasticity of their demands, and to push down costs, if they are to prosper. In those situations in which competition is feasible, regulatory commissions clearly should welcome it rather than rush to restrict it.”).

364. *Id.* at 160–61.

365. See generally Pub. Util. Comm'n of Or., Order No. 12-013, *supra* note 85. The Oregon Public Utility Commission recently considered EV infrastructure policy and determined that at this early stage in the EV market, it was appropriate to allow electric utilities the choice to either operate EV charging equipment as part of their utility investments, or as a non-regulated venture outside of the regulatory proceeding. *Id.* at 6.

366. See TOMAIN & CUDAHY, *supra* note 13, at 169–73 (describing the theory of natural monopolies).

367. See *id.*

368. See *id.* (explaining that conditions for a natural monopoly only exist when the addition of another customer requires a relatively small cost).

369. See *id.*

370. Lyon et al., *supra* note 139, at 265–66.

371. *Id.* (calculating that in a number of scenarios savings from “smart charging” with faster Level 2 chargers also did not justify utility system investments in Level 2 chargers (estimated between \$1,500 and \$2,500)).

353. See TOMAIN & CUDAHY, *supra* note 13, at 198–201.

354. NAT'L RESEARCH COUNCIL, *supra* note 1, at 9.

355. See *id.* at 7.

356. See *id.* at 6–7.

357. See Hofmeister, *supra* note 281, at 86.

358. See Press Release, Nat'l Assoc. of Regulatory Util. Comm'rs, Colorado's Epel, Maine's Littell Named as New Leadership of NARUC Environmental Task Force (Feb. 25, 2013), available at <http://naruc.org/News/default.cfm?pr=357&pdf=>.

359. KAHN, *supra* note 20, at 326 (“Manifestly, elaboration of all the ‘correct’ regulatory principles is of little avail if their interpretation and application are to be entrusted to incompetent and inadequately financed commissioners. It should be clear from these volumes that the principles are far from clear-cut or self-enforcing, but require instead the exercise of the most complex judgments, both of economic analysis and in the reconciliation of economic and noneconomic objectives.”).

360. See *id.* at 326 (“Manifestly, elaboration of all the ‘correct’ regulatory principles is of little avail if their interpretation and application are to be entrusted to incompetent and inadequately financed commissioners. It should be clear from these volumes that the principles are far from clear-cut or self-enforcing, but require instead the exercise of the most complex judgments, both of economic analysis and in the reconciliation of economic and noneconomic objectives.”).

necessity, for EV owners.<sup>372</sup> Charging points should not be considered part of the regulatory compact with utilities. The natural monopoly rationale is also not available as a reason to subsidize EVs by incorporating the costs of in-home charging equipment into the general utility rate base. If an EV owner wants the added convenience of a Level 2 charging station, that consumer should bear that cost.

The policy rationales for reducing gasoline consumption noted above, however, might be used to argue in support of subsidies for private EV charging stations.<sup>373</sup> Subsidies may help to overcome the economically inefficient behavior of vehicle purchasers who are averse to higher upfront costs and blind to long-term benefits, like reduced future fuel costs.<sup>374</sup>

Using utility rates to provide these subsidies, though, would raise significant distributional concerns. Early adopters of EVs might be wealthier than average utility ratepayers.<sup>375</sup> Accordingly, their decision to buy EVs would be subsidized by everyone else. At the same time, low-income families are disproportionately impacted by increases in utility bills, which tend to make up a higher percentage of their monthly budgets than other income groups.<sup>376</sup>

The federal government and many states have already made the decision to subsidize EV purchases through the tax code, which may be a better tool for EV subsidies than electricity rates.<sup>377</sup> To the extent that subsidies attempt to correct for positive externalities such as GHG mitigation or reduced oil imports, the costs of those subsidies might be best spread across the entire country. If a state seeks to further promote EV use, it should also consider using the tax code before using utility rates.<sup>378</sup> The income tax base also tends to be

more progressive than utility rates, so the burden of a tax benefit will be borne by those most able to afford it.<sup>379</sup>

On the other hand, those who favor aggressive subsidies to promote EVs might favor an approach of overlapping federal and state subsidies wherever they are politically feasible. Historically, clean energy development has often been subsidized in the United States by a complicated mix of state and federal policies.<sup>380</sup> In addition, there may be some benefits to using the utility rate base rather than the tax code if a state seeks to provide EV subsidies. First, the utility rate base may be more realistic option for political reasons. In addition, some low-income citizens may not have enough tax liability to make use of a non-refundable tax credit, so a utility subsidy could increase access to the subsidy for low-income citizens. Further, the utility rate base may be able to provide the incentive closer in time to the purchase of the EV or the infrastructure, rather than waiting until an income tax return is filed in the following year. This might make the incentive more effective in influencing driving behavior.<sup>381</sup> These kinds of comparative subsidy analyses are probably better left for state legislatures than PUCs.

Ultimately, tax subsidies should probably be favored over utility rate subsidies. This does not necessarily mean, however, that electric utilities should not subsidize EV purchases or infrastructure if those costs are borne by utility shareholders, as opposed to ratepayers. For example, Consumers Energy, a major investor-owned utility in Michigan, has been providing \$2,500 subsidies toward the installation of Level 2 chargers for EV purchasers, but has not asked the Michigan Public Service Commission to recover these costs from other utility customers.<sup>382</sup> Indeed, it might be economically rational for electric utilities to seek to promote the early adoption of a vehicle technology, since it could provide a significant source of electricity demand. This is particularly true at a time when utilities face significant business risks from reduced electricity demand and competition against distributed generation systems.<sup>383</sup>

Authorizing regulated utilities to own and manage residential charging infrastructure might also lead to a reduced incentive for technological innovation. For example, AT&T's ownership of telephone equipment has largely been credited

372. Only 15% of current Chevy Volt owners charge at with Level 1 chargers. Britta Gross, Director, Advanced Vehicle Commercialization Policy, General Motors, Presentation to Society of Automotive Engineers Government Industry Conference (Jan. 31, 2013), Volt Infrastructure Learnings, at Slide 9, available at: [http://www.sae.org/events/gim/presentations/2013/gross\\_britta.pdf](http://www.sae.org/events/gim/presentations/2013/gross_britta.pdf).

373. Indeed, some might even argue that public utility rates should be used to subsidize the purchase of EVs themselves. LANSING BD. OF WATER & LIGHT, CONNECTIONS 1 (Nov. 2010), available at [www.lbwl.com/About-the.../Connection-Newsletter-November-2010/](http://www.lbwl.com/About-the.../Connection-Newsletter-November-2010/) (describing the Lansing, MI municipal utility's \$7500 subsidy program for purchase of the Chevy Volt).

374. Brandon Hofmeister, *Bridging the Gap: Using Social Psychology to Design Market Interventions to Overcome the Energy Efficiency Gap in Residential Energy Markets*, 19 SOUTHEASTERN ENVTL. L.J. 1, 20–24 (2010) [hereinafter Hofmeister, *Bridging the Gap*].

375. CTR. FOR CLIMATE AND ENERGY SOLUTIONS, AN ACTION PLAN TO INTEGRATE PLUG-IN ELECTRIC VEHICLES WITH THE U.S. ELECTRICAL GRID 41 (2012), available at [http://www.fhwa.dot.gov/environment/climate\\_change/energy/resources\\_and\\_publications/pev\\_action\\_plan/actionplan.pdf](http://www.fhwa.dot.gov/environment/climate_change/energy/resources_and_publications/pev_action_plan/actionplan.pdf).

376. HANNAH CHOI GRANADE ET AL., MCKINSEY AND COMPANY, UNLOCKING ENERGY EFFICIENCY IN THE U.S. ECONOMY 14 (2009), available at [http://www.mckinsey.com/client\\_service/electric\\_power\\_and\\_natural\\_gas/latest\\_thinking/-/media/204463A4D27A419BA8D05A6C280A97DC.ashx](http://www.mckinsey.com/client_service/electric_power_and_natural_gas/latest_thinking/-/media/204463A4D27A419BA8D05A6C280A97DC.ashx).

377. The federal Internal Revenue Code currently offers consumers up to \$7,500 in federal income tax credits if they purchase a qualified electric vehicle. 26 U.S.C. §30d (2013). The credit begins to phase out when the manufacturer of the vehicle has sold at least 200,000 qualifying vehicles in the United States.

378. Maryland, for example, has implemented a number of EV subsidies outside of the electricity regulatory process: grants for public charging stations, allowing EVs to use HOV lanes, \$2,000 tax credits for purchase of EVs, and a tax credit for 20% of installation costs of EVSE (capped at \$400).

MD. ELEC. VEHICLE INFRASTRUCTURE COUNCIL, FINAL REPORT TO THE GOVERNOR AND MARYLAND GENERAL ASSEMBLY 21 (2012), available at [http://www.mdot.maryland.gov/Office\\_of\\_Planning\\_and\\_Capital\\_Programming/Electric\\_Vehicle/Documents/Final\\_Report\\_Full\\_Document.pdf](http://www.mdot.maryland.gov/Office_of_Planning_and_Capital_Programming/Electric_Vehicle/Documents/Final_Report_Full_Document.pdf).

379. The U.S. income tax system is generally progressive, charging higher marginal rates to taxpayers who earn more money. Many state income tax rates are also progressive, through some use flat income taxes. Electricity rates, in contrast, tend to be regressive—low-income households tend to spend a higher percentage of their monthly budgets on utility bills than do high-income households. HANNAH CHOI GRANADE ET AL., *supra* note 376, at 14.

380. See generally U.S. GEN. ACCOUNTING OFFICE, GAO-13-136, WIND ENERGY: ADDITIONAL ACTIONS COULD HELP ENSURE EFFECTIVE USE OF FEDERAL FINANCIAL SUPPORT (2013) (detailing the myriad of federal and state policies promoting the electricity generation by wind).

381. David Diamond, *The Impact of Government Incentives for Hybrid-Electric Vehicles: Evidence From US States*, 37 ENERGY POL'Y 972, 981 (2009).

382. Application of Consumers Energy Company for Approval of Its Experimental Electric Vehicle Tariff, Opinion and Order, Case No. U-16446, 2 (Mich. Pub. Serv. Comm'n, Sept. 14, 2010), available at <http://efile.mpsc.state.mi.us/efile/docs/16446/0002.pdf>.

383. See generally PETER KIND, DISRUPTIVE CHALLENGES: FINANCIAL IMPLICATIONS AND STRATEGIC RESPONSES TO A CHANGING RETAIL ELECTRIC BUSINESS. EDISON ELECTRIC INSTITUTE (2013), available at <http://www.eei.org/ourissues/finance/Documents/disruptivechallenges.pdf>.

with deterring innovation in telephone devices for decades.<sup>384</sup> Like electricity, telephone service has been regulated as a traditional natural monopoly in the United States.<sup>385</sup> For many decades, telephones themselves were treated as utility-owned infrastructure.<sup>386</sup> All telephone consumers shared costs of the phones as part of their general telephone charges.<sup>387</sup> Moreover, AT&T owned Western Electric, the primary manufacturer of telephones.<sup>388</sup> AT&T's ownership of telephone infrastructure created little innovation in telephone technology.<sup>389</sup> To date, electric utilities have not sought to directly own EV charging equipment manufacturers, but their ownership of the equipment itself may nonetheless lead to inefficiencies and insufficient incentives to provide innovative and bundled charging services.

The CA PUC recently dealt with the complex issue of how regulated residential charging should interact with competitive public charging stations.<sup>390</sup> The CA PUC ruled that California utilities would not own EV charging equipment that serves only one customer.<sup>391</sup> However, at least through June 30, 2013, general California ratepayers will reimburse EV owners for infrastructure upgrades designed to enable EV charging, including the installation of EV charging equipment.<sup>392</sup> So even though the utility will not own the charging equipment, the costs of the charging equipment upgrades will essentially be borne by all ratepayers.<sup>393</sup> Ratepayers would pay for basic charging arrangements—a flexible term that the PUC indicated would generally encompass Level 1 and Level 2 charging capability for a vehicle.<sup>394</sup> This policy subsidizes EV ownership through electric rates, but does not fall prey to the disadvantages of monopoly utility ownership of charging equipment.

However, the CA PUC did not enable full competition in the provision of charging services to residential EV owners. Although the ownership of public charging stations is competitive and might be provided by non-utility companies, the rates charged to EV owners will not be subject to competition.<sup>395</sup> The CA PUC found that third party providers of charging infrastructure services in residential settings must be charged the special utility EV residential rate, to level the playing field with utilities for providing charging services.<sup>396</sup>

In fact, this ruling essentially prohibits any competition for residential service provision. California also allows EV owners to stay on regular rates if they wish, as well as having special EV “whole house” rates without a dedicated EV meter.<sup>397</sup>

The CA PUC's balancing may be explained by the importance it placed on the policy goal of influencing EV charging times.<sup>398</sup> Because early EV adoption is not likely to lead to a significant impact on peak demand, however, this reliance might be misplaced. It might be more efficient and more conducive to innovation to effectively allow free competition not just in public EV charging stations, but in the residential EV charging market as well. This decision would open the door to a much broader and politically volatile state policy discussion of retail electric competition generally, however. Given that EVs are likely still going to be a small piece of the electricity load for many years to come, the special case of EVs probably should not be used to drive the bigger discussions of whether a state should broadly allow retail electricity competition. The CA PUC's decision may therefore be a practical way to maintain the general regulated rate system for residential homes, but allow for competition in public charging stations.

### E. Smart Meters

A final piece of charging infrastructure that might be considered to enable EV charging, either in public charging stations or in residential garages, is the “smart meter.” Although unnecessary to recharge an EV, this is the primary technology necessary to implement time variable pricing.<sup>399</sup> Accordingly, to the extent that proactive management of EV charging times produces benefits to the electricity system, this particular piece of infrastructure may warrant shared cost-recovery.<sup>400</sup>

Many utilities are already rolling out smart meter initiatives for reasons unrelated to EVs: smart meters can enhance reliability, enable time-of-use pricing, and give consumers better information about their electricity usage.<sup>401</sup> Like most utility meters, the full utility rate base generally shares the costs of these meters.<sup>402</sup> An EV could have a dedicated smart meter of its own, separate from the household meter, which

384. See KAHN, *supra* note 20, at 303–04.

385. *Id.* at 127–29.

386. *See id.* at 140–45.

387. *See id.*

388. *See id.* at 291.

389. *See id.* at 303 (“[O]pening the market to a large number of other, technologically progressive companies, by offering them the opportunity of competing on equal terms for Bell company custom, would contribute powerfully to innovation. The result could well be even more rapid reduction in cost and proliferation of new services than has been accomplished thus far.”); *see also* Hush-a-Phone Corp. v. United States, 238 F.2d 266, 267 (D.C. Cir. 1956); Use of Carterfone Device in Message Toll Tel. Serv., 13 F.C.C.2d 420, 424 (1968).

390. Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 1–2.

391. *Id.* at 49.

392. *Id.* at 59.

393. *See id.*

394. *Id.*

395. *See id.* at 26.

396. *See id.* at 25, 33 (“[I]n order to preserve equitable, cost of service treatment and maintain a level playing field between utilities and electric vehicle service

providers, existing residential Electric Vehicle rates should apply to electric vehicle service providers operating in the residential setting. Electric vehicle service providers should only be eligible for residential rates designed to serve Electric Vehicle load and, therefore, would not be eligible for non-time-of-use general service rates in the residential context. We adopt this limitation to ensure that electric vehicle service providers have appropriate rate incentives in the provision of their services in the residential setting to encourage off-peak charging.”).

397. *See id.* at 20–21.

398. CAL. PUB. UTILS. COMM'N, REVENUE ALLOCATION AND RATE DESIGN, *supra* note 41, at 3.

399. CAL. PUB. UTILS. COMM'N, THE UTILITY ROLE IN SUPPORTING PLUG-IN VEHICLE, *supra* note 28, at 10.

400. Pub. Util. Comm'n of Or., Order No. 12-013, *supra* note 85, at 11.

401. U.S. DEP'T OF ENERGY, SMART GRID SYSTEM REPORT 10 (2009), available at <http://energy.gov/sites/prod/files/2009%20Smart%20Grid%20System%20Report.pdf>.

402. *See, e.g.*, Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 38, 40.

would enable an EV-specific rate that could encourage off-peak charging.<sup>403</sup>

It is not completely necessary, however, for a second smart meter to be installed in a home for a variable EV rate to be implemented.<sup>404</sup> So long as the house has at least one smart meter, the EV could be “submetered” with some additional technology (either in the vehicle or on a charging point) that enables communication between the charging equipment and the home’s meter.<sup>405</sup> The submeter would not necessarily need to be owned by the utility, but could be owned by a consumer or a third party EV charging service.<sup>406</sup> In order to assure that the submeter is accurate and to prevent tampering PUCs will likely need to provide some regulatory oversight of submeters, as well as remedies for fraud and abuse.<sup>407</sup>

Accordingly, one important regulatory question is whether separate smart meters should be required of all EV owners and if so, who should bear the costs of this investment. If such a mandate was placed on EV owners because of the regulator’s desire to influence the time of charging for the benefit of all ratepayers, it may be justifiable to have the system’s ratepayers bear the cost of the infrastructure that enables this benefit.<sup>408</sup> It is difficult to make a definitive conclusion of whether a “smart charging” policy for EVs is actually cost-effective for the entire utility system.<sup>409</sup> The economics are variable and can change substantially depending on the characteristics of individual electric grids.<sup>410</sup> If a smart charging policy does not result in significant efficiencies, it may not be worth spreading the investments in enabling infrastructure such as smart metering technologies.<sup>411</sup> A recent University of Michigan study of two major U.S. regional electricity markets estimated that smart meters’ corresponding efficiencies in those electric grids failed to justify their approximately \$150 per meter costs.<sup>412</sup>

Given the possibility of submetering arrangements and the still-emerging state of the EV charging market, it is probably unnecessary to require all EV owners to install smart meters and take service with a time-of-use rate.<sup>413</sup> The grid-wide benefits are still too small to justify requiring smart meters for every EV.<sup>414</sup> Allowing submetering technology might enable innovative business plans and charging man-

agement technologies for EV charging.<sup>415</sup> Advanced metering technology is also still at a formative stage, so PUCs should also be wary of approving investments in technology or locking in technological requirements that might soon be obsolete.<sup>416</sup> Ultimately, some form of national standardization is probably preferable to ensure interoperability for different EV products, a course which FERC is pursuing.<sup>417</sup>

Moreover, if smart meters were mandated, the utility and the regulatory commission would need some way of determining when a ratepayer purchased an EV.<sup>418</sup> Perhaps this could be accomplished by having the state motor vehicle agency forward this information to the relevant utility.<sup>419</sup> But this disclosure and the associated oversight could prove costly and might raise privacy concerns among potential EV owners, acting as a deterrent to EV purchase.<sup>420</sup>

Most state utility commissions currently allow EV owners the option of installing a secondary smart meter, rather than requiring them to do so.<sup>421</sup> California, for example, reached a determination that seems a sensible balancing. The PUC decided to keep all metering options—including submetering—open to EV owners.<sup>422</sup> This allows for innovation and competition in submetering technologies.<sup>423</sup> At the same time, the utility retains control over the primary meter providing the total household reading.<sup>424</sup> Submetering technology is still emerging, so the PUC created a stakeholder group to study the issue further.<sup>425</sup> Submeters would be regulated by the California Department of Food and Agriculture and would be paid for by the EV owners themselves or by third party service providers.<sup>426</sup>

In general, the costs of a California residential customer’s first meter are borne by all ratepayers as part of the utilities’ general cost of service.<sup>427</sup> The CA PUC determined that the costs of dedicated EV meters, owned by the utilities, should be borne by individual ratepayers, rather than the general customer rate base.<sup>428</sup> If utilities were able to spread the

403. CAL. PUB. UTILS. COMM’N, THE UTILITY ROLE IN SUPPORTING PLUG-IN VEHICLE, *supra* note 28, at 10.

404. *Id.*

405. *Id.* at 11.

406. *See id.* at 6.

407. CLEAN ENERGY COALITION, PLUG-IN READY MICHIGAN, *supra* note 26, at 40; *see also* Cal. Pub. Utils. Comm’n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 39.

408. California is considering using electric meters to track road taxes or credits for California’s Low Carbon Fuel Standard. Cal. Pub. Utils. Comm’n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 34.

409. Lyon et al., *supra* note 139, at 265 (comparing economic impacts of PHEVs between the two major U.S. regional grid—MISO and PJM—and noting that the balance of supply and demand and the fuel source used to meet marginal demand can change the economic impacts of smart charging).

410. *Id.*

411. *Id.*

412. *Id.*

413. *Id.* at 266.

414. Cal. Pub. Utils. Comm’n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 36–37.

415. Allowing competition for meter provision may provide cost savings and other innovations for consumers, including bundling metering services with other services. *Id.* at 39.

416. CAL. PUB. UTILS. COMM’N, THE UTILITY ROLE IN SUPPORTING PLUG-IN VEHICLE, *supra* note 28, at 12. Of course, individual consumers face a similar risk of choosing technologies that might soon become obsolete, and the expert staff at energy regulatory commissions may better able to understand some of the technical attributes of purchasing decisions than consumers. *See id.*

417. *See generally* Eisen, *supra* note 72, at 1.

418. Pub. Util. Comm’n of Or., Order No. 12-013, *supra* note 85, at 14.

419. Cal. Pub. Utils. Comm’n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 12.

420. *Id.* at 13.

421. The early reports show that only about 20% of Chevy Volt owners opted for a special time-of-use rate and smart meter. Gross, *supra* note 396, at Slide 9; *see e.g.*, Cal. Pub. Utils. Comm’n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 36.

422. *Id.*

423. *Id.* at 40–41.

424. *Id.* at 41.

425. Cal. Pub. Utils. Comm’n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 44.

426. *Id.* at 43.

427. *Id.* at 46–47.

428. *Id.* at 48. If the utility owns the meter, and a third party or resident owns the charging infrastructure, there might be duplicative installation costs, inefficiently adding to the transaction costs of owning an electric vehicle. If possible, it is probably better to optimize installation by having both installed at same

costs of meters more broadly, they would gain an advantage in the market for providing charging services.<sup>429</sup> Although this does increase the cost of EV ownership and may therefore be seen as a deterrent to EV ownership, the increase is insubstantial.<sup>430</sup> It also provides a more balanced competitive environment between second smart meters and submeters, since the customer would bear the costs for each of those items.<sup>431</sup> This policy also avoids the distributive justice concerns of low-income families subsidizing the purchase of EVs by high-income consumers. Moreover, the costs of the meter can be spread over time to the EV owner, taking advantage of consumers' general aversion to high upfront costs.<sup>432</sup> In sum, this is probably a sound policy that other utility commissions should consider.

### III. Existing Electricity Regulatory Statutes' Treatment of Charging Providers

So far, this Article has discussed the normative arguments for how state regulatory commissions should treat investments in EV charging infrastructure. However, the limitations state utility regulatory statutes place on commissions often limit how they *can* deal with these investments. Part A of this part describes one crucial and potentially limiting preliminary question currently faced by many states: how to treat non-incumbent utilities that seek to provide EV charging services. Part B describes a further complicating factor: the Federal Power Act gives exclusive jurisdiction to FERC to regulate wholesale electricity rates, which may hinder a PUC's ability to regulate charging services.

#### A. State Regulatory Restrictions on Non-Utility Charging Providers

In states with regulated retail utilities, the utilities are typically granted a monopoly over the retail sale of electricity to consumers.<sup>433</sup> In return for this monopoly, the utilities have a duty to serve all customers and accept rate regulation of the prices they can charge.<sup>434</sup> These statutory provisions would seemingly prohibit third party sales of electricity to EV owners from any party other than the monopoly utility.<sup>435</sup>

There are a number of potential resellers of electricity for vehicle charging: owners of standalone charging stations, gas stations who expand to sell electricity, landlords who provide EV charging to tenants or guests of tenants, employers who provide recharging to employees, or other retail businesses that provide EV charging services to individuals. If a business decided to give away electricity for free, it would

not likely run afoul of regulatory proscriptions. If, however, a charging equipment owner sold electricity—either at a flat rate or on a per kilowatt-hour basis—the seller may be participating in a prohibited activity that is the exclusive domain of a regulated utility. In addition to determining whether EV sellers are prohibited from selling electricity altogether, states that allow retail electricity competition must also determine whether EV charging providers are subject to the regulatory requirements (e.g., licensing) that are often placed on non-utility electricity providers.

Some have suggested that EV charging services be classified as merely selling a parking space or access to charging equipment, not electricity itself, and therefore could avoid regulation by state utility commissions.<sup>436</sup> However, this categorization seems like a legal fiction designed to avoid clear statutory prohibitions on the sale of electricity.<sup>437</sup> Unless the parking charge was exactly the same for EV and non-EV owners, it would seem that any premium charged is really a sale of electricity. The primary service offered to EV charging customers is to access the electricity itself.<sup>438</sup> This is the reason why someone would pay to charge his or her vehicle. No one would pay extra to park a vehicle at a charging station that was not actually connected to the electric grid. Claiming the price premium for the equipment, but not the sale of electricity, might be a formalistic way to avoid regulatory problems, but it flies in the face of the intent of most state utility regulatory codes, which provide a monopoly on retail sales. Accordingly, even when this type of argument is made or accepted by a state regulatory commission, it might still fall subject to litigation to determine the proper statutory construction of the relevant state regulatory statute.

However, as noted above, a competitive market for retail electricity charging services, at least for public charging stations, is probably preferable. Many states have already taken action to clarify whether third party sellers of EV charging stations violate state restrictions on electricity sales.<sup>439</sup> In California, the CA PUC undertook a rulemaking to determine whether charging station owners should be considered "electrical corporations or public utilities pursuant to [Pub. Util. Code] §§216 and 218."<sup>440</sup> Despite the seemingly clear language of the existing statute, the CA PUC determined that charging station owners were not public utilities sub-

time, but this may not be possible if a PUC wants to maintain separate ownership of these devices to promote competition.

429. *Id.* at 47.

430. See Cal. Pub. Utils. Comm'n, Phase 2 Decision on Establishing Policies, *supra* note 44, at 48.

431. *Id.* at 40–41, 46–47.

432. *Id.* at 48; Hofmeister, *Bridging the Gap*, *supra* note 372, at 20.

433. Rossi, *supra* note 84, at 1236.

434. *Id.*

435. See generally CHAVEZ-LANGDON, *supra* note 160 (noting that a regulatory question exists as to whether the statutory provisions prevent sales to EV owners).

436. *Id.* at 2.

437. See *id.*

438. See *id.*

439. The City Council of the District of Columbia passed legislation in late 2012 providing that "The term 'public utility' excludes a person or entity that owns or operates electric vehicle supply equipment but does not sell or distribute electricity, an electric vehicle charging station service company, or an electric vehicle charging station service provider." Energy Innovation and Savings Amendment Act of 2012, tit. I, §101(b), 59 D.C. Reg. 014392 (Dec. 21, 2012); The Oregon PUC determined that EV charging providers were not covered by the Oregon utility regulatory statute. See Pub. Util. Comm'n of Or., Order No. 12-013, *supra* note 85, at 5.

440. Cal. Pub. Utils. Comm'n, Rulemaking 09-08-009, Assigned Comm'r's Scoping Memo 3 (January 12, 2010), available at <http://docs.cpuc.ca.gov/efile/RULC/112302.pdf>. "Pursuant to §§216 and 218 the Commission regulates as public utilities corporations and persons owning, controlling, operating, or managing facilities used for the transmission, delivery, or furnishing of electricity to the public." See Cal. Pub. Utils. Comm'n, Decision in Phase 1, *supra* note 51, at 19.

ject to price regulation.<sup>441</sup> The PUC noted that a number of owners of EV charging station equipment—such as a private homeowner or landlord that owns electrical equipment—did not offer the infrastructure for “public dedication” and, therefore, clearly did not qualify as regulated utilities.<sup>442</sup> Public charging stations were a much closer call, but the PUC ultimately relied on legislative enactments directing the PUC to evaluate EV enabling policies made *subsequent* to the statute in issue as conclusive evidence that EV charging stations should not be subject to regulation as public utilities.<sup>443</sup> Such use of vague subsequent legislative enactments as evidence of an earlier legislature’s intent to abrogate clear statutory text is a statutory interpretation stretch, to say the least.<sup>444</sup> The PUC further defended its decision as good public policy.<sup>445</sup> The decision was probably good public policy, but it nonetheless posed a substantial litigation risk to non-utility service providers because of its reliance on questionable statutory interpretation methodologies.

At the behest of the CA PUC,<sup>446</sup> the California legislature subsequently passed AB 631, which cleared up the statutory language and officially excluded EV charging stations from the state’s “Public Utility” definition.<sup>447</sup> If a state seeks to create a free market for EV charging services, a legislative amendment, rather than a strained interpretation by a

441. *See id.* at 19. The decision relied on an earlier precedent that sellers of compressed natural gas for vehicles were not regulated public utilities. *See id.* at 4, 31 (citing Cal. Pub. Utils. Comm’n, Rulemaking D.91-07-018, 1991 Cal. PUC LEXIS 509 (July 2, 1991)).

442. *See id.* at 18–19.

443. *Id.* at 19–20 (“Recently enacted §740.2 requires the Commission, in consultation with other agencies and industries, to evaluate policies to ‘. . . develop infrastructure sufficient to overcome any barriers to the widespread deployment and use of plug-in hybrid and electric vehicles.’ Section 740.2 directs the Commission to focus on the potential impacts of vehicle charging on electrical infrastructure and grid operations. Specifically, the Commission is directed to address grid reliability and infrastructure upgrades, integration of renewable energy resources, technology advancements, legal impediments, and the possible shifting of greenhouse gas emissions reduction responsibility from the transportation sector to the electrical industry. Section 740.2 does not direct the Commission to regulate electric vehicle charging service providers as public utilities pursuant to §§216 and 218. Thus we conclude that the legislature did not intend that the Commission treat electric vehicle charging service providers as public utilities. Rather the legislature intended that we use the authority granted in §740.2 to address the potential impacts of vehicle charging. Our review of §740.3 further supports this conclusion. Section 740.3 directs the Commission to develop policies to promote the development of infrastructure needed to facilitate the use of electric power to fuel low emission vehicles. Nothing in §740.3 explicitly or implicitly directs the Commission to regulate electric vehicle charging service providers as public utilities. In fact, §740.3(c) requires that the Commission ‘ensure that utilities do not unfairly compete with nonutility enterprises.’ Clearly, the legislature contemplated that providers of electric vehicle charging equipment would include both utility and non-utility entities. Therefore, we conclude that §740.3 further demonstrates that the legislature did not intend the Commission to treat all electric vehicle charging providers as public utilities pursuant to §§216 and 218.”).

444. *See* *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 190 (1978) (reaffirming idea that repeals by implication are not favored, but instead altering earlier legislation requires a clear, affirmative act by the legislature).

445. Cal. Pub. Utils. Comm’n, Decision in Phase 1, *supra* note 51, at 18 (“Removing regulatory uncertainty advances the mandates of §740.2 to remove barriers to the widespread deployment and use of electric vehicles by informing planning prior to the introduction of significant electric vehicles in the market, mitigating related potential risk factors associated with investment opportunities in electric vehicle markets. . .”).

446. *Id.*

447. Cal. Pub. Utils. Code §216 (West 2013).

PUC, seems to be the cleanest and most common way to deal with these existing statutes’ prohibitions.<sup>448</sup> Hawaii has also excluded EV charging stations from its public utility definition.<sup>449</sup> Illinois recently enacted legislation providing that furnishing the service of charging EVs does not qualify as selling electricity under Illinois law and is not subject to regulatory statutes governing utilities and competitive electric suppliers.<sup>450</sup> In states that have not yet passed legislation, however, there still may be significant statutory barriers to third-party sales of EV charging stations, which a utility could use to enjoin non-utility charging providers from conducting business.<sup>451</sup>

## B. Federal Regulatory Restrictions on Non-Utility Charging Providers

The sale of electricity by non-utility charging providers also implicates federal electricity regulatory authority. Section 201 of the Federal Power Act provides that FERC has exclusive authority over “the sale of electric energy at wholesale.”<sup>452</sup> This phrase is further defined by the Act as “a sale of electric energy to any person for resale.”<sup>453</sup> This would seemingly preempt a state commission from imposing a rate charged by a regulated public utility on a third-party reseller of charging services. Third-party resellers might be forced to procure electricity on the wholesale market, subject to regulation by FERC. However, state PUCs and legislatures will likely dispute FERC’s authority to set wholesale EV charging rates.

For example, the California legislature amended its public utility code to authorize the CA PUC to adopt rules to address the impact of EVs on grid stability.<sup>454</sup> The CA PUC has interpreted this authority to give it the “authority to dictate the terms under which the utility will provide service” to third-party charging stations.<sup>455</sup> The CA PUC also asserted that “the sale of electricity by an investor-owned utility to an electric vehicle charging service provider is a retail electricity transaction. Therefore, the Commission has jurisdiction over that transaction and can set the rate that the provider pays to the utility.”<sup>456</sup> The CA PUC further noted that this

rate design authority may be a tool to address how electric vehicles impact the electric grid and can help to integrate renewable energy resources. The rate that an electric vehicle charging provider pays to the utility will be a cost of doing business that the charging provider may pass on to its customers or absorb.<sup>457</sup>

448. *See, e.g., id.*; HAW. REV. STAT. §269-1(L) (2013); 220 ILL. COMP. STAT. ANN. §5/16-102 (West 2012).

449. HAW. REV. STAT. §269-1(L) (2013).

450. 220 ILL. COMP. STAT. ANN. §5/16-102 (West 2012).

451. Only 10 states have passed such clarifying legislation thus far. *See* CHAVEZ-LANGDON, *supra* note 160, at 4.

452. 16 U.S.C. §824(b)(1) (2006).

453. §824(d).

454. CAL. PUB. UTILS. CODE §740.2 (West 1997).

455. Cal. Public Utils. Comm’n, Decision in Phase 1, *supra* note 51, at 25.

456. *Id.* at 27.

457. *Id.* at 28. The Commission further noted that “The Commission has the authority to create demand response and energy efficiency programs to provide

The Federal Power Act's seemingly conclusive language that FERC has jurisdiction over the "sale of electric energy at wholesale in interstate commerce" was dismissed as follows:<sup>458</sup>

[W]e conclude that selling electric vehicle charging services does not make an entity an electric utility and that a seller of electric vehicle charging services that purchases electricity from an investor-owned utility is an end-user that purchases the electricity at retail. Thus, the sale of electricity by an investor-owned utility to an electric vehicle service provider is a retail sale of electricity, not a wholesale sale or a "sale for resale." This means that the sale falls under the exclusive jurisdiction of the California Public Utilities Commission, not under the jurisdiction of FERC. To the extent any party perceives uncertainty in this area, that party is free to seek a FERC declaratory order or a FERC order disclaiming jurisdiction.<sup>459</sup>

Although it is understandable that the CA PUC would want to exercise jurisdiction over utility sales to EV charging providers, the CA PUC's legal reasoning is circular and seemingly devoid of any defensible rationale.<sup>460</sup>

As seen with the state statutory restrictions on resale of electricity, there is a theoretical argument that EV charging providers are not actually selling electricity but merely selling access to charging.<sup>461</sup> Illinois recently enacted a statute that provided, "[a]n entity that furnishes the service of charging electric vehicles does not and shall not be deemed to sell electricity."<sup>462</sup> However, a state definition of electricity sale that attempts to avoid federal jurisdiction is not entitled to any deference by FERC or the judicial system. The federal definition of what constitutes a wholesale sale of electricity is paramount. In this case, an interpretation that EV charging stations are not selling electricity seems strained and indefensible. Indeed, under this line of reasoning any entity wishing to avoid federal regulation could simply claim that it does not sell electricity, but rather mere access to electricity charging infrastructure. This loophole would swallow the rule.

To date, FERC has not squarely addressed its authority to regulate sales of electricity to charging station owners who sell charging services to EV owners. On July 16, 2009, FERC issued a Smart Grid Policy Statement that analyzed some of the jurisdictional issues related to EV charging infrastructure.<sup>463</sup> In the proceeding leading up to this statement, some parties expressed concern that FERC might be expanding its jurisdictional reach into distribution systems with respect to EV infrastructure.<sup>464</sup> FERC determined that the Energy Independence and Security Act of 2007 gave it new authority to adopt "standards needed to insure smart grid functional-

ity and interoperability."<sup>465</sup> This authority could be used by FERC to:

[A]dopt smart grid standards—such as meter communications protocols or standards—that affect all facilities, including those that relate to distribution facilities and devices deployed at the distribution level, if [FERC] finds that such standards are necessary for smart grid functionality and interoperability in interstate transmission of electric power, and in regional and wholesale electricity markets.<sup>466</sup>

However, FERC's description of this standard-setting power is limited. It would not authorize broad powers for direct rate recovery for infrastructure investments.<sup>467</sup>

FERC specifically addressed its authority to set general interoperability standards that would "ultimately accommodate a wide array of advanced options for electric vehicle interaction with the grid."<sup>468</sup> It "urge[d] the early development of technical requirements that can permit distribution utilities to facilitate electric vehicle charging during off-peak load periods."<sup>469</sup> FERC made clear, however, that this was just a technical standard giving the state commissions "an additional tool to deal with any electric vehicle-related load growth that they may see in the future"<sup>470</sup> and "would in no way require the state to adopt such a pricing policy."<sup>471</sup> FERC further noted that it did not intend "to issue policy guidelines for storing electric power by charging electric vehicles during off-peak load periods," nor did it intend "to require the use of dynamic pricing in retail [electricity] rates."<sup>472</sup>

FERC has taken a hands-off approach to the regulation of EV infrastructure, concentrating on technical standards that would allow peak load pricing, but doing nothing to require its use.<sup>473</sup> At the same time, FERC has done nothing to imply it would not have the power to order variable pricing for EVs if deemed necessary and appropriate under its existing statutory authority.<sup>474</sup> The regulation of wholesale sales of electricity from a supplier to an EV charging retailer seems squarely within FERC's authority.<sup>475</sup> FERC and the federal courts have made clear on a number of occasions that when electricity is sold for resale to another party, the initial sale is

465. *Id.* at 61337.

466. *Id.*

467. *Id.* ("EISA [. . .] does not make any standards mandatory and does not give [FERC] authority to make or enforce any such standards. Under current law, [FERC]'s authority, if any, to make smart grid standards mandatory must derive from the FPA. Similarly, its authority to allow rate recovery of smart grid costs must derive from the FPA. The authority to adopt standards under EISA does not change the scope of [FERC]'s ratemaking or reliability jurisdiction, as many commenters' note.")

468. *Id.* at 61346.

469. *Id.* at 61347.

470. *Id.*

471. *Id.* at 61347–48.

472. *Id.* at 61338, 61345.

473. *Id.* at 61337.

474. *See id.* at 61347–48.

475. In addition, FERC also noted that the "reliability of the bulk-power system could be affected by the high levels of penetration of electric vehicles. *id.* at 61347. This finding could be used to enable FERC, in collaboration with the North American Electric Reliability Corporation, to exercise broad authority to impose reliability standards for the integration of EVs with the bulk-power system. 16 U.S.C. §824 (2006). At this point, it is unclear what form such standards might take.

customers incentives to reduce their energy usage at certain times (demand response) or on an ongoing basis (energy efficiency). Existing programs have resulted in significant peak load reductions and energy savings." *Id.*

458. *Id.* at 30.

459. Cal. Public Utils. Comm'n, Decision in Phase 1, *supra* note 51, at 30.

460. *Id.* at 29–30.

461. Pub. Util. Comm'n of Or., Order No. 12-013, *supra* note 85, at 4–5.

462. 220 ILL. COMP. STAT. ANN. §5/16-102.

463. FERC Smart Grid Policy, 128 FERC ¶ 61060 (July 16, 2009).

464. *Id.* at 61336.

a wholesale transaction that falls under FERC's jurisdiction, not the jurisdiction of a state utility commission.<sup>476</sup>

The most relevant FERC precedent may be from the landlord-tenant context. FERC has claimed that it has no jurisdiction over a utility's sale of electricity to master-metered customers that provide submetered services to residential tenants.<sup>477</sup> FERC reasoned that that the master-metered landlords were providing primarily a submetering function for the end-use customer and that so long as the landlord charged the tenants the exact same rate that the landlord was charged, it did not constitute a FERC jurisdictional sale for resale.<sup>478</sup> So long as no profit derives from the resale of electricity, FERC will allow a state PUC to regulate the rate as a retail rate.<sup>479</sup>

However, if non-utility EV charging providers do not completely pass through their wholesale electricity prices to customers, they presumably will not be considered to be a mere pass-through submeter provider. This would seemingly defeat any ability to profit from EV charging, and frustrate the development of a market of charging services. Again, the legal fiction of claiming that the EV provider merely rents equipment rather than sells electricity seems unlikely to pass the smell test. If Congress believes that state regulation of electricity rates charged to EV charging providers is preferable to FERC regulation, this could be accomplished by an amendment to the Federal Power Act. But barring that, FERC's authority over wholesale transactions is clearly established.<sup>480</sup>

Even if FERC or a reviewing federal court were to accept the argument that EV charging is not really a sale for resale, FERC still has authority to regulate matters "affecting or pertaining to" wholesale prices.<sup>481</sup> Because EV charging at peak hours has the potential to ultimately impact wholesale electricity prices, FERC may have the statutory authority to regulate it.<sup>482</sup> This authority does not extend to anything that might impact rates, however.<sup>483</sup> Rather, the United States Court of Appeals for the D.C. Circuit has limited such authority to "only those practices that affect rates and service significantly, that are realistically susceptible of specification, and that are not so generally understood in any contractual

arrangement as to render recitation superfluous."<sup>484</sup> Whether EV usage is significant enough to trigger this authority is unclear.<sup>485</sup> An argument could be made that currently, EV usage does not have a very significant impact on wholesale markets.<sup>486</sup> On the other hand, if EVs are widely adopted, they could significantly impact rates and markets.<sup>487</sup> The issue is an electricity policy decision, and courts would likely defer to FERC's expertise on the matter.<sup>488</sup>

FERC should use its regulatory authority to regulate wholesale electricity rates to EV charging providers in a manner that ensures consistency with other wholesale transactions. This will lead to a more robust and efficient wholesale electricity market overall.<sup>489</sup> It should also generally encourage the most efficient uses of electricity infrastructure for charging.<sup>490</sup>

In areas that are currently served by competitive wholesale electricity markets, those time-variable market prices will likely form the default basis for wholesale prices for EV charging stations.<sup>491</sup> This is beneficial to the extent that it efficiently aligns the marginal prices of electricity with the marginal cost of production.<sup>492</sup> Third-party resellers might seek to obtain wholesale power via long-term contracts and such contracts would generally be left untouched by FERC under the *Mobile-Sierra* doctrine of regulatory deference to freely contracted rates.<sup>493</sup> The actual and expected real time price signals from the wholesale markets will likely significantly influence these contract negotiations.<sup>494</sup> EV charging stations will therefore be free to incorporate these wholesale price signals into retail prices in a manner that is attractive to consumers. Competition should be used to the extent possible to help derive the pricing structures that work most efficiently. EV charging providers might charge different rates for charging in different time periods, or they might change their general rates daily, just as gas stations currently post their retail prices every morning.

State PUCs will likely retain an important role in the EV charging market, even with FERC regulation of wholesale rates. The rate for home charging, which in many cases will remain a regulated retail rate, will set a baseline expectation for EV charging costs. This will also provide a form competition to public EV charging stations. Home charging is responsible for the bulk of EV charging, and PUCs will also be able to influence time of charging by thoughtfully setting those rates.<sup>495</sup>

476. *United States v. Cal. Pub. Utils. Comm'n*, 345 U.S. 295, 316–18 (1953) (holding that a sale of electricity from a utility to the U.S. Navy, which resold some of the electricity to other users such as military personnel living on military housing, was regulated by FERC, not the CA PUC); *City of Oakland v. Fed. Energy Regulatory Comm'n*, 754 F.2d 1378, 1380 (9th Cir. 1985) (holding that the resale of electricity to individually metered tenants of the City of Oakland's airport is sale for resale subject to FERC's exclusive jurisdiction, and reseller is entitled to wholesale rates); *Dep't of the Navy*, 49 FERC ¶ 61383, at 62400 (Dec. 21, 1989).

477. *S. Cal. Edison Co. et al.*, 95 FERC ¶ 61003; *PacifiCorp, Wash. Water Power Co., Puget Sound Energy, Inc.*, 92 FERC ¶ 61032.

478. *Puget Sound Energy, Inc.*, 92 FERC ¶ 61032; *S. Cal. Edison Co. et al.*, 95 FERC ¶ 61003.

479. *S. Cal. Edison Co. et al.*, 95 FERC ¶ 61003; *PacifiCorp, Wash. Water Power Co., Puget Sound Energy, Inc.*, 92 FERC ¶ 61032.

480. *PacifiCorp, Wash. Water Power Co., Puget Sound Energy, Inc.*, 92 FERC ¶ 61032; *S. Cal. Edison Co. et al.*, 95 FERC ¶ 61003; *San Diego Gas & Electric Co.*, 95 FERC ¶ 61003 (Apr. 2, 2001).

481. *See Eisen*, *supra* note 71, at 104.

482. *Id.* at 108–09.

483. *Id.* at 120.

484. *City of Cleveland v. Fed. Energy Regulatory Comm'n*, 773 F.2d 1368, 1376 (D.C. Cir. 1985).

485. *Eisen*, *supra* note 71, at 120.

486. *Id.*

487. However, if FERC began regulating EVs under this authority, this analogy might be used to allow FERC to regulate other major sources of electricity demand.

488. *See Eisen*, *supra* note 71, at 125.

489. *Id.* at 130.

490. *Id.*

491. FERC Smart Grid Policy, 128 FERC at 61347.

492. *See KAHN*, *supra* note 20, at 177.

493. *Morgan Stanley Capital Grp., Inc. v. Pub. Utils. Dist. No. 1 of Snohomish Cnty., Wash.*, 554 U.S. 527, 534 (2008).

494. *Id.*

495. *See LOVINS*, *supra* note 5, at 173.

#### IV. Conclusion

The regulatory treatment of EV charging infrastructure is a complex matter for state utility commissions and FERC. As Alfred Kahn has advised, “industries differ one from the other, and the optimal mix of institutional arrangements for any one of them cannot be decided on the basis of ideology alone. The ‘central institutional issue of public utility regulation’ remains . . . finding the best possible mix of inevitably imperfect regulation and inevitably imperfect competition.”<sup>496</sup>

State commissions and FERC should exercise their statutory authority to broadly encourage a nationally competitive market for EV charging services. Competition should promote lower prices within the EV charging market and enable a broader form of competition with other vehicle fuels such as gasoline and biofuels. In addition, because EV charging service quality and technology is still developing, an unregulated marketplace is best suited to create incentives for service innovations that consumers might find attractive.<sup>497</sup> Regulated utilities should not be prohibited from participating in the market for public charging, but they should not be given exclusive monopoly authority to provide public EV charging services.

Regulated utilities will likely maintain a monopoly on residential EV charging in many states. EV-specific policy should probably not drive the larger decisions of whether retail electricity competition is generally appropriate in a given state. The U.S. decentralized system of retail electricity rate regulation will likely provide a natural laboratory for the design of regulated EV charging rates for residential homeowners. At this early stage of the EV charging market, state PUCs should give EV consumers options to choose special EV rates or allow them to stay on regular rates.

State PUCs are probably not best suited to make decisions about subsidies for EV adoption, but they have important roles to play in ensuring that EV infrastructure investments are made in a sound manner.<sup>498</sup> PUCs might also consider pro-EV policies as a tie-breaker when traditional regulatory principles do not provide a clear policy outcome. Because of the complex, overlapping regulatory authority governing the U.S. energy sector, state and federal utility regulators should work collaboratively, and keep abreast of the energy and climate policy developments outside of the electricity sector that might influence EV policymaking. As we learn more about the technology, the economics, and the social costs and benefits of EVs, regulators should adapt their policies accordingly.

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496. See KAHN, *supra* note 20, at xxxvii, 177; (“The determination of whether unregulated competition is the best device for achieving economically efficient pricing and, if not, what controls ought to be imposed can be made only on the basis of an appraisal of the particular technology and economic circumstances of each individual case.”).

497. See generally *id.* at 196.

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498. See *infra* Part III.B.