8. Concluding Remarks (at bottom of p. 210)

The deployment of a EV-charging infrastructure is of critical importance to maintain Illinois's leading position in grid modernization. For many years now, a major causal factor of the slow growth in EV sales has been tied to the lack of adequate EV-charging infrastructure. There is a need to put an end to this chicken-and-egg syndrome so that the rapid adoption of EVs can proceed in order to remove the millions of polluting fossil-fueled internal combustion engine vehicles from the roads, and to realize their benefits to grid efficiency and utilization. Given the fact that since 2017, the CO2 emissions from the transportation sector have exceeded those from the stationary electricity generation system, the imperative for the reduction of the population of polluting fossil-fueled vehicles is clear. Not only is the displacement of such vehicles through the growth in the number of EVs an excellent example of beneficial electrification, the establishment of an EV-charging infrastructure creates many new jobs, brings about a cleaner environment and provides a role model for the electrification of other transportation sectors, such as trucks, buses and company fleets, as well as that of other sectors. Additionally, transportation electrification likely represents the single greatest opportunity to increase the utilization and efficiency of the electric grid to the benefit of all ratepayers. None of this will happen automatically however. Clearly, there are many questions to be answered as to the mechanism under which the infrastructure is to be developed, impacts on electric rates and the role of utilities. The ICC can initiate docketed proceedings in this matter so as to determine the most expeditious modality to deal with those questions. The key point is that the EVs represent an unparalleled opportunity to substitute electricity for less efficient and less productive energy forms and reduce emissions, and in doing so also benefit the electric grid and all utility customers. Transportation electrification will be an important element in the continuing modernization of the grid, and can facilitate more intensive and effective utilization of distribution grid integrated RERs.

Commented [EK1]: This isn't all about CO2 reductions.

Commented [EK2]: Need to emphasize benefits outside of CO2 reductions which currently these concluding remarks focus on exclusively.

Commented [EK3]: This should probably reference the fact that the IIC indeed has already opened an EV/TE investigation docket.

1.11 How Will Transportation Electrification Affect the Grid and its Users? (p. 39-42)

While market penetration forecasts vary, EVs may soon become a major presence on Illinois roads. Illinois is estimated to have about 15,000 PEVs registered in the state through 2017, making it among the top 10 states in EV penetration (though that number represents a tiny percentage of the 4.5 million passenger vehicles in Illinois). A Rocky Mountain Institute (RMI) report on the growth trends, costs and benefits of EV notes that national EV sales have grown, on average, 32 % year over year for the past four years [20]. However, EVs were just 1% of total vehicle sales nationally as of 2016. The proliferation of EVs provides many opportunities for individual, social and environmental benefits, but their full and beneficial integration into the electric system raises new issues for policymakers. Key questions include:

- Should state policy be directed toward supporting growth in the EV and EV- charging markets?
- What regulatory policies may maximize the system value of transportation electrification?
- Are there other transportation technologies (such as hydrogen or natural-gas vehicles) that should be incentivized?

A state-specific long-term study performed for Illinois by M.J. Bradley (commissioned by the Midwest Transportation Electrification Collaborative) details some of the potential economic and consumer benefits of a transition to EVs:

- reduced electricity bills for all customers through increased grid utilization and system efficiency
- societal (environmental and public health) benefits due to reduced air pollution from internal combustion engine (ICE) vehicles
- savings to the consumer from a total cost of ownership perspective

Any forecast going out to 2050 involves a high degree of uncertainty—political, regulatory, technological and economic. However, Bloomberg New Energy Finance projects that EVs will become less expensive than ICE vehicles on a total cost of ownership basis by 2025 and on an upfront cost basis by 2030 [21]. EVs will have a significant effect on the electric system, because plugging in an average all-electric car can add 35-40 % to the annual energy usage of a typical household.5 If charging is done during off-peak hours for the electric system and the local circuit, the new load can fill in the “valleys” of system-load shape and be served without upgrading distribution infrastructure. In this case, the fixed costs of the utility system would be spread over a higher volume of energy usage, putting downward pressure on per/kWh electric rates for all customers. However, if EV owners plug in at peak times or if enough EVs charge simultaneously to raise the system or circuit peak, distribution system upgrades may be needed. Innovative policies and technologies to facilitate and motivate EV drivers to charge their cars at optimal times may include new time-varying EV rate designs and “smart charging” programs that allow central-charge management of participating vehicles. In addition, fleet conversion and public bus conversion would have substantial effects on the distribution system, and direct current "fast charge" stations (DCFC) may add significant and potentially less manageable new demand.

Another set of questions facing regulators and market participants will be raised by the need for public charging stations and related infrastructure known as electric vehicle supply equipment (EVSE.) As much as 90 % of EV-charging is currently done at home and at work, indicating that local trips are within the range of most EVs [22]. However, longer distance driving requires recharging the EV battery along the way. Additionally, many EV owners and potential EV owners, especially those in multi-unit dwellings, simply do not have access to home charging and may rely significantly or entirely on public charging, a dynamic that likely will increase as EVs reach the broader market. An EV will become more appealing if consumers know they will have widespread ready access to reliable public charging. So the answer, in part, depends on one's view of the role of state regulation in advancing transportation electrification and addressing this "chicken and egg" dilemma, especially considering the lack of a working business model for private companies to offer public charging services directly to drivers. This uncertainty has resulted in a lack of private investment in public charging infrastructure. This issue is complicated by the fact that DCFC infrastructure is costly and highway charging stations may be used mainly by drivers who don't reside in the local area.

Costs of charging infrastructure comprise upfront capital, and ongoing operation and maintenance. Costs are much higher for DCFC than for AC Level 2. The value proposition for site hosts to install and operate charging stations includes business promotion, customer attraction, employee retention and meeting sustainability goals. Some stakeholders assert that building codes should be modified to ensure that wiring and conduit is in place to facilitate EVSE installation. Some EVs and charging equipment have the capability to undertake load management functions and help ensure efficient energy use. In the future, it may be possible for connected EVs to discharge to the grid in peak periods, a concept known as Vehicle to Grid or "V2G."

Other countries in Europe and Asia (most notably China) are developing their EV markets, including related EV-charging infrastructure, at a significantly faster pace than we are in Illinois and the United States. A National Renewable Energy Laboratory (NREL) study determined that to facilitate 15 million plug-in EVs in the US by 2030, there is a potential need to develop approximately 600,000 public chargers.

The pace of transportation electrification depends upon the complex interaction of public policy, customer choice, cost (of EVs themselves as well as the relative prices of electricity and gasoline), market forces, transit agency adoption, technology/performance development, availability of charging infrastructure, and economic conditions. There may also be dramatically different adoption rates in different locations. The "neighbor" effect has already been shown to cause clusters of consumer EV adoption, and initial adoption is generally in higher income areas.

There are many reasons why some stakeholders advocate a strong utility role in developing EVSE. These include the benefits of systemic planning, maintaining a reliable system for voltage and VAR as more DERs are introduced, supporting cyber and physical security, intelligently integrating dynamic EV loads, ensuring system-net benefits from such loads, having full access on reasonable terms to the "big data" that EVSE will generate as deployed, and ensuring that sufficient and reliable charging infrastructure exists in all areas, including otherwise underserved communities. Such stakeholders assert that without a significant role for utilities, needed EVSE will not be built and growth of beneficial electrification will be hindered.

Commented [EK4]: Suggest deleting the sentence below. Even Tesla itself does not say this, and indeed advocates for the important and strong role of utilities.

In formulating policy, lawmakers and regulators must consider whether advantages of using utilities to build out public-charging infrastructure outweigh concerns that utility-owned charging facilities may shut out competitors or stifle innovation. This view is premised upon the existence of a competitive market for charging services, a topic that is debated, and a condition that does not yet exist across all market segments, or in the view of some: no market segments. They must balance such concerns against arguments and data that suggest that utility involvement, instead, can support competition and innovation, address market failures and accelerate the market to the benefit of all participants. In addition to being service- and price-regulated and accountable to state regulators, utilities generally have access to low-cost capital, ability to integrate EVs as DERs, call-center capability, established customer relationships and other incumbent and legacy core competencies and advantages.

Commented [EK5]: This is a key consideration to note that is the premise of this particular view.

Therefore, it seems reasonable that utilities would play some role in supporting, promoting, or otherwise incentivizing public-charging infrastructure, especially in areas where this infrastructure has not otherwise been developed. Construction and operation of EV facilities may or may not be within the core competency of utilities, as they may lack the incentives and entrepreneurial culture of unregulated firms. On the other hand, they may extend the benefits of conventional utility asset maintenance and resiliency core competencies to public EVSE. Costs and risks of utility investment may be borne by non-participants, and customers may be at greater risk of stranded costs in the event of underperforming or obsolete facilities. At the same time, as previously discussed, most studies suggest significant net benefits to the grid from accelerating transportation electrification, mitigating concerns of potential cross-subsidization.

An additional stakeholder perspective is that deployment of a variety of smart technologies can support transportation electrification. The vast majority of EV charging occurs at the home where there is flexibility in when the vehicle is charged. Drivers are therefore willing, with the right incentives, to defer charging to optimal times for the grid. Utilities are in the unique position to evaluate the most efficient, effective and accurate means to encourage optimized charging at the home and to ensure that new EV load is incorporated in a safe, reliable and efficient manner. Some stakeholders advocate an EV-only utility time of use (TOU) rate option, as opposed to a single rate for all household usage. While the cost of an additional meter can be prohibitive, there are alternative methods, such as "smart EVSE," including with sub-metering capabilities to allow EV-specific rates without installing a second meter. These technology-forward solutions can also make it simple and easy for customers to respond to price signals, often with hands-off “set it and forget it” functionality, to align their behavior with the interests of the grid and ratepayers as a whole.

Commented [EK6]: Important to note the capabilities to connect the dots for readers.

Some stakeholders assert that it is crucial to keep in mind that the primary purpose of EVs and EV-charging stations is to support the conveyance of drivers, riders and goods between destinations. These critical transportation functions cannot be held secondary to their potential value as energy storage or grid service providers, without limiting the ability to support widespread adoption of these technologies. In this view, V2G is unlikely to emerge as a viable service because of the deleterious effect on batteries of increased charge/discharge cycles. At the same time, other stakeholders assert that many of the benefits of V2G can be achieved with V1G “smart charging” that does not rely on two-way flows of energy with the battery.

Some stakeholders note that as more and more EVSE is deployed and EVs are added to the roadways, the implications of competing, proprietary standards and networks become increasingly serious. Especially given the challenging economics for charging networks and deployments, and the solvency issues that plagued the industry’s pioneers, proprietary hardware that does not support software flexibility may represent an unjustifiable increased risk that utilities, and ratepayers or taxpayers could be left with stranded assets or systems that do not meet evolving needs. Additionally, such networks limit innovation and competition in both the EVSE hardware and software space, as infrastructure owners are limited in their selection of hardware to suit their varying needs and operational parameters, and in their ability to easily switch software systems. For these reasons, encouraging the use of open standards is an important consideration when utilizing ratepayer or taxpayer funding to deploy electric vehicle charging infrastructure.

Commented [EK7]: This is a critical consideration in the context of TE and public charging infrastructure that is currently absent deserves mention.

Transportation electrification is not limited to personal vehicles. Urban transit systems such as the Chicago Transit Authority (CTA) rail network have long been electrified, and electric buses now show great potential to produce long-term social and customer benefits. Appendix C provides details on CTA’s bus electrification program.

Commented [EK8]: Final two paragraphs swapped in order for better flow/conclusion.

Many NextGrid stakeholders assert that it is incumbent on all stakeholders—not just the regulated utilities but also the auto, truck and bus manufacturers, environmental NGOs, consumer advocates, low and moderate income (LMI) advocates and others—to engage now in the discussion of EV issues that present significant opportunities but also significant challenges to business and the electricity grid.

7.2 Time-Varying Rates (p. 196-199)

The discussion in this section focuses on time-varying rates—TVR—and so relates primarily to the energy-supply portion of customers' rates rather than the delivery service portion. Thus, it applies principally to residential customers. Generally, non-residential customers, whose load is above 100 kW, do not take supply service from the utility, and when they do, it is at hourly index prices based on the hourly wholesale rates. Pricing structures for competitive retail supply are generally not under the ICC's purview. Time-of-use (TOU) pricing differentiates prices by time periods, with fixed predetermined prices between two consecutive general-rate cases. Prices are typically higher during peak periods and lower at off-peak periods. The prices also serve to promote certain technologies, such as distributed energy storage, plug-in electric vehicles, and rooftop solar PV systems. For example, a cost-based, off-peak rate can improve the competitiveness of electric vehicles so as to induce more consumers to switch to electric from gasoline vehicles or to not switch to natural gas vehicles. These price signals also serve to induce usage behavior in a way that benefits the grid. Depending on their application, TOU rates may need to be sufficiently flexible to accommodate changing characteristics of supply and demand over time.

Commented [EK9]: Need to illuminate the other important functions of TOU/TVR rates.

Under critical peak pricing (CPP), the utility raises substantially its prices during "critical peak periods," or for certain specified hours during so-called event days. The goal is to reduce load during those few hours within which the utility has exceptionally high generation or power-purchasing costs. The benefit to customers is that they receive lower prices during non-critical periods relative to those under the standard tariff. A major benefit to the utility is capacity deferral and the reduced probability of shortfalls. In the absence of time-based price signals, such as critical peak pricing or its cousin's peak time rebate and real-time pricing, customers use electricity without regard to scarcity. Such a situation exacerbates the ramifications of the coincident peak problem and leads to higher costs and, eventually, rates for everyone. Typically, the utility notifies customers in advance of a critical peak event and, under CPP, the number of events per year is capped. CPP is simple to implement, and customers pay truly high prices during only a small number of hours. Its biggest drawback lies with resistance to the utility setting extremely high prices during "stress" periods. This can seriously burden some customers.

Under EIMA [4], both ComEd and Ameren have in place programs which reward customers for reduced consumption during grid stress times. Payments are made to customers using funds received from capacity markets, and customers are not penalized if they fail to achieve a load reduction in response to a request. Real-time pricing (RTP) sets rates at short intervals (e.g., hour- to-hour) in line with a utility's marginal energy costs—often defined by the market prices during those times21. A major consideration in RTP design is the five-minute or hourly changes in wholesale prices. RTP links wholesale prices to the retail electricity price, thus giving utility customers more appropriate price signals. The consequence is a more efficient level of total demand and more efficient allocation of electric power across hourly periods. Customers may benefit from lower energy and capacity costs. RTP can also help with the effective integration of renewable energy resources into an electric grid by using load flexibility during all hours of the day. Notwithstanding its strong theoretical appeal, backed by empirical evidence across numerous studies showing net benefits, we have seen relatively little use of this pricing method at the state level, especially for residential customers22. Evidence also indicates that automated tools to monitor and act upon price changes are required. Until the wide implementation of such tools becomes reality, the monetary benefits ostensibly do not justify customers' time and attention.

A perceived barrier to RTP is the widespread acceptance of average-cost pricing in public utility regulation, i.e., the setting of uniform prices across different periods based on embedded historical accounting costs. Such pricing limits customers risk exposure and the need to pay fluctuating prices—for example, higher prices during peak periods and other periods of high demand. There is concern that some consumers are unable to shift load either by usage reductions or time-of-day shifts, because of their particular circumstances, such as work schedules, lack of efficient equipment, age or medical conditions, and thereby face higher utility bills. Even if consumers do shift their loads, regulators may conclude that the benefits would still fall short of metering and other costs. Peak-time rebate is perhaps the most palatable type of critical peak/real-time TOU rate program to consumer advocates. It requires the automatic enrollment of all customers. This addresses the participation issue that has particularly plagued opt-in TVR.

The WG7 meetings had presentations on modern rate design and TVR. The discussions were long, at various points heated, and led to the following policy questions:

- Which program among TOU pricing, RTP, critical peak pricing (CPP), or peak- time rebates is most useful to attain a specific objective? What are the additional economic-efficiency gains from RTP relative to TOU pricing? Can two or more of these programs serve complementary purposes?
- Are TVR or dynamic rates good candidates for mandatory, opt-in, or a default/opt- out options? What are the advantages and disadvantages of each with reference to current rates? Is it possible in Illinois to have RTP as a mandatory rate, as customers are free to switch from the incumbent utility to an ARES?
- There is empirical evidence from the CUB study that RTP benefits residential customers in Illinois. Yet, participation rates are very low—below 2 %. What accounts for such low participation and is it due to inadequate customer education or the shallow penetration by technologies, such as programmable thermostats, or both?
- Is it appropriate for vulnerable customers to receive special treatment if they experience higher utility bills than under standard rates?
- If RTP becomes widely used by customers, can customers receive net savings comparable to the smart meter costs?
- Can RTP be the key contributor to the benefit maximization from new technologies in a NextGrid world?

The formulation of the responses to these questions requires considerable further work to ensure that the specifics of the Illinois situation are appropriately considered ahead of the adoption of a specific strategy.

Multiple challenges in the TVR arena indicate the many intricacies involved in balancing the interests of all the stakeholders. Presentations and discussions stressed the importance of engaging price-responsive demand and DER to simultaneously keep electricity affordable and ensure reliability, resiliency and environmental sustainability. A key challenge is to effectively separate efficient price signals from the intra-class allocation of embedded costs. One of the views presented stressed the complementarity of TVR and RTP. TVR can be targeted for behavioral responses to a limited number of events, while RTP can be deployed using smart technology to respond to price signals to serve complementary purposes. The engagement of flexible demand and DERs can combine a notice of high-price periods to bring about behavioral responses, while access to smart technology and the ability to respond to rates with a dynamic RTP component can go further and gain the full benefits of smart technology. A prime example of this is the utilization of smart charging technology for electric vehicles, which allows for the delivery of accurate and dynamic price signals (both TVR and RTP), provides for the ability of centrally managed charging in response to system and local conditions, and allows drivers to easily and automatically respond to these signals via hands-off "set it and forget it" preferences utilizing the smarts within the charger or vehicle.

Commented [EK10]: Language in this paragraph is cleaned up and we provide an illustrative example.

The challenges of specifying details to recover costs and their allocation across customer classes were alluded to in the vast majority of comments. Written comments submitted to the NextGrid process were added to the WG7 record in order to urge Illinois to encourage more TVR offerings and consumer outreach efforts to expand adoption. The comments include description of successes in terms of savings under current RTP rates in other states and references to the lessons from the ICC's Blue Ribbon Telecommunications Task Force in the 1990s. The following bullets summarize the highlights of TVR discussions:

- The response to TVR and dynamic pricing may be considerably enhanced by the effective deployment of smart technologies. For example, home-display monitors or smart thermostats can increase the average peak reductions associated with TVR by more than 70 % [110]. Indeed, smart thermostats and intelligent systems and technology can automate responses to dynamic rates or RTP so that customers need not have to keep abreast of possibly rapid price changes.
- Protecting vulnerable customers under TVR is an important consideration.
- TVR brings the benefits of decreased electricity usage when economically efficient so as to encourage customers to shift their usage away from peak or high-cost periods to periods of considerably lower prices.
- The allocation of residual costs that arise, typically, from fixed costs requires careful judgement so as to ensure just and reasonable rates.
- Whenever volumetric rates fail to reflect marginal societal costs, they can lead to economically inefficient outcomes.

- While there is no doubt that marginal cost pricing can advance economic efficiency, its deployment in rates must be combined with an equitable mechanism to recover residual revenue requirements to ensure utility financial stability.
- An important issue is whether TVR are opt-in or opt-out rates. While most TVR around the country are offered on an opt-in basis, opt-out TVR implementations result in much higher participation rates by customers. These opt-out TVR lead to lower utility marketing costs but have undesirable impacts on those customers unwilling or unable to adjust their usage, making them worse off.
- Given the absence of an agreed upon single definition of affordability, this issue is more appropriately addressed outside TVR consideration and any other rate designs with the primary objective of advancing economic efficiency. Any improvement in economic efficiency reduces investments and expenditures required to provide reliable, resilient, and environmentally sustainable electric service, so as to make electricity more affordable.
- There are questions as to how much more economically efficient are RTP relative to TOU rates, and whether TOU rates can achieve most of the economic-efficiency gains that RTP brings about.

Clearly, the effective implementation of TVR brings challenges but also provides opportunities to bring about efficiencies and benefits when effectively implemented. The perspectives of the WG7 participating stakeholders on the TVR issues are summarized in the table in Appendix G.

Commented [EK11]: Edits make this read in a more balanced/less skeptical manner.

4.12 Transportation Electrification (p. 135-137)

Many stakeholders assert that transportation electrification (TE)—a topic also discussed in detail by WG1—entails enormous potential benefits for customers and communities and, therefore, needs to be supported through appropriate public policies and initiatives. Undoubtedly, TE and electrification of other sectors are likely to be components of any federal, state or local plans for carbon-emission reduction. Those who favor public policy support of TE argue that, in addition to the high performance, low operating costs, environmental benefits and other characteristics that are gaining electric vehicles (EV) a foothold in the automobile market, smart EV charging can improve the utility system load shape, bring about more efficient utilization of utility assets, create new sources of flexible resources for supply-demand balance, enhance customer resiliency and utilize renewable energy more effectively. Other stakeholders observe that at this early stage of EV market development, the rate at which consumers will embrace EVs in larger numbers and the specific types of EVs they will purchase—battery-only vehicles or plug-in hybrid vehicles, which have auxiliary gasoline engines for extended trips— remains uncertain. Electric vehicles are beginning to make inroads in many sectors including government and private fleets, buses and long-distance trucking. For utilities, TE represents a potential to stop the declines in load that they have experienced over approximately the last decade.

The charging of personal EVs may spur substantial growth in residential energy usage. Time-variant rates and managed charging programs can ensure that charging occurs primarily during overnight and off-peak periods, without incurring significant utility investment in new distribution infrastructure. Increased electricity sales during night-time and off-peak hours allow the utility's fixed costs to be spread over a greater volume of energy, resulting in downward pressure on the rates of all customers, including those who don't have EVs. However, the lack of existing public- charging infrastructure combined with the "range anxiety" of potential EV buyers is an issue that poses an obstacle to mass-market EV adoption.

Much of the discussion around policy to promote EV growth has centered on the need for public support of electric vehicle supply equipment (EVSE), particularly direct-current fast-charging (DCFC) which is essential to high market penetration of electric-only vehicles. Key issues have emerged about the roles of private market providers and public utilities, criteria for sizing and locating charging stations, regulatory policy and oversight, rate-design options for charging services and many other related matters. Because of the environmental and potential system benefits of EVs, policies and programs to address barriers to EV adoption must be the subject of comprehensive investigation by policy makers. We note that the ICC has held policy sessions and initiated a Notice of Inquiry in 2018 to begin to consider a range of issues associated with EV growth and charging infrastructure.

We also note that the continued developments of fuel cells and hydrogen as a fuel may provide a complementary technology pathway for transportation in the future, but these technologies have received considerably less attention than TE.

Commented [EK12]: The deleted language above isn't an informed opinion. See the IL-specific MJB&A study discussed in section 1.11, in addition to a wealth of other studies on this topic.

Commented [EK13]: Language change to not make it seem like load decline is due primarily or entirely to an economic downturn.

In addition to issues surrounding charging infrastructure, numerous policy matters and stakeholder proposals were discussed in the WG deliberations. We collected a set of representative ideas from the participating stakeholders on other aspects of TE to create the list below. The listed ideas do not necessarily reflect agreement by other WG members and the selection is intended to reflect the broad range of issues aired. The list is not intended to be exhaustive, is not in any prioritized order and includes the following stakeholder recommendations:

- Targeted marketing of hourly pricing and other TOU rate structures to EV owners accompanied by training of auto dealers with onsite information and enrollment materials.
- Implementation of TOU rates that apply only to the EV-charging portion of household usage: The additional expense of a second meter can be avoided by using the charger itself to measure consumption, or employment of a module, or application of disaggregation software to calculate EV energy usage.
- Smart-charging pilots under which a utility will modulate charging among participating vehicles to optimize loads based on real-time variables to prevent ramping or neighborhood peak issues, coordinate with renewable energy output, optimize local load shape and use aggregated EV loads as DR resources. EV DR may also be done by non-utility aggregators as is being piloted in California, and the added value, if any, of having a third party involved may be examined [78].
- A study of workplace charging is advisable to assess its suitability for combination with solar-energy deployment. While today in Illinois, sunny afternoons are generally peak periods when new loads will not be beneficial, if solar power penetration ever reaches a similar level to that seen in parts of California, support for workplace charging might provide system and public benefits.
- Multi-unit buildings with parking lots pose particular challenges for EV charging because the combined load of many cars charging simultaneously can stress a building's electricity circuits. There is a need to investigate strategies to deal with the many possible technical solutions and billing alternatives for building owners, property managers, homeowners associations and the utility. All customers have an interest in avoiding costly distribution system upgrades, as those eventually result in higher delivery charges. The discussions raised questions of whether utility support and regulatory involvement in EVSE at large buildings may be beneficial. Some stakeholders project that whether a tenant or owner in a multi-unit building has a right to plug in an electric vehicle or install EVSE, or whether these decisions should be left to private discretion and market forces, is a public policy issue.
- The utilization of street lights as a public charging option may create viable opportunities for the many potential EV owners without a garage or access to electricity in their parking spot. Existing street lights are often adjacent to parked cars, where Level 1 charging may be installed on poles. With the shift to more efficient LED streetlights, there may be adequate existing capacity to accommodate EV charging at low power. A complication arises from the fact that street lights are usually charged on a separate utility rate structure or provided free to a municipality and recovered through a

franchise fee. The ICC has the ability to study these rate structures and franchise agreements to determine whether there exists an opportunity for a cost-effective new option to support TE.

- The launch of a training and education program for customers about the benefits of EVs can empower them to make energy-informed purchase decisions with respect to vehicle choice and home charging infrastructure. In this way, utilities can promote market transparency and transformation to enable customers to compare vehicles and other options based on their energy cost merits.
- The need for EVSE coordination was suggested by some stakeholders with a recommendation that utilities create publicly available maps or mapping tools that indicate where grid infrastructure is sufficient for EV-charging facilities. Such information allows EV charging-station hosts to estimate necessary infrastructure upgrade costs by location, to effectively site and plan new station costs. Moreover, such a coordinated effort can track planned installations so that multiple hosts can coordinate their efforts.
- Some stakeholders suggested the modification of class definitions to support TE. They recommend that the ICC define a new class for public-transit electric-bus fleets to create the analogue of the “railroad”-rate class for public-transit electric-rail fleets. The railroad-rate class has historically received a discounted demand charge—the so-called “distribution facilities charge”—in part based on the fact that electric-rail transit service provides public benefits, because it is an affordable, low- emissions transportation mode that encourages compact development. Since public-transit electric-bus fleets provide similar benefits, there is a well-established rationale for this suggestion. This extension can be further broadened to other public fleets, such as school buses or emergency-response vehicles. As in other rate-class considerations, cost causality and allocation are regulatory issues. This matter is further addressed in Chapter 7.
- Deployment of public-bus electrification is one way to bring TE benefits to LMI communities. Such a TE initiative also advances the cause of environmental justice in communities that are adjacent to major sources of pollution. In the same vein, the pursuit of other strategies, such as EV car-sharing programs in LMI neighborhoods, was also suggested.
- Open standards and hardware/software interoperability are critical considerations for the planning and deployment of infrastructure to support transportation electrification that leverages ratepayer or taxpayer investments in EVSE. At their core, open standards and interoperability can facilitate a seamless driver experience, minimize infrastructure investment risks, and allow for the efficient integration of EVs into the electric grid. Utilizing them means that it is possible to connect an array of software, network, and utility IT systems with any charging station, regardless of the vendor via open and royalty-free protocols.

Commented [EK14]: This is a critical consideration in the context of TE and public charging infrastructure that is currently absent deserves mention.