BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Petition to Initiate a Proceeding	:	
to Consider Issuance of a Policy Statement on Electric	:	Docket No. M-2022-
Utility Rate Design for Electric Vehicle Charging	:	

P-2022-3030743-AEL-2/4/22

Petition to Initiate a Proceeding to Issue a Policy Statement

ChargEVC-PA files this Petition requesting that the Public Utility Commission initiate a proceeding that will result in issuance of a Policy Statement on electric utility rate design for electric vehicle (EV) charging in Pennsylvania. This Petition is filed pursuant to 66 Pa.C.S. § 501, 1301, 1330, 2807(f) and 1501, and 52 Pa. Code § 5.41.

Description of Petitioners

ChargEVC-PA is a broad and diverse coalition formed to serve as a trusted resource for research and information on, and as an advocate for, advanced electric vehicle adoption and market development in Pennsylvania. ChargEVC-PA's members ("Petitioners") include:

Electrification Coalition
Greenlots
Keystone Energy Alliance
Natural Resources Defense Council (NRDC)
Plug In America
Sierra Club
Adams Electric Cooperative

Background

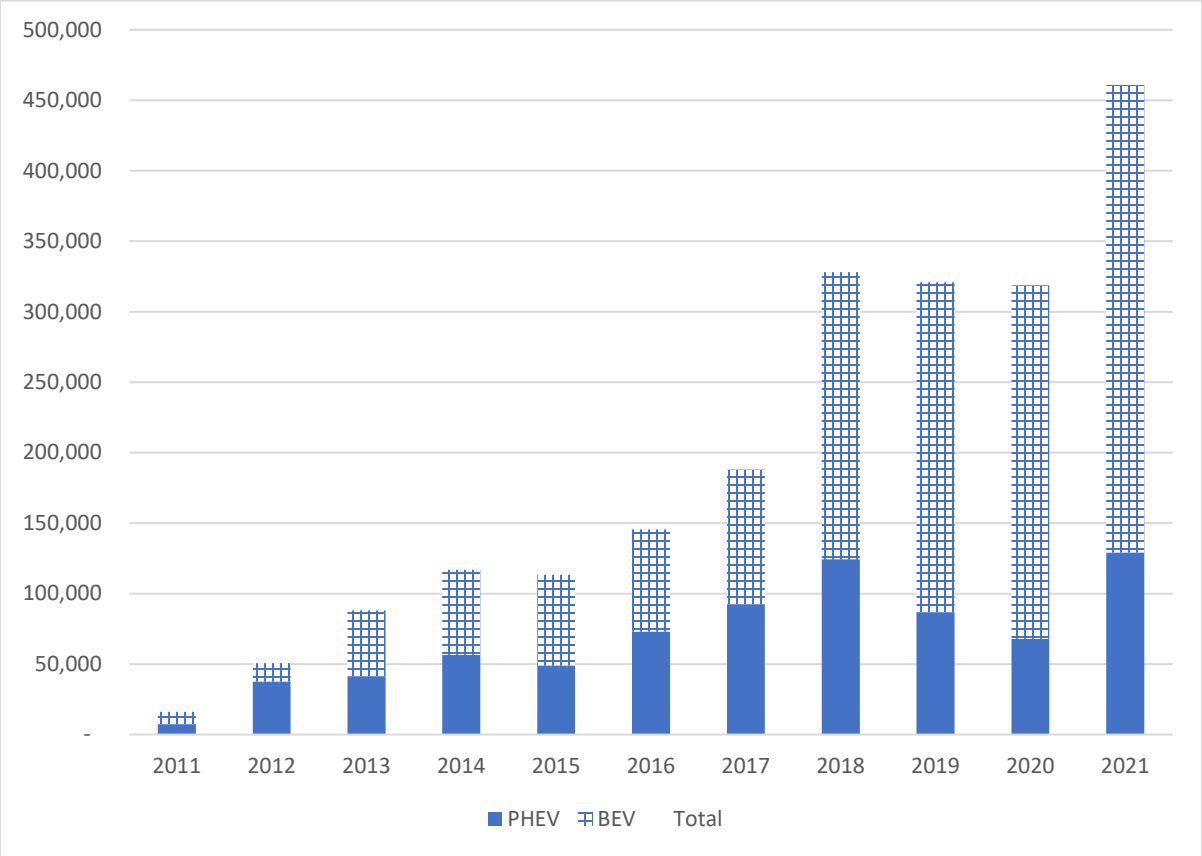
A. EV adoption in Pennsylvania to Date

Of the more than 12 million registered vehicles in Pennsylvania, approximately 29,000 are electric vehicles.[1] Electric-vehicle sales in Pennsylvania have been growing steadily and

[1] Pennsylvania Electric Vehicle Roadmap: 2021 Update. files.dep.state.pa.us/Energy/OfficeofPollutionPrevention/StateEnergyProgram/PAElectricVehRoadmapBookletDEP5334.pdf.

exceeded 7,300 in 2020.[2] Nevertheless, electric vehicles still make up a small fraction – under 1% – of total vehicles in Pennsylvania. Figure 1 shows the annual vehicle sales by year for battery electric vehicles ("BEVs") and plug-in hybrid electric vehicles ("PHEV") from 2011 through June 2021. As the figure shows, the national electric vehicle market has grown substantially over the past ten years, with significant growth in the last few years. BEV sales increased nearly 400% from 2017 through 2020 (the last year of full sales data). Data for 2021 is through September, indicating 2021 sales far surpassed 2020 sales for BEV and PHEVs.

Figure 1. National EV Sales by Year.[3] Data for 2021 is through September. PHEV = plug in hybrid electric vehicle, BEV = battery operated vehicle.



[2] Ibid.

[3] Electric Vehicle Sales Dashboard. January 26, 2022. Alliance for Automotive Innovation. autosinnovate.org/resources/electric-vehicle-sales-dashboard.

B. Expected Growth in EV Sales

EV sales in the US are projected to grow dramatically. By 2030, EV sales are expected to be 25-30% of total vehicle sales, reaching 45-50% by 2035.[4] Nearly all major vehicle manufacturers have announced their intentions to commit significant capital to EV production and to transition sales to EVs:

- Audi aims to completely electrify its lineup by 2033.[5]
- BMW has set goal for 50 percent of global sales to be BEVs by 2030.[6] BMW also announced its intention to invest 30 billion euros by 2025 on EV and autonomous driving technology research and development.[7] By the end of 2025, BWM will have delivered approximately two million electric vehicles to customers.[8]
- Daimler (maker of Mercedes-Benz) has publicly stated that the entire Mercedes portfolio will eventually be electrified, with 15-25% of 2025 sales to be battery-electric vehicles. Daimler is making significant investments in battery production networks, committing to spending 20 billion euros by 2030 on battery cells.[9]
- Ford says it will invest $22 billion in EVs through 2025.[10] Ford has also publicly stated its expectations to have fully electric vehicles account for 40-50% of U.S. car sales by 2030.[11] Ford has recently announced electric versions of popular vehicles the F-150 Lighting and Mustang Mach 1. The F-150 Lightning preorders have already reached nearly 200,000, and Ford announced that due to strong demand it is doubling the planned production capacity for its electric pickup truck to 150,000 units per year.[12] Ford plans to make the largest ever U.S. investment in electric vehicles at one time by any automotive

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[4] Global electric vehicle sales grew 41% in 2020, more growth coming through decade: IEA. IHS Markit. ihsmarkit.com/research-analysis/global-electric-vehicle-sales-grew-41-in-2020-more-growth-comi.html.

[5] Audi Going All-Electric by 2033. June 25, 2021. thedetroitbureau.com/2021/06/audi-going-all-electric-by-2033/.

[6] BMW Expects at Least Half Of Sales to be Electric Cars By 2030. March 17, 2021. reuters.com/article/us-bmw-results/bmw-expects-at-least-half-of-sales-to-be-electric-cars-by-2030-idUSKBN2B90S7.

[7] BMW to invest 30 billion Euros by 20024 in EV, autonomous driving tech. March 18 2020. BMW Blog. bmwblog.com/2020/03/18/bmw-to-invest-30-billion-euros-by-2025-in-ev-autonomous-driving-tech/.

[8] Every Automaker's EV Plans Through 2035 and Beyond. October 2021. Forbes Wheels. forbes.com/wheels/news/automaker-ev-plans/.

[9] Daimler buys battery cells in a total volume of 20 billion euros. daimler.com/innovation/case/electric/battery-cells.html.

[10] The Ford Electric Vehicle Strategy: What You Need to Know. May 19, 2021. media.ford.com/content/fordmedia/fna/us/en/news/2021/05/19/the-ford-electric-vehicle-strategy--what-you-need-to-know.html.

[11] Ford Statements on Electric Vehicle Sales and White House Announcement. August 5, 2021. media.ford.com/content/fordmedia/fna/us/en/news/2021/08/05/ford-statements-electric-vehicle-sales-white-house.html.

[12] Ford doubles Lightning production again. January 4, 2022. electrek.co/2022/01/04/ford-doubles-lightning-production-again-to-150000-units-per-year-by-2023-600k-bevs-annually-by-2024/.

manufacturer with SK Innovation investing $11.4 billion at Tennessee and Kentucky production sites.[13]

- GM aims to completely electrify its light-duty lineup by 2035.[14] GM has already committed to spending $27 billion to introduce 30 electric vehicle models by 2025 and is building a battery manufacturing plant in Ohio to help meet this objective.[15] [Add latest announcement re $7B planned investment in MI to produce cars and batteries?]It announced that it would increase its investment in electric and autonomous vehicles to $35 billion through 2025.[16]
- Honda is targeting to meet 100% of EV sales in North America by 2040.[17] Honda is planning to release 70,000 Prologue electric SUVs in 2024, with anticipated sales of 500,000 EVs by 2030.[18]
- Hyundai has recently stopped developing new powertrains for internal combustion engine vehicles to shift resources to developing electric cars. According to the same report, Hyundai plans to be fully electric by 2040.[19] Kia, a subsidiary of Hyundai, expects 25 percent of its global sales to come from EVs by 2029.[20] Hyundai Motor will build U.S.-made electric vehicles for American consumers starting next year as part of parent Hyundai Motor Group's plan to invest $7.4 billion in the U.S. by 2025.[21] Hyundai plans to launch 16 EV models by 2025 and announced a $35 billion investment in mobility and other auto technologies over the next five years.[22]

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[13] Ford To Lead America's Shift to Electric Vehicles With New Mega Campus In Tennessee And Twin Battery Plants In Kentucky; $11.4B Investment To Create 11,000 Jobs And Power New Lineup Of Advanced EVs. September 2021. Ford Media Center. media.ford.com/content/fordmedia/fna/us/en/news/2021/09/27/ford-to-lead-americas-shift-to-electric-vehicles.html.

[14] Ford, GM and Stellantis Joint Statement on Electric Vehicle Annual Sales. August 5, 2021. media.gm.com/media/us/en/gm/home.detail.html/content/Pages/news/us/en/2021/aug/0805-electric.html.

[15] GM Announcement Shakes Up U.S. Automakers' Transition to Electric Cars. October 12, 2021. nytimes.com/2021/01/29/business/general-motors-electric-cars.html.

[16] General Motor's Electric Vehicle Plan Just Got Even More Expensive. June 2021. The Verge. theverge.com/2021/6/16/22536601/gm-ev-investment-increase-amount-electric-autonomous-vehicles.

[17] Honda Targets 100% EV Sales in North America by 2040, Makes New Commitments to Advances in Environmental and Safety Technology. April 23, 2021. hondanews.com/en-US/honda-corporate/releases/release-32797eaea7316f1bed4bfcd27919f703-honda-targets-100-ev-sales-in-north-america-by-2040-makes-new-commitments-to-advances-in-environmental-and-safety-technology.

[18] Honda Announces Pathetic Electric Vehicle Ambitions in the US. September 2021. Electrek. electrek.co/2021/09/20/honda-announces-pathetic-electric-vehicle-ambitions-in-us/#:~:text=Today%20Honda%20announced%20that%20it,Prologue%20electric%20SUVs%20in%202024%3A&text=This%20will%20take%20Honda%20to,in%20North%20America%20by%202040.

[19] Exclusive: Hyundia to slash combustion engine line-up, invest in EVs – sources. May 27, 2021. reuters.com/article/autos-hyundai-electric-idAFL2N2NF00L.

[20] KIA Motors Accelerates Business Transformation to Become a Leading EV Brand. September 16, 2020. press.kia.com/eu/en/home/media-resouces/press-releases/2020/KiaMotors_to_become_a_leading_EV_brand.html.

[21] Hyundai to Build EVs in U.S. Under $7.4B Spending Plan. May 2021. Wardsauto. wardsauto.com/industry-news/hyundai-build-evs-us-under-74b-spending-plan.

[22] Subaru Gives First Look at Electric Crossover It Will Build With Toyota. January 2020. Car and Driver. caranddriver.com/news/a30613610/subaru-crossover-concept-ev-hybrid-plans/.

- Jaguar Land Rover aims to have zero tailpipe emissions by 2026 and completely electrify its lineup by 2039,[23] planning to spend $3.5 billion annually to meet this target.[24]
- Lucid projects an 88% average annual increase in production volume between 2022 and 2026. Its July 13 investor presentation now anticipates under 1,000 units produced in 2021, 20,000 in 2022, 49,000 in 2023 and 251,000 units in 2026 – the final year projected. Revenues were forecast to ramp from $97 million in 2021 to nearly $23.8 billion in 2026 – a 198% compound annual growth rate.[25]
- Mazda announced that 100% of its products will have some level of electrification and the EV ratio will be 25% by 2030.[26] Mazda will introduce three new fully electric models and five plug-in hybrids by 2025[27] and aim for carbon neutrality by 2050.[28]
- Mitsubishi expects 50 percent of its global sales to come from EVs by 2030,[29] reducing carbon emissions from new cars by 40% from fiscal-year 2010 levels by 2030 and achieving net-zero carbon emissions by 2050.[30]
- Nissan has set a goal for 40 percent of its sales to be EVs by 2030,[31] and said it will produce 23 new electrified models by 2030, 15 of which will be fully electric. Nissan will also spend around $17.6 billion over the next 5 years to accelerate the roll-out of electric vehicles.[32]
- Rivian produced 1,015 vehicles and delivered 920 in 2021. Rivian plans to build a second, $5 billion manufacturing plant in Georgia, starting production in 2024. This plant will eventually produce 400,000 vehicles per year.[33]

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[23] Jaguar To Turn All Electric By 2025, Land Rover EVs Start In 2024. February 15, 2021. forbes.com/sites/michaeltaylor/2021/02/15/jaguar-to-turn-all-electric-by-2025-land-rover-evs-start-in-2024/?sh=1a0f06367174.

[24] Jaguar Land Rover plans to go fully electric by 2039 and said it would spend $3.5 billion on the goal each year. February 2021. Insider. businessinsider.com/jaguar-land-rover-fully-electric-2039-2021-2.

.[25] Lucid Motors (LCID) Could Be The Next Tesla — If Peter Rawlinson Delivers. July 2021. Forbes. forbes.com/sites/petercohan/2021/07/27/lucid-motors-lcid-could-be-the-next-tesla---if-peter-rawlinson--delivers/?sh=2d664c354322.

[26] Mazda Announces New Technology and Product Policy towards 2030. June 17, 2021. newsroom.mazda.com/en/publicity/release/2021/202106/210617a.html.

[27] Mazda's Electrification Plan Includes 3 EVs and 5 Hybrids. October 2021. Treehugger. treehugger.com/mazda-s-electrification-plan-3-evs-5-hybrids-5204808.

[28] Every Automaker's EV Plans Through 2035 And Beyond. October 2021. Forbes Wheels. forbes.com/wheels/news/automaker-ev-plans/.

[29] Mitsubishi Motors New Environmental Plan Seeks 40% CO2 Emissions Reduction and 50% Ratio of Electric Vehicles by 2030. November 2, 2020. mitsubishi-motors.com/en/newsrelease/2020/detail1300.html.

[30] Mitsubishi Plans to Embrace Plug-In Hybrids in A Big Way This Decade. November 2020. Green Car Reports. greencarreports.com/news/1130178_mitsubishi-plans-to-embrace-plug-in-hybrids-in-a-big-way-this-decade.

[31] Nissan Targets 40% Of U.S. Sales to be Electric By 2030. August 5, 2021. usa.nissannews.com/en-US/releases/release-25819c9aeb4792ebec3d4ddceb2bb4bd-nissan-targets-40-of-us-sales-to-be-electric-by-2030.

[32] Nissan lays out $17.6 billion plan to electrify its future. November 2021. The Verge, theverge.com/2021/11/29/22807700/nissan-electric-vehicle-investment-plan-concepts.

[33] Rivian Announces Production And Delivery Numbers For 2021. Jan 11, 2022. InsideEVs. insideevs.com/news/559907/rivian-production-delivery-numbers-2021/

- Stellantis set a goal that 40% of its US sales will be electric by 2030. Stellantis is investing over $35 billion between now and 2025, specifically in electrification efforts and EVs.[34]
- Subaru expects 40 percent of its global sales to come from EVs by 2030[35]. Every Subaru product will have a hybrid or electric version by the mid-2030s.[19]
- Tesla delivered 936,172 vehicles globally in 2021, and it is an 87% increase from Tesla's 2020 sales[36]. Tesla sales for the U.S. automotive market in 2021 were 301,998[37]. Tesla is aiming to sell 20 million electric vehicles per year and to have 1,500 GW of energy storage by 2030[38].
- Toyota has announced it plans to introduce 15 fully electric models globally by 2025,[39] and plans to invest $3.4 billion in U.S.-built batteries through 2030.[40] Toyota expects to sell 3.5 million EVs globally by 2030 and plans to convert its Lexus brand to 100% electric.[41]
- Volkswagen plans to have built 1.5 million EVs by the end of 2025,[42] and plans to introduce 75 electric vehicles across its brands by 2029. It also announced that it will spend $66 billion in the next five years on electrification and new digital technology.[19]
- Volvo plans to become a fully electric car company by 2030.[43]

Edison Electric Institute (EEI) forecasts 18 million EVs on US roads in 2030, and Boston Consulting Group projects that global EV sales will reach 24% of new vehicles sales in 2030.[44]

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[34] As Expected, Stellantis Prioritizes An Electric Future. September 2021. InsideEVs. insideevs.com/news/534584/stellantis-major-investment-electric-future/.

[35] Subaru Has an Ambitious New Goal for its Electric Vehicles. February 7, 2020. motorbiscuit.com/subaru-has-an-ambitious-new-goal-for-its-electric-vehicles/.

[36] Tesla Delivered Almost a Million EVs Worldwide in 2021. Jan 3, 2022. Car and Driver. caranddriver.com/news/a38657616/tesla-million-evs-worldwide-2021/

[37] Tesla Sales Figures – US Market. goodcarbadcar.net/tesla-us-sales-figures/

[38] Impact Report 2020. tesla.com/ns_videos/2020-tesla-impact-report.pdf

[39] Toyota joins the battery powered EV craze. November 17, 2021. yahoo.com/news/toyota-joins-battery-powered-ev-120054196.html.

[40] Toyota plans US-made batteries by 2025: Will more ambitious EV targets follow? October 2021. Green Car Reports. greencarreports.com/news/1133895_toyota-plans-us-made-batteries-by-2025-will-more-ambitious-ev-targets-follow.

[41] Toyota, in Reversal, Says It Will Shift More Rapidly to EVs. December 14, 2021. wsj.com/articles/toyota-in-reversal-says-it-will-shift-more-rapidly-to-evs-11639465002.

[42] Just How Real Is Volkswagen's Conversion To Electric Vehicles?. March 28, 2021. forbes.com/sites/enriquedans/2021/03/28/just-how-real-is-volkswagens-conversion-to-electric-vehicles/?sh=7f147dc12909.

[43] Volvo Cars to be Fully Electric by 2030. March 2, 2021. media.volvocars.com/us/en-us/media/pressreleases/277409/volvo-cars-to-be-fully-electric-by-2030.

[44] Can the US Reach 50 Million EVs in Operation by 2030? September 2020. Evadoption. evadoption.com/can-the-us-reach-50-million-evs-in-operation-by-2030/.

Over 90 EV and PHEV makes and models are currently available on the market today.[45] This number is expected to grow over the next several years as auto manufacturers increase production and unveil new models.

The recently passed Infrastructure and Jobs Act of 2021 includes $7.5 billion for a nationwide EV charger network along highway corridors to alleviate range anxiety.[46] The law includes several critical investments in EV charging in the Commonwealth, including $171 million Pennsylvania would expect to receive over a five-year period to support the expansion of an EV charging network.[47] The Commonwealth will also have an opportunity to apply for billions of additional grant funding dedicated to EV charging investments. These investments will increase sales of electric vehicles in Pennsylvania, which underscores the need to develop sound rate design to manage changing, which will reduce costs and rates for all customers in Pennsylvania.

Additionally, the Infrastructure and Jobs Act amends the Public Utility Regulatory Policies Act of 1978 ("PURPA") to require states to consider measures to promote electrification of the transportation sector, including establishment of rates that promote charging options for customers, improve customer experience, accelerate third party investment in public charging, and appropriately recover costs related to electricity supply for EVs and associated infrastructure.[48]

Recent studies have shown the total cost of ownership is lower for an EV than a traditional gasoline powered car in many cases.[49,50] This is largely driven by the lower costs of maintenance and fuel for EVs. While EVs still cost more to purchase up front than a traditional gasoline vehicle, several forecasts are predicting price parity soon. Bloomberg New Energy Finance is predicting price parity for both vehicle types when battery prices reach $100/kWh, which is predicted to happen between 2025 and 2027 in Europe.[51] Volkswagen is predicting price parity

[45] Compare Electric Cars: EV Range, Specs, Pricing & More. February 2021. insideevs.com/reviews/344001/compare-evs/.

[46] Bipartisan Infrastructure Law. The White House. whitehouse.gov/bipartisan-infrastructure-law/.

[47] The Infrastructure Investment and Jobs Act will Deliver for Pennsylvania. August 2021. The White House. whitehouse.gov/wp-content/uploads/2021/08/PENNSYLVANIA_Infrastructure-Investment-and-Jobs-Act-State-Fact-Sheet.pdf?eType=EmailBlastContent&eId=44444444-4444-4444-4444-444444444444.

[48] Infrastructure Investment and Jobs Act of 2021. Public Law 117-58 November 15, 2021. Section 40431(a)(21)(A-D). congress.gov/117/plaws/publ58/PLAW-117publ58.pdf.

[49] North American Automove EV vs. ICE Total Cost of Ownership. December 2020. Nickel Institute. nickelinstitute.org/media/8d993d0fd3dfd5b/tco-north-american-automotive-final.pdf.

[50] Electric Vehicle Ownership Costs: Today's Electric Vehicles Offer Big Savings for Consumers. October 2020. Consumer Reports. advocacy.consumerreports.org/wp-content/uploads/2020/10/EV-Ownership-Cost-Final-Report-1.pdf.

[51] Hitting the EV Inflection Point: Electric Vehicle Price Parity and Phasing Out Combustion Vehicle Sales in Europe. BloombergNEF. May 2021. transportenvironment.org/wp-content/uploads/2021/08/2021_05_05_Electric_vehicle_price_parity_and_adoption_in_Europe_Final.pdf.

by 2025.[52] UBS is predicting price parity by the end of 2024.[53] The exact date of price parity is unclear, but given the rapidly declining cost of batteries, it will most likely occur soon and eliminate one of the most significant barriers to EV adoption, the higher up front cost of an EV.

C. Benefits of EV Deployment in Pennsylvania

Increased penetration of electric vehicles can provide significant benefits to Pennsylvania, including reducing customer rates if increased usage is managed properly. As explained in the Pennsylvania Department of Environmental Protection's "Pennsylvania Electric Vehicle Roadmap" (February 2019, p. 1; *see also* January 2021 Update):

> "Electric vehicles (EV) have the potential to transform Pennsylvania's transportation system and provide significant benefits for the environment, economy, and society. As battery costs continue to fall and vehicle range increases, EV's are becoming a cost-effective and viable option for consumers and fleets alike."

The Roadmap details a number of potential benefits for the public and for utility customers – both EV users and nonusers -- from EV deployment, including:

- **Benefits to electric-grid utilization** – electrification of transportation could improve load factor on the grid, increasing the overall efficiency of the system. As such, EV adoption can drive down costs for *all* ratepayers.
- **Economic development benefits** – by transitioning its transportation system to run on electricity, Pennsylvania can decrease its reliance on oil and increase reliance on domestic fuels and a local electricity sector that will bring economic benefits to Pennsylvania's economy.
- **Consumer cost savings** – Due to greater fuel efficiency and lower fuel cost along with lower maintenance requirements, EVs provide opportunities for substantial cost savings for consumers. These cost savings provide additional discretionary income to Pennsylvania residents, which also drives local economic development through increased consumer spending on goods and services.
- **Air pollutant reductions and human-health improvements** – the DEP Roadmap indicates that a number of Pennsylvania counties consistently exceed EPA human-health standards for ozone and fine-particulate matter. The burning of transportation fuels, such as gasoline and diesel, is a substantial source of air pollution. With zero tailpipe emissions, EVs present the potential to reduce air pollution and adverse health impacts and burdens on Pennsylvanians and their communities.
- **Greenhouse gas reductions** – climate change caused by greenhouse gas (including carbon) emissions is one of the most significant challenges we face today. The July 28,

[52] Volkswagon foresees EV price parity with ICE by 2025, 50% EV sales by 2030. CNET. July 13, 2021. cnet.com/roadshow/news/volkswagen-ev-ice-sales/.

[53] Tearing Down the Heart of an Electric Car Lap 2: Cost Parity a Closer Reality? UBS. 2020. ubs.com/global/en/investment-bank/in-focus/2020/heart-of-electric-car.html.

2021 Research Report on Climate Change published by the UN Security Council made clear that "climate change is the biggest threat to security that humans have ever faced" (quoting world-renowned naturalist David Attenborough). The UN Report went on to reaffirm that urgent steps must be taken to reduce carbon emissions. Transportation is a major contributor to carbon emissions. Electrification of the transportation sector is key to reducing greenhouse gas emissions.

D. Barriers to EV Deployment in Pennsylvania

The DEP Roadmap identifies several critical barriers to deployment of EVs in Pennsylvania:

- **Awareness barriers** – consumers and other stakeholders lack detailed knowledge of EV and charging technologies, as well as their environmental and cost benefits.
- **Decision-making barriers** – lack of confidence in EV range and limited availability of public charging stations are among the barriers to committing to EVs.
- **Economic barriers** – Higher upfront costs for EVs can present an economic hurdle. **More importantly, lack of favorable electric utility EV charging rate options creates an economic barrier to adoption.**
- **Policy and regulatory barriers** – lack of policy incentives or mechanisms to drive investments in EVs constitute a barrier.
- **Technical and infrastructure barriers** – changes in customer refueling methods, lack of charging-station standardization, and limitations on the ability to charge at home for those without dedicated parking create technical barriers to EV adoption.
- **Supply-chain barriers** – limitations on EV models and inventory, along with the need to train maintenance technicians and immature supply chains present barriers.

E. Opportunities to Advance EV Deployment in Pennsylvania

The Commonwealth – and this Commission – are presented with real opportunities to undertake regulatory and policy measures to advance EV growth in Pennsylvania and to help realize the benefits that EV adoption can bring. The DEP Roadmap lays out several strategies to overcome these barriers and advance EV adoption in Pennsylvania, including:

- Establishing a utility transportation electrification directive
- Establishing statewide EV sales goals
- **Encouraging residential and commercial EV rate designs**
- Expanding rebate programs
- Advancing charging investment
- Strengthening charging network planning, investment and communications
- Establishing marketing, education and technical-assistance campaigns
- Establish dealer outreach and support
- Adopt EV-ready building codes
- Exploring financing for EVs and charging equipment

F. Argument: Utility Rate Design Presents a Key Opportunity to Advance EV Adoption and Reduce Costs and Customer Rates

The Commission has already taken some steps to promote EV adoption. In November 2018, the Commission issued a Policy Statement on Third Party Electric Vehicle Charging, clarifying that service provided by a public EV charging facility should not be construed as a sale of electricity to a residential customer, and requiring that electric distribution companies (EDCs) expressly address EV charging stations in their tariffs.[54] In her accompanying statement, Chairman Dutrieuille explained that by enacting policies to foster regulatory clarity for the Commonwealth's electric vehicle charging industry, "[the Commission] take[s] a large step forward in designing a regulatory landscape which supports innovative and dynamic pricing for electric vehicle charging."

In addition, Duquesne, PECO and UGI have, with Commission approval, implemented various programs to promote EVs, including incentives and education for customers and installation of public chargers, and to learn about how EV charging will impact the distribution grid.[55,56,57,58,59] In accompanying statements to the Commission orders approving these programs, Chairman Dutrieuille has commended the utilities for their initiatives. For example, in her December 16, 2021 statement accompanying approval of Duquesne's most recent EV program elements (Docket No. R-2021-3024750), Chairman Dutrieuille made clear:

> As I have stated before, I believe electric utilities play a key role in supporting the prudent development of the EV marketplace. Look no further than the testimony in this proceeding which states, "transportation electrification market trends demonstrate there is a need and benefit for utility planning and investment in infrastructure and programs." To that end, I commend Duquesne and the Settling Parties for the inclusion of these programs.[60]

The Petitioners submit that the Commission has an opportunity to take another important step forward to promote EVs in Pennsylvania by issuing a Policy Statement on EDC rate design for EV charging. Well-designed utility EV rates can reduce rates for **all** customers and provide EV owners potential cost savings. A recent study conducted by Synapse Energy Economics in

[54] Docket No. M-2017-2604382

[55] Docket No. R-2021-3023618

[56] Docket No. R-2018-3000124

[57] Docket No. P-2020-3019290

[58] Docket No. R-2018-3000164

[59] Docket No. R-2021-3024601

[60] The Commission's Mission Statement provides in part: "The Commission . . . fosters new technologies and competitive markets in an environmentally sound manner." The Petitioners submit that promoting EV adoption through appropriate utility rate design for EV charging (and thereby reducing utility and customer costs) is in furtherance of the Commission's stated mission.

California found that over an eight-year period, EV drivers contributed far more in revenues than costs, driving down rates for all customers.[61]

The DEP Roadmap notes that currently available electric utility tariffs limit potentially greater fuel savings from EVs, and the Roadmap highlights the lack of Pennsylvania utility rates designed specifically to address the opportunities EV charging presents, and to encourage EV adoption. Only two Pennsylvania companies offer time-varying (such as time-of-use, or TOU) rates for the *supply* portion of the bill (Duquesne and, more recently, PECO), and none of the Electric Distribution Companies in Pennsylvania offers TOU rates for the *delivery* portion of the bill. Moreover, the TOU rates that Duquesne and PECO offer are for "whole house" use. The Roadmap recommends a strategy to advance EV deployment, where "[e]ach utility and electricity supplier could be encouraged to analyze and propose rate designs based on their own peak periods, timelines for introducing advanced meters, and other considerations and constraints." (p. 38)

Time-varying rates allow utilities to provide a clear price signal to customers to avoid charging during peak times, when system costs and demand are high. The rates would encourage customers to shift charging from high system utilization and cost times to lower cost times of day, which would allow customers to save money on charging (because off peak rates are lower than on peak or flat rates) and allow utilities to passively manage growing peak demand.

While EV adoption rates are low today, customer adoption of EVs is, as explained above, expected to increase significantly in the coming years, especially considering the commitments that auto manufacturers – including startups and incumbents - have made to EV production. The growth of EVs potentially presents the most significant load-growth challenge for electric utilities in decades. If managed properly, though, through appropriate rate design, this growth could potentially *lower* rates for all customers. However, if customers do not receive price signals through rates or other encouragement to charge during off peak periods, this growth could drive significant increases to system investments, and thus rates for all customers.

An average residential electric customer in Pennsylvania uses approximately 850 kWh a month or 10,150 kWh per year.[62] According to the Pennsylvania Department of Transportation, the average driver in Pennsylvania travels 12,000 miles per year. If this customer switched to an electric vehicle, she would add roughly 3,400 kWh per year, an increase of nearly 35% of annual electric consumption.[63]

Perhaps more significant than this substantial increase in usage from a distribution-planning standpoint is the fact that EV charging will dramatically increase peak demand on the distribution system unless charging is directed to off-peak periods. Indeed, an average at-home

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[61] Electric Vehicles Are Driving Electric Rates Down. Synapse Energy Economics. June 2020. synapse-energy.com/sites/default/files/EV_Impacts_June_2020_18-122.pdf.

[62] United States Energy Information Administration, Form 861, Annual Electric Power Industry Report. Annual average of residential customers for First Energy, PPL, Duquesne, PECO, and UGI Electric for 2020. eia.gov/electricity/data/eia861/.

[63] This estimate assumes an annual average the EV travels 3.5 miles per kWh.

EV charger draws 7.2 kW of power, which has the potential to substantially increase peak demand.[64]

Notably, however, the significant increase in consumption due to EV charging has the potential to *reduce* system costs and rates for all customers because the fixed costs of the distribution system will be collected over a much larger number of kWh, although this is only true if new infrastructure investment costs are also minimized. In the absence of price signals or incentives to charge new vehicles in off-peak hours, many customers will likely charge during peak hours, including late afternoon and early evening. The increased load during peak hours would increase costs on the transmission and distribution system as new investments would be needed to increase system capacity.

Rate design has the capacity to shift the new load into off-peak hours when system load is lower, which will reduce future system (as well as energy) costs. A reduction in future system costs will lower rates for all customers because, as noted previously, the fixed costs of the distribution system will be collected over a much larger number of kWh due to the increased usage over other hours from EV charging. A recent study estimated that EV drivers in Pacific Gas and Electric and Southern California Edison service territories have contributed $806 million more in revenues than associated costs from 2012-2019, which reduced rates for all customers.[65]

As such, the Petitioners request that the Commission initiate a proceeding focused solely on utility EV rate design. The Petitioners submit that such a proceeding will provide a productive forum for the sharing of information and ideas, and that issuance of a formal Policy Statement will provide guidance to utilities and other interested parties as they continue to forge a path forward for customers on EV adoption.

G. This Proceeding Should Evaluate a Range of Utility Rate-Design Options for EV Charging

There are a number of utility rate-design options available to address EV charging. It should be noted that it is not the Petitioners' intention to have the Commission direct a one-size-fits-all approach. Nor is it Petitioners' intention to have the Commission dictate in this proceeding the specific rate designs that particular Pennsylvania EDCs should adopt. Rather, Petitioners urge the Commission, utilities and interested parties to evaluate a range of utility rate-design options for EV charging. And, while certain preferences may emerge from that evaluation, Petitioners suggest that the consideration of specific rate-design proposals should be left to individual EDC filings, in the context of general base rate cases, default-service cases, standalone rate-design tariff filings, or otherwise. Petitioners note that EDCs may also wish to first offer pilot EV rate-design programs before implementing more permanent tariff provisions. The Petitioners

[64] United States Department of Energy. Fact #995, September 18, 2017: Electric Vehicle Charging at Home Typically Draws Less Than Half the Power of an Electric Furnace. energy.gov/eere/vehicles/articles/fact-995-september-18-2017-electric-vehicle-charging-home-typically-draws.

[65] Electric Vehicles Are Driving Rates Down. Synapse Energy Economics. June 2020 Update.

recognize that each EDC must design tariff provisions that reflect its and its customers' unique characteristics and circumstances.

H. Rate-Design Principles for EV charging

EV rates should be designed to have a positive impact not only on customers who use EVs, but also on all customers and the grid. Specifically, effective EV rates should be designed to meet certain principles, as explained in the September 26, 2018 Synapse Energy Economics report entitled "Driving Transportation Forward in Pennsylvania" (pp. 5-8) (*see also* October 2019 NARUC Report entitled "Electric Vehicles: Key Trends, Issues, and Considerations for State Regulators" pp. 25-36):

- Lower electricity rates for all utility customers through more efficient utilization of existing grid assets
- Avoid unnecessary grid upgrades by encouraging customers to shift charging to off-peak hours
- Reduce emissions by better aligning charging with renewable energy production
- Encourage customer adoption of EVs by reducing charging costs and maximizing fuel-cost savings
- Create a viable business case for public charging infrastructure

I. EV Rate Designs

With these principles in mind, utilities may consider a variety of EV rate designs as alternatives to flat rates. These include:

- **Time-of-Use (TOU) Pricing**, where rates are established for two or more pricing tiers based on defined time periods. Rates are set lower during off-peak periods and higher during peak periods.
- **Critical-Peak Pricing**, where a high price is triggered for specific events, such as those for system reliability, when demand is high.
- **Peak-Time Rebates**, where customers earn financial rewards for reducing energy relative to a baseline.
- **Real-Time and Hourly Pricing,** where supply rates are based on the wholesale price of energy as opposed to a flat rate.
- **Time-Limited Demand Charges,** where demand charges – typically to commercial and industrial customers – apply only during peak periods. Similarly, demand charges can be reduced for electric service to third-party owned public charging stations to incentivize deployment of public charging networks. A related design, for residential customers, entails providing a demand-reduction credit when customers' EV charging is curtailed during peak periods on the system (akin to air-conditioning load-control programs).
- **Managed Charging**, where the utility or other third-parties control when charging occurs.

It is helpful to think of EV charging rate designs in three customer categories: (1) residential charging, (2) commercial and industrial charging (largely fleet vehicles), and (3) electric service to third-party owned public chargers. The above rate-design options can be applied to each category of service.

Petitioners envision implementation of cost-based rate designs. Petitioners are not advocating for subsidies to EV owners or operators in the EV charging rate designs.

An overarching consideration is whether the EV charging rate is designed as part of the rate charged to the customer (e.g., a "whole-home" rate), or is designed as a standalone EV rate which requires a separate meter and billing.

Another consideration is whether the rates designed should be optional for all customers or made mandatory for EV loads.

A further consideration is whether EV-specific rates should vary by season (summer, winter).

To be most effective, rate design for EV charging should also consider both the distribution and supply portions of the service provided (recognizing that supply service can be provided either by the EDC or by a competitive generation supplier).

Simplicity is a critical element of utility rate design because customers need to understand and be able to respond to rate design with little effort. Simplicity also reduces potentially high customer education and marketing costs.

J. EV Charging Policy Statements Adopted in Other States

Several states have issued policy statements supporting general EV deployment and specific EV rate design, addressing the critical importance of rate design in managing the significant new growth in electric consumption that EV adoption brings. Please refer to Appendix A for three examples.

K. EV Rate Design Studies

Several recent studies highlight the importance of enhanced utility rate design for EV charging across the country. Please refer to Appendix B for summaries of some of these studies.

L. Examples of Existing Utility EV Charging Rate Design Tariff Offerings

Many utilities in various jurisdictions have implemented EV-specific rate designs. Please refer to Appendix C for examples.

M. Proposed Policy Statement

The Petitioners request that the Commission issue a Policy Statement on electric utility rate design for EV charging as follows:

POLICY STATEMENT ON ELECTRIC UTILITY RATE DESIGN FOR ELECTRIC VEHICLE CHARGING

§ 69. Electric Utility Rate Design for Electric Vehicle Charging

1. Electric vehicle deployment can bring a variety of benefits to Pennsylvania.

2. Electric Utilities in Pennsylvania should take steps to foster electric vehicle deployment.

3. In particular, it is the policy of the Commission that all jurisdictional electric distribution companies should propose specific tariff language addressing rate design for electric vehicle charging for its residential, commercial and industrial customers, and customers who operate public charging stations.

4. Those tariff proposals should strive to:

    (a) Lower electricity rates for all utility customers through efficient utilization of existing grid assets
    (b) Avoid unnecessary grid upgrades by encouraging customers to shift charging to off-peak hours
    (c) Encourage customer adoption of EVs by reducing charging costs and maximizing fuel-cost savings
    (d) Help create a viable business case for public charging infrastructure
    (e) Rely on industry best practices for customer communications, data analysis, and reporting

N. Questions to be Addressed and Information Requested

The Petitioners recommend in its order that the Commission pose the following questions to be addressed by those parties filing comments:

General Questions

1. Should the Commission adopt minimum filing requirements for EV rate design proposals?
2. What goals should the Commission focus on in reviewing utility proposals for EV rates?
3. Should the EV charging rates be designed as part of the rate otherwise charged to the customer (e.g., a "whole-home" rate), or designed as a standalone EV rate, which requires a separate meter and billing?
4. Should the rates as designed be default or opt in? Should EV-specific rates be required for those customers participating in other approved utility EV programs?

5. Should the EV-specific rates vary by season (summer, winter)?
6. What opportunities are there for managed charging, and what role should EDC rates play in managed charging?
7. How should rate design for supply and distribution be aligned (if at all)?
8. How can EV charging be aligned with renewable energy production?
9. Should eligibility to participate in utility-offered EV incentive programs be tied to utilization of EV-specific rates?
10. How should low-income and equity considerations be considered for EV-specific rate design?

Residential Rate Questions

11. What types of rate design are optimal for residential EV charging?
12. What are the potential benefits of optimal rate designs?
13. What are the costs associated with various rate design options?
14. What are best practices in designing an EV specific rate?
    a. Hours for peak, off-peak, and super off-peak periods (includes length of period)
    b. Communications to customers for education, enrollment, and changes
15. How often should customers be permitted to switch rate plans once enrolled?
16. What metering capability is needed for various rate design options, and should customers be required or have the option to separately meter EV consumption from the house load?
17. Should the Commission entertain rate design pilot proposals or just move directly into new EV rate designs?

Commercial, Industrial and Public Charging Rate Questions

18. What types of rate design are optimal for commercial and industrial EV charging?
19. Should utilities require a specific separate rate for direct current fast charge ("DCFC") stations? If so, should the rate designs recognize issues related to demand charges and station economics in periods of low utilization?
20. Should the Commission consider specific separate tariffs for workplace, fleet, or electrified mass transit?

O. Proposed Scope of this Proceeding and the Policy Statement

As noted above, there are many barriers to EV adoption and several policy and regulatory solutions that could be pursued to address them. There are many important issues regarding EV adoption and electric utility support that are worthy of the Commission's attention, including rebates and incentives for EV adoption, outreach and education, equity for low-income customers and communities, recovery and allocation of costs of utility infrastructure investments needed to support the buildout of EV charging (including customer contribution policies), and utility company rates for public charging. In order to keep this proceeding focused and manageable, the Petitioners request that the proceeding be limited to considerations of electric utility rate design for EV charging.

P. Proposed Structure for the Proceeding

The Petitioners offer the following for consideration as a structure and timeline for this proceeding. The structure and timeline outlined herein is intended as a suggested approach to addressing these issues. While the Petitioners find value in holding en banc hearings and additional workshops, there may be other means of addressing the issues in a collaborative manner.

A. Issuance of an Order by the Commission (a) initiating this proposed proceeding to consider issuance of a Policy Statement, (b) proposing a Policy Statement, and (c) inviting comments to be filed by interested parties within 90 days after publication in the Pennsylvania Bulletin

B. Filing of written reply comments within 60 days after initial comments are due

C. An en banc public hearing before the full Commission within 30 days after reply comments are due; Commission Staff to organize speaker panels

D. Up to three informal workshops, led by Commission Staff, among interested parties within 60 days after the en banc public hearing, designed to further share information and ideas and to reach as much consensus as possible on Policy Statement language

E. Issuance by the Commission of a final Policy Statement and publication in the Pennsylvania Bulletin no later than December 2022.

The Petitioners recognize that the Commission has a busy docket, and Petitioners appreciate the Commission's and parties' attention to this subject matter. The Petitioners respectfully request that the Commission proceed with some degree of urgency, as we expect that realistically it will take some years (a) for the Commission to consider and issue a generic policy statement, (b) for utilities thereafter to formulate and for the Commission to approve specific EV charging rate design proposals (and, in some cases, to conduct rate-design pilots), (c) for utilities to roll those rate designs out to the public, and (d) for customers to become educated and begin taking advantage of those rate designs. It is, in our view, imperative that appropriate utility rate design be considered and adopted in advance of the huge increase in EV ownership – and attendant electric load -- that is looming. Doing so will have several advantages: (a) it will allow time to test the new rate designs, especially as to their operation and customer acceptance, (b) it will forestall the need for new infrastructure to meet the increase in load and demand that increases in EV charging will bring, thereby avoiding cost increases for all customers, (c) customer awareness and utilization of specific EV charging rate designs will likely be enhanced if those rate-design offerings are available at the time of vehicle purchase, rather than sometime after, and (d) favorable off-peak rates will lower EV charging costs, which will itself provide incentive for and accelerate EV purchases.

Q. Conclusion

For the reasons set forth above, the Petitioners request that the Commission initiate a proceeding that will result in issuance of a Policy Statement on electric utility rate design for electric vehicle charging in Pennsylvania.

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Appendix A – State Assessments of EVs and EV Charging Rate Design

The following list provides three examples of states that have explored EV charging rate design issues from a statewide approach. The list is intended to be informative and provide additional information for Commission consideration. This list is not exhaustive.

Minnesota – In February 2019, the Minnesota Public Utilities Commission issued an expansive order on EV-related issues following public workshops and input from utilities, market participants, government agencies, and other stakeholders.[66] The Commission invited parties to provide comment on several issues including the possible impact of EVs on the electric system (and the potential benefits), degree to which utilities and utility policy can impact the extent of EV penetration in Minnesota, and possible EV tariff options to facilitate wider availability of EV charging infrastructure.[67] The Commission found that: [68]

- Barriers to increased EV adoption include (a) inadequate supply of and access to charging infrastructure, and (b) lack of customer awareness of EV benefits and charging options.
- How EVs are integrated with the electric system will be critical to ensuring that transportation electrification advances the public interest. This may include rate design that pairs charging with periods of low demand and high renewable energy generation, encourages advanced technology for enhanced load management, and provides direct benefits to EV owners through lower fuel costs of electricity.
- Within the utility role regarding EVs, optimizing the cost-effective integration of EVs through appropriate rate designs, policies, and investments will improve system utilization/efficiency and benefit utility ratepayers, including non-EV owners.

Arizona – In 2019, the Arizona Corporate Commission ("ACC") approved two electric vehicle policy statements.[69,70] These policy statements encourage electric vehicle use, innovative rate designs, and charging infrastructure development. Regarding EV rate design, the Commission policy specifically encourages utilities to:

- "Develop and propose innovative rate designs and load management strategies applicable to EV charging."

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[66] *See* In the Matter of a Commission Inquiry into Electric Vehicle Charging and Infrastructure. Minnesota Public Utility Commission. Final order in Docket No. E-999/CI-17-879. February 1, 2019. edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7B10BBAA68-0000-C413-9799-DF3ED0978E75%7D&documentTitle=20192-149933-01.

[67] *Ibid* page 1-2.

[68] *Ibid* page 10-11.

[69] *See* Arizona Corporate Commission Staff Policy Statement for Electric Vehicles, Electric Vehicle Infrastructure, and the Electrification of the Transportation Sector in Arizona. Docket No. RU-00000A-18-0284, Decision No. 77044. docket.images.azcc.gov/0000195197.pdf.

[70] *See* Electric Vehicle Implementation Plan. In the Matter of Possible Modifications to the Arizona Corporate Commission's Energy Rules. July 19. 2019. Docket No. RU-00000A-18-0284, Decision No. 77289. docket.images.azcc.gov/0000199128.pdf.

- "Propose rate design tariffs and load management strategies that incentivize customers to charge vehicles during off-peak hours."
- "Develop optional rate design tariffs and technology-based load management strategies for workplace, fleet charging, and electrified mass transit that encourage light, medium, and heavy-duty vehicle charging at times that would improve the integration of variable resources and the electric systems operational flexibility."
- "Propose rate design tariffs and technology-based load management strategies that alleviate or address demand charges and other issues faced when deploying DC fast charging stations."

Following the issuance of the policy statement, Arizona utilities have filed several rate design proposals to meet the ACC's objectives.[71] These proposals include a range of potential rate options for both residential and commercial customers.

Maryland –The Maryland Public Service Commission ("PSC") initiated a statewide distribution grid modernization proceeding in 2016.[72] The proceeding (which is still ongoing) includes a significant focus on EV rate design, specifically on how EV integration would impact the state's distribution system and how rate design could optimize this process. The Maryland PSC initiated a workgroup to further study EV rate design options, which would allow electric utilities to work closely with stakeholders. In October 2021, the utilities jointly filed the result of a statewide rate design pilot for EV rates.[73] The Commission is set to hold hearings in early 2022 to discuss the results of the pilot study, with the hope of implementing permanent EV rate design options for Maryland electric customers. The EV rate design pilot evaluation included many noteworthy findings including:

- Pilot participants responded to price signals by reducing and shifting consumption, and saved money on TOU rates. In the first year, the savings across the joint utilities ranged from 5.3 to 9.7%. In year 2, the savings ranged from 2.3 to 7.5%.
- The piloted TOU rates reduced peak demand in the summer season by 9.3 to 13.7% and by 4.9 to 5.4% for the non-summer season
- Daily energy consumption during the summer season went down for two of three utilities. The weekday reductions ranged from 3.0 to 4.6%. Off-peak usage did not increase, which was an unexpected result.
- Low to moderate income customers responded to the price signals in a similar magnitude to that of non-low to moderate income customers.

[71] Most of these proposals and subsequent orders can be found in Docket No. RU-00000A-18-0284.

[72] *See* Maryland Public Service Commission Notice of Public Conference, September 26, 2016. PC44.

[73] The utilities participating in the rate design pilot study included Baltimore Gas and Electric, PEPCO, and Delmarva Power and Light.

Appendix B – Studies of EV Rate Design Options

The following list provides brief summaries of relevant recent studies on EV rate issues. This list is intended to be informative and is not exhaustive.

- *Increasing Electric Vehicle Fast Charging Deployment: Electricity Rate Design and Site Host Options (Edison Electric Institute)*[74] Projections show that EV adoption will increase steeply in the coming years. As adoption increases, demand to rapidly charge vehicles will also grow. If not implemented thoughtfully, fast charging can cause issues for utilities and customers. For utilities, fast charging can introduce sporadic, large spikes in electricity demand, which may require expensive upgrades in areas with insufficient capacity. Customers may be burdened with paying "three-part rates that include a fixed monthly charge ($/month) for recovery of fixed costs, a volumetric charge ($/kWh) to recover costs that vary with usage, and a monthly demand charge ($/kW-month) to reflect the cost impact of the customer on the capacity of the system." Utilities must determine how to recover costs while ensuring that electricity rates don't inhibit the development of the electric vehicle market.

- *Electric Vehicles: Key Trends, Issues, and Considerations for State Regulators (National Association of Regulatory Utility Commissioners)*[75] This report reviews several key EV-related issues and questions facing public utility commissions, including a discussion on grid impacts and rate design. Commissions are currently facing a critical question of what role should EV rate design play regarding load management. The research notes that unaddressed EV charging could strain local distribution networks and that rate design is one way to minimize any unintentional impacts to the grid.

- *Utilities and Electric Vehicles: The Case for Managed Charging (SEPA)*[76] Many utilities see the emergence of the electric vehicle market as a strategic opportunity for load growth. Poor load management is a significant risk to the development of this market. According to the Sacramento Municipal Utility District, "an estimated 17 percent (12,000) of the utility's transformers may need to be replaced due to EV-related overloads, at an average estimated cost of $7,400 per transformer". Managed charging is a solution to avoid or reduce grid overload issues.

[74] "Increasing Electric Vehicle Fast Charging Deployment: Electricity Rate Design and Site Host Options." January 2019. Brattle Group, prepared for Edison Electric Institute. brattle.com/wp-content/uploads/2021/05/15077_increasing_ev_fast_charging_deployment_-_final.pdf.

[75] "Electric Vehicles: Key Trends, Issues, and Considerations for State Regulators." October 2019. National Association of Regulatory Utility Commissioners. pubs.naruc.org/pub/32857459-0005-B8C5-95C6-1920829CABFE.

[76] "Utilities and Electric Vehicles: The Case for Managed Charging." April 2017. Smart Electric Power Alliance. sepapower.org/resource/ev-managed-charging/.

- *DCFC Rate Design Study: For the Colorado Energy Office (Rocky Mountain Institute)*[77] The State of Colorado commissioned a study to do an analysis of Xcel Energy's new rate for fast charging infrastructure. This rate was put in place to address the issue of high costs while electric vehicle adoption is still in its early stages and charger utilization is low. The study found that a sliding-scale tariff design provides utilization rates for fast charging infrastructure that create an attractive business opportunity for charging network operators, keep the costs at a lower or comparable rate to the cost of fueling a gas-powered vehicle, and allows for appropriate cost recovery for the utility.

- *Residential Electric Vehicle Rates That Work: Attributes that Increase Enrollment (SEPA)*[78] Increased adoption of electric vehicles will also increase peak demand. In many cases, this peak load can put a strain on the local distribution system and can be especially problematic when several electric vehicles are clustered on one transformer. Time-varying rates are a useful tool that utilities can use to incentivize charging at off-peak hours.

- *Electric Vehicle Cost-Benefit Analysis: Arizona (M.J. Bradley)*[79] This study evaluated the costs and benefits of increased electric vehicle adoption in the State of Arizona. With increased electric vehicle adoption comes increased load during peak hours and may require upgrades to distribution infrastructure. The study found that managed off-peak charging can provide net benefits to all utility customers if charging is shifted to hours when the grid is underutilized, and the cost of electricity is lower. The study found that by 2050, the average household in Arizona could save approximately $176 on their annual utility bill by switching to an electric vehicle and utilizing off-peak charging.

- *Electric Vehicle Cost-Benefit Analysis: Colorado (M.J. Bradley)*[80] This study evaluated the costs and benefits of increased electric vehicle adoption in the State of Colorado. With increased electric vehicle adoption comes increased load during peak hours and may require upgrades to distribution infrastructure. The study found that managed off-peak charging can provide net benefits to all utility customers if charging is shifted to hours when the grid is underutilized, and the cost of electricity is lower. The study found that by 2050, the average household in Colorado could save approximately $80 on their annual utility bill by switching to an electric vehicle and utilizing off-peak charging.

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[77] "DCFC Rate Design Study." Revised February 2020. Rocky Mountain Institute for the Colorado Energy Office. rmi.org/insight/dcfc-rate-design-study/.

[78] "Residential Electric Vehicle Time-Varying Rates That Work: Attributes That Increase Enrollment." November 2019. Smart Electric Power Alliance. sepapower.org/resource/residential-electric-vehicle-time-varying-rates-that-work-attributes-that-increase-enrollment/.

[79] "Electric Vehicle Cost-Benefit Analysis: Arizona." M.J. Bradley. December 2018. mjbradley.com/sites/default/files/AZPEVCBAnalysisFINAL04dec18.pdf.

[80] "Electric Vehicle Cost Benefit Analysis: Colorado." M.J. Bradley. April 2017. mjbradley.com/sites/default/files/CO_PEV_CB_Analysis_FINAL_13apr17.pdf.

- *Electric Vehicle Cost-Benefit Analysis: Minnesota (M.J. Bradley)*[81] This study evaluated the costs and benefits of increased electric vehicle adoption in the State of Minnesota. With increased electric vehicle adoption comes increased load during peak hours and may require upgrades to distribution infrastructure. The study found that managed off-peak charging can provide net benefits to all utility customers if charging is shifted to hours when the grid is underutilized, and the cost of electricity is lower. The study found that by 2050, the average household in Minnesota could save approximately $171 on their annual utility bill by switching to an electric vehicle and utilizing off-peak charging.

[81] "Electric Vehicle Cost-Benefit Analysis: Minnesota." M.J. Bradley. July 2018. mjbradley.com/sites/default/files/MN%20PEV%20CB%20Analysis%20FINAL%2015aug18.pdf.

Appendix C – Rate Design Examples from other Utilities

Sector	Utility	State	Rate name	Application	Separate meter required?	Peak periods	Notes
Res	Alabama Power	AL	Rate Rider PEV[82]	Whole house	No	EV Charging Period: Daily, 9 pm – 5 am	Discount on metered consumption during specified time period
Res	APS	AZ	R-TECH[83]	Whole house	No	On-Peak: Mon – Fri, 3 pm – 8 pm, excluding designated holidays | Off-Peak: All other hours	Three-part rate available for EV owners
Res	SRP	AZ	E-29[84]	Whole house	No	On-Peak: May 1 – Oct 31, Mon – Fri, 2 pm – 8 pm; Nov 1 – Apr 30, Mon – Fri, 5 am – 9 am & 5 pm – 9 pm | Super Off-Peak: Daily, 11 pm – 5 am; All designated Holidays | Off – Peak: All other hours & Designated Holidays	EV specific rate with super Off-Peak window
Res	TEP	AZ	Demand Super Off-Peak TOU EV[85]	EV only	No	On-Peak: May – Sept, Mon – Fri, 3 pm - 7 pm; Oct – Apr, Mon – Fri, 6 am - 9 am & 6 pm - 9 pm | Off-Peak daily. 10 pm - 5pm	EV specific three-part rate with super Off-Peak window

[82] alabamapower.com/content/dam/alabama-power/pdfs-docs/Rates/pev.pdf

[83] aps.com/en/Utility/Regulatory-and-Legal/Rates-Schedules-and-Adjustors.

[84] srpnet.com/prices/pdfx/Nov2021/E-29.pdf

[85] tep.com/wp-con tent/uploads/111-TRDSOTE.pdf.

Sector	Utility	State	Rate name	Application	Separate meter required?	Peak periods	Notes
Res	TEP	AZ	Super Off-Peak TOU EV[86]	EV only	No	On-Peak: May – Sept, Mon – Fri, 3 pm - 7 pm; Oct – Apr, Mon – Fri, 6 am - 9 am & 6 pm - 9 pm except designated holidays | Off-Peak daily 10 pm - 5pm | Shoulder peak: All other hours	EV specific two-part rate with super Off-Peak window
Res	PG&E	CA	EV2-A[87]	Whole house	No	On-Peak: 4 pm - 9 pm | Shoulder-Peak: 3 pm - 4 pm & 9 pm - 12 am | Off-Peak: 12 am to 3 pm	Customers may be eligible for low-income bill discounts
Res	PG&E	CA	EV-B[88]	EV only	Yes	On-Peak: 2 pm - 9 pm | Shoulder-Peak: 7 am - 2 pm & 9 pm - 11 pm | Off-Peak: 11 pm - 7 am	Customers are not eligible for low-income discounts
Res	SDG&E	CA	EV-TOU-5[89]	Whole house	No	On-Peak: Daily, 4 pm – 9 pm | Super Off-Peak: Nov 1 – May 31, Mon – Fri, 12 am – 6 am; Mar – Apr, Mon – Fri, 10 am – 2 pm; Sat – Sun, 12 am – 2 pm & Holidays; June 1 – Oct 31, Mon – Fri, 12 am – 6 am; Sat – Sun, 12 am – 2 pm & Holidays | Off- Peak: All other hours	Special Super Off-Peak rates in March - April

[86] tep.com/wp-content/uploads/110-TRSOTE.pdf.

[87] pge.com/en_US/residential/rate-plans/rate-plan-options/electric-vehicle-base-plan/electric-vehicle-base-plan.page#panel29762.

[88] pge.com/en_US/residential/rate-plans/rate-plan-options/electric-vehicle-base-plan/electric-vehicle-base-plan.page#panel29762.

[89] sdge.com/residential/pricing-plans/about-our-pricing-plans/electric-vehicle-plans

Sector	Utility	State	Rate name	Application	Separate meter required?	Peak periods	Notes
Res	SDG&E	CA	EV-TOU-289[89] above[89]	Whole house	No	On-Peak: Daily, 4 pm – 9 pm | Super Off-Peak: Nov 1 – May 31, Mon – Fri, 12 am – 6 am; Mar – Apr, Mon – Fri, 10 am – 2 pm; Sat – Sun, 12 am – 2 pm; June 1 – Oct 31, Mon – Fri, 12 am – 6 am; Mar – Apr, Mon – Fri, 10 am – 2 pm; Sat – Sun, 12 am – 2 pm | Off- Peak: All other hours	Special Super Off-Peak rates in March - April
Res	SDG&E	CA	EV-TOU[89]	EV only	Yes	On-Peak: Daily, 4 pm – 9 pm | Super Off-Peak: Nov 1 – May 31, Mon – Fri, 12 am – 6 am; Mar – Apr, Mon – Fri, 10 am – 2 pm; Sat – Sun, 12 am – 2 pm & Holidays; June 1 – Oct 31, Mon – Fri, 12 am – 6 am; Sat – Sun, 12 am – 2 pm & Holidays | Off- Peak: All other hours	Special Super Off-Peak rates in March - April
Res	SMUD	CA	Time-of-Day Rate[90]	Whole house	no	Off-Peak: Jan 1 - Feb 28, 8 pm - 5 pm; Jun 1 - Sept 30, 12 am - 12 pm | Shoulder-Peak: Jun 1 - Sept 30, 12 pm - 5 pm; 8 pm - 12 am | On-Peak: Jan 1 - Feb 28, 5 pm - 8 pm; June 1 - Sept 30, 5 pm - 8 pm	Additional discount of 1.5 cents for all electricity usage between 12 am and 6 am with the registration of an EV on SMUD website

[90] smud.org/en/Rate-Information/Time-of-Day-rates/Time-of-Day-5-8pm-Rate/Rate-details#Evdiscount.

Sector	Utility	State	Rate name	Application	Separate meter required?	Peak periods	Notes
Res	Southern California Edison	CA	TOU-D-PRIME[91]	Whole house	No	On-Peak: Jun 1 – Sept 30, Mon-Fri, 4 pm – 9 pm | Shoulder-Peak: June 1 – Sept 30, Sat – Sun, 4 pm – 9 pm; Oct 1 – May 31, Daily, 4 pm – 9 pm | Off-Peak: June 1 – Sept 30, Daily, 9 pm – 4 pm; Oct 1 – May 31, Daily, 9 pm – 8 am | Super Off-Peak: Oct 1 – May 31, Daily, 8 am – 4 pm	TOU rate designed for high usage households
Res	Delmarva	DE	Plug-In Vehicle Rate Plan[92]	EV only	No	On-Peak: Mon – Fri, 12 pm - 8 pm | Off-Peak: Mon – Fri, 8 pm - 12 pm; Sat – Sun & All designated holidays	Voluntary TOU EV rate
Res	Georgia Power	GA	TOU-PEV-9[93]	EV only	Yes	On-Peak: June – Sept, Mon – Fri, 2 pm – 7 pm | Off-Peak: June – Sept, Mon – Fri, 7 am – 2 pm & 7 pm – 11 pm; Sat – Sun, 7 am – 11 pm; Oct – May, 7 am – 11 pm | Super Off-Peak: Daily, 11 pm – 7 am	Senior Citizens with household incomes below or at 200% of the federal poverty level per individual will be eligible for a monthly bill discount of up to $18

[91] sce.com/sites/default/files/inline-files/TOU-D-PRIME_Fact_Sheet_0320_WCAG.pdf

[92] delmarva.com/SiteCollectionDocuments/Master%20tariff%20eff%2001-01-2022%20filed%2012-22-2021%20DSIC%20and%20EE.pdf.

[93] georgiapower.com/content/dam/georgia-power/pdfs/electric-service-tariff-pdfs/TOU-PEV-9.pdf

Sector	Utility	State	Rate name	Application	Separate meter required?	Peak periods	Notes
Res	AES Indiana	IN	Rate EVX[94]	EV Only	Yes	On-Peak: June – Sept, Mon – Fri, 2 pm – 7 pm; Oct – May, 8 am – 8 pm | Shoulder-Peak: June – Sept, Mon – Fri, 10 am – 2 pm & 7 pm – 10 pm, Sat – Sun, 10 am – 10 pm | Off-Peak: All other hours & holidays	Customers required to participate for minimum of 12 months
Res	BGE	MD	Electric Vehicle TOU[95]	Whole house	No	On-Peak: Jun 1 - Sept 30, Mon - Fri, 10 am - 8 pm; Oct 1 - May 31, Mon - Fri, 7 am - 11 am & 5 pm - 9 pm excluding designated holidays | Off-Peak: All other times	Delivery charges increase over a three-year period
Res	Delmarva	MD	Whole House TOU R-PIV[96]	Whole house	No	On-Peak: Mon – Fri, 12 pm - 8pm, excluding designated holidays; Off-Peak: All other times	TOU periods only for supply charges (distribution charges vary by season, not time of day)
Res	DTE	MI	EV Plan (D1.9)[97]	EV only	Yes	On-Peak: Mon - Fri, 9 am – 11 pm | Off-Peak: All other hours	Must own EV to qualify

[94] aesindiana.com/sites/default/files/2021-02/Rate%20EVX%20-%20Time%20of%20Use%20Service%20for%20Electric%20Vehicle%20Charging%20on%20Customer%20Premises_45029_Effective%2012-5-2018.pdf

[95] bge.com/MyAccount/MyBillUsage/Documents/Electric/ScheduleEV.pdf.

[96] delmarva.com/Documents/dpl%20md%20tou.pdf.

[97] https://newlook.dteenergy.com/wps/wcm/connect/dte-web/home/service-request/residential/electric/pev/pev-res-rate-plans

Sector	Utility	State	Rate name	Application	Separate meter required?	Peak periods	Notes
Res	DTE	MI	Time-of-Day Plan (D1.2)[97]	Whole house	No	On-Peak: Mon – Fri, 11 am – 7 pm | Off-Peak: All other hours	Available to all customers but marketed to EV owners
Res	DTE	MI	Dynamic Peak Pricing Plan (D1.8)[98]	Whole house	No	On-Peak: Mon – Fri, 3 pm – 7 pm | Shoulder-Peak: Mon – Fri, 7 am – 3 pm & 7 pm – 11 pm | Off- Peak: All other hours	Includes critical peak price component, customers required to stay on rate for 12 months
Res	MN Power	MN	Off-Peak Rate[99]	EV only	Yes	Off-Peak: Mon – Friday, 10 pm - 8 am; Sat - Sun; Select Holidays | On-Peak: All other hours	Customers will pay cost of additional meter and a monthly service charge of $4.25
Res	Xcel	MN	A08[100]	EV only	Yes	On-Peak: Mon – Fri, 9 am - 9 pm except designated holidays | Off-Peak: All other hours	Service to be separately metered but customers may sub meter
Res	Xcel	MN	A82/A83[101]	EV only	No	On-Peak: Mon – Fri, 9 am - 9 pm except designated holidays | Off-Peak: All other hours	All you can eat rate, with discount for prepayment, excess charges for on-peak times

[98] newlook.dteenergy.com/wps/wcm/connect/dte-web/home/service-request/residential/pricing/rate-options#accordionlength-6b5f1e4c-3055-42fd-b7ee-5fcd89528e2b

[99] mnpower.com/CustomerService/RateBook.

[100] xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Me_Section_5.pdf.

[101] xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Me_Section_5.pdf.

Sector	Utility	State	Rate name	Application	Separate meter required?	Peak periods	Notes
Res	Xcel	MN	A80/A81[102]	EV only	No	On-Peak: Mon – Fri, 3 pm - 8 pm except designated holidays | Off - peak: Daily, 12 am - 6 am | Shoulder-Peak: All other hours	Pre-Pay Option Service is Available for customers who want to pay installed costs of charging equipment prior to the beginning of service
Res	ACE	NJ	RS-PIV Whole House TOU[103]	Whole house	No	On-Peak: Mon - Fri, 12 pm - 8 pm | Off-Peak: All other hours	Existing meter to be replaced with an interval meter to track Off-Peak usage
Res	ACE	NJ	Off-Peak, Off-Bill PIV Only Rate TOU[104]	EV only	No	On-Peak: Mon - Fri, 12 pm - 8 pm | Off-Peak: All other hours	Customers to install mobile device provided by ACE into their PIV to measure Off-Peak charging
Res	ACE	NJ	PIV Only Rate TOU + EVSE[105]	EV only	No	On-Peak: Mon - Fri, 12 pm - 8 pm | Off-Peak: All other hours	Discounted off peak rates

[102] xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Me_Section_5.pdf.

[103] Proposed, not yet approved. atlanticcityelectric.com/DoingBusinessWithUs/Documents/ACE%20-%20PIV%20Petition%20-%2012-17-2019%20-%20EO18020190.pdf#search=ev%20tou.

[104] Proposed, not yet approved. atlanticcityelectric.com/DoingBusinessWithUs/Documents/ACE%20-%20PIV%20Petition%20-%2012-17-2019%20-%20EO18020190.pdf#search=ev%20tou.

[105] Proposed, not yet approved. atlanticcityelectric.com/DoingBusinessWithUs/Documents/ACE%20-%20PIV%20Petition%20-%2012-17-2019%20-%20EO18020190.pdf#search=ev%20tou.

Sector	Utility	State	Rate name	Application	Separate meter required?	Peak periods	Notes
Res	JCP&L	NJ	Residential Customer Sub-Program[106]	EV Only	No	On-Peak: Mon - Fri, 6 am - 11 pm | Off-Peak: All other hours	Bill credits for those with qualified level 2 charger willing to share data with JCP&L
Res	PNM	NM	Whole home EV TOU rate[107]	Whole house	No	Super Off-Peak: 10 pm – 5 am	Limited pilot available under existing residential TOU rate
Res	Con Edison	NY	Smart Charge New York[108]	EV only	No	Off-Peak: daily 12 pm - 8 am | On-Peak: June 1 - Sept 30, 2 pm - 6 pm | Shoulder-Peak: All other hours	Program provides enrollment bonus ($150), monthly rewards (higher in summer), and Off-Peak charging rewards per kWh (rewards reduced for customers on existing TOU rates)
Res	Con Edison	NY	EV TOU[109]	EV only	Yes	On-Peak: 8 am – 12 am | Off-Peak: 12 am – 8 am	EV customers eligible for reduced monthly customer charge.

[106] Proposed, not yet approved. firstenergycorp.com/content/dam/customer/OpCoHome/files/JCPLRegulatory/JCPL-Electric-Vehicle-Verified-Petition-3-1-2021-and-Direct-Testimonies.pdf.

[107] edocket.nmprc.state.nm.us/AspSoft/HandlerDocument.ashx?document_id=1207051.

[108] coned.com/en/save-money/rebates-incentives-tax-credits/rebates-incentives-tax-credits-for-residential-customers/electric-vehicle-rewards/electric-vehicle-charging-rewards-faq.

[109] coned.com/en/our-energy-future/technology-innovation/electric-vehicles/electric-vehicle-drivers/electric-vehicles-and-your-bill.

Sector	Utility	State	Rate name	Application	Separate meter required?	Peak periods	Notes
Res	Austin Energy	TX	EV 360 Plug In Electric Vehicle Smart Charging Program[110]	EV Only	yes	On-Peak: Mon – Fri, 2 pm - 7 pm | Off-Peak: Mon – Fri, 7 pm - 2 pm; Sat - Sun	Fixed rate for charging within Off-Peak hours with elevated rate/kWh for charging during On-Peak hours. Program includes unlimited access to utility public EV charging stations
Com	Alabama Power	AL	Rate BEVT Business EV TOU[111]	EV only	Yes	On-Peak: June 1 – Sept 30, Mon – Fri, 12 pm – 7 pm | Shoulder-Peak: June 1 – Sept 30, Mon – Fri, 10 am – 12 pm & 7 pm – 9 pm; Oct 1 – May 31, Mon – Fri, 7 am – 9 pm | Off- Peak: All other hours	Energy charges are assessed based on a time varying energy rates
Com	JCP&L	NJ	DCFC Public Charging Sub-Program[112]	EV only	Yes	On-Peak: Mon - Fri, 6 am - 11 pm | Off-Peak: All other hours	DCFC will be separately metered and receive a credit for the first three years of operation (PY1 50%, PY2 50%, PY3 25%)

[110] austinenergy.com/ae/rates/approved-rates-schedules/approved-electric-rates.

[111] alabamapower.com/content/dam/alabama-power/pdfs-docs/Rates/BEVT.pdf

[112] Proposed, not yet approved. firstenergycorp.com/content/dam/customer/OpCoHome/files/JCPLRegulatory/JCPL-Electric-Vehicle-Verified-Petition-3-1-2021-and-Direct-Testimonies.pdf.

Sector	Utility	State	Rate name	Application	Separate meter required?	Peak periods	Notes
Com	PNM	NM	Non-Residential Charging Station Pilot[113]	EV only	Yes	On-Peak: June – Aug, Daily, 5 pm - 10 pm; Sept – May, Daily, 5 pm - 8 pm | Off-Peak: All other hours	Eliminates demand charges for all non-residential EV charging stations that accept PNM EV program incentives
Com	Con Edison	NY	DCFC Charging Infrastructure Program[114]	EV only	Yes	N/A	Provides an annual declining per plug incentive to qualifying DCFC stations
Com	PECO	PA	Electric Vehicle DCFC Pilot Rider (EV-FC)[115]	EV only	No	N/A	Fixed demand credit, initially equal to 50% of the combined maximum nameplate capacity rating for all DCFCs connected to the service will be applied to the customer's billed distribution demand.

[113] pnm.com/documents/28767612/28775078/Schedule_3F.pdf/7b50bfd0-faf4-3fbb-3a55-a02db4c5e430?t=1642686078939.

[114] cdne-dcxprod-sitecore.azureedge.net/-/media/files/coned/documents/our-energy-future/technology-and-innovation/electric-vehicles/order-establishing-direct-current-fast-charging-program.pdf?rev=e2ddeb23165a490b86f7b4a25f2519c8.

[115] peco.com/SiteCollectionDocuments/Elec%20Compliance%20tariff%20eff%20Jan%201%202022.pdf.

CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the foregoing has been served upon the following persons, in the manner indicated, in accordance with the requirements of 52 Pa. Code § 1.54 (relating to service by a participant):

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