STATE OF NEW HAMPSHIRE
PUBLIC UTILITIES COMMISSION

DOCKET NO. DG 19-057

IN THE MATTER OF:

PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE
D/B/A EVERSOURCE ENERGY
DISTRIBUTION SERVICE RATE CASE

DIRECT TESTIMONY OF

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STATE OF NEW HAMPSHIRE

DATED: DECEMBER 20, 2019

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I. Introduction

Q. Ms. Ohler, please state your name, business address and position.

A. My name is Rebecca Ohler. I am employed by the State of New Hampshire, Department of Environmental Services (NHDES), located at 29 Hazen Drive in Concord NH, as the Administrator of the Technical Services Bureau of the Air Resources Division. Included in this testimony is Addendum RO-1, a statement of my education and work experience.

Q. Please briefly describe your experience and specific knowledge or skills that relate to your testimony in this docket.

A. I have been working in the field of air pollution control since 1989 and have been involved in the policy development and discussion regarding state policies aimed at reducing both criteria pollutants and greenhouse gas (GHG) emissions. I have served on the project proposal evaluation team for Renewable Portfolio Standard (RPS) solicitations and for past Regional Greenhouse Gas Initiative (RGGI) solicitations. I currently serve as the Chair of the Energy Efficiency and Sustainable Energy (EESE) Board, and have served on the EESE Board's Energy Efficiency Resource Standard (EERS) committee since its inception.

NHDES, which I represent, has, through work with our counterparts across the Northeast states and through our leadership of the Granite State Clean Cities Coalition,[1] extensive knowledge about and access to resources relative to electric vehicles (EV) and associated electric vehicle supply equipment (EVSE), including Level 2 and Direct Current Fast Charging (DCFC) EVSE.

I currently serve as the clerk of the state's Electric Vehicle Charging Stations Infrastructure Commission,[2] which was created by SB517 in 2018.[3] Prior to becoming the Bureau Administrator for the NHDES Technical Services Bureau, I held a number of

[1] New Hampshire Granite State Clean Cities Coalition, https://www.granitestatecleancities.nh.gov/, (Last accessed December 18, 2019).

[2] Electric Vehicle Charging Stations Infrastructure Commission, https://www.des.nh.gov/organization/divisions/air/tsb/tps/msp/sb517.htm, (Last accessed December 18, 2019).

[3] Senate Bill 517, An Act Establishing an Electric Vehicle Charging Stations Infrastructure Commission, http://gencourt.state.nh.us/bill_Status/billText.aspx?sy=2018&id=1829&txtFormat=pdf&v=current, (Last accessed December 18, 2019).

positions in the department's Mobile Sources Section, focused on improving the state and region's air quality by reducing air pollution from the transportation sector.

Q. Have you previously testified before the Commission?

A. Yes. Previously, I testified before the Commission in DE 15-137 Energy Efficiency Resource Standard, and DE 12-262 CORE Electric and Gas Energy Efficiency Programs for 2013-2014.

Q. Mr. Skoglund, please state your name, business address and position.

A. My name is Christopher J. Skoglund. I am employed by the State of New Hampshire, Department of Environmental Services, located at 29 Hazen Drive in Concord NH, as the Climate and Energy Program Manager in the Technical Services Bureau of the Air Resources Division. Included in this testimony is Addendum CS-1, a statement of my education and work experience.

Q. Please briefly describe your experience and specific knowledge or skills that relate to your testimony in this docket.

A. I have been working at NHDES since 2008 and have been involved in planning, projects, and programs across the electric power, building, and transportation sectors, having worked as an energy and transportation analyst and a climate and energy analyst, before assuming my current position. I have been involved in several multi-sector planning efforts, coordinating the development of the: 2009 NH Climate Action Plan, the 2012 EESE Board Review on the Independent Study of Energy Policy Issues ("SB 323 (2010) Study"); and the New England Governors/Eastern Canadian Premiers 2017 Regional Climate Action Plan Update. In addition, I also regularly testify before the state legislature and conduct energy and GHG analysis for NHDES and the State of New Hampshire, inclusive of the electric power, building, and transportation sectors.

Q. Have you previously testified before the Commission?

A. No. However, I am an active participant in the DE 16-576 Net Metering pilot studies, the IR 15-296 Grid Modernization proceeding, and the DE 17-136 EERS working groups, and am presently an Intervenor in this rate case, as well as DG 17-152 Liberty Gas Least Coast Integrated Resource Plan, and DE 19-064 Liberty Utilities Rate Case.

II. Overview and Summary

Q. Please describe the purpose of your testimony, including an overview of your analyses, conclusions, and the focus of your testimony.

A. The purpose of our testimony is to recommend that Eversource include a proposal for an EV time of use (TOU) rate for the residential sector, and that a separate mechanism, possibly a different rate or customer class designed to overcome the disincentive for investment in DCFC due to demand charges, be considered.

Our testimony begins (Section III) with an overview of EVs, which are part of a larger, emerging trend in strategic electrification of the entire energy system. This includes a summary of the current EV market and the potential environmental, energy, economic impacts that EVs may incur.

The second part of our testimony (Section IV) addresses the role that rates can have on EV adoption and charging behavior, and the potential for rates to reduce the impact that EV charging can have on the grid. This includes providing support for inclusion of TOU rates and a rate or customer class specific that addresses the negative impact that demand charges currently have on the business case for installing and operating DCFC within New Hampshire. Availability of DCFC throughout New Hampshire is instrumental to more widespread adoption and use of EVs in New Hampshire and the Northeast.

III. EV Overview

Q. How do EVs compare to conventional internal combustion engines?

A. Motor vehicles with conventional gasoline and diesel internal combustion engines (ICE) have been around for over a century. These vehicles rely on the combustion of liquid fuels to power the vehicle. EVs rely on an external power source to charge an onboard battery, which powers the electric motor as well as the vehicle's electronics.

There are two main types: battery electric vehicles (BEVs), and plug-in hybrid electric vehicles (PHEVs).

BEVs are pure electric. They use one or more electric motors powered by a battery pack. The range of BEVs varies from 80 to 335 miles, depending on the model. The range of an EV can vary based upon driving conditions, such as outside temperature and high driving speeds. BEVs are plugged in to an electric power source to charge. The battery also recharges during operation through regenerative braking.

PHEVs are much like regular hybrid-electric vehicles (HEVs) in that they have both an electric motor and a gasoline engine, but unlike HEVs they can be plugged in to charge, and have all-electric ranges that vary from 10 to 50 miles. PHEVs use the electric motor, at times selectively, until the battery is depleted, and then the vehicle switches seamlessly to the gasoline engine. Similar to regular hybrid vehicles, PHEVs also recharge the battery during operation through regenerative braking.

According to the US Department of Energy, EVs are significantly more efficient than gasoline vehicles. EVs convert over 77 percent of the electrical energy from the grid to power at the wheels, whereas conventional gasoline vehicles only convert about 17–21 percent of the energy stored in gasoline to power at the wheels.[4]

Q. How is the vehicle market and the vehicle fleet changing as a result of the commercialization of EVs?

A. EV technology is rapidly progressing. The price of EV batteries has fallen from $1,100 per KWH storage capacity in 2010 to $156 in 2019. It is anticipated that costs will fall below $100 per KWH in 2024, at which point EVs will reach price parity with ICE vehicles.[5]

In the United States, annual sales of EVs today are relatively low, approximately one percent of passenger vehicle sales in 2018, but are projected to exceed 3.5 million vehicles, more than 20 percent of annual vehicle sales, by 2030. This translates to 18.7

[4] US DOE (2019). All-Electric Vehicles, Office of Energy Efficiency & Renewable Energy, https://fueleconomy.gov/feg/evtech.shtml, (Last accessed December 18, 2019).

[5] BNEF (2019). 2019 Electric Vehicle Outlook, Bloomberg NEF, https://about.bnef.com/electric-vehicle-outlook/, (Last accessed December 16, 2019).

million EVs on the rode in the US in 2030, up from slightly more than 1 million at the end of 2018. At this point, EVs will make up about seven percent of the 259 million vehicles, including cars and light trucks, expected to be on U.S. roads in 2030.[6]

Additionally, other segments of the transportation sector will also electrify, with light commercial EV sales projected to reach 56 percent, and medium commercial EV sales expected to reach 31 percent in 2030.[7] Already, electric bus manufacturers, like Lion Electric, New Flyer and BAE Systems are working with communities to deploy electric transit buses and school buses.

Q. What factors influence the rate of adoption?

A. As noted, in the United States, there are over one million EVs on the road today. This number will continue to rise as:

- more charging infrastructure is deployed, leading to reduced range anxiety;
- the cost of EVs continues to decrease;
- the range of EVs continues to increase, complementing the rise in public charging infrastructure; and
- consumers become increasingly aware of the cost and environmental benefits of driving electric.

Currently, there are around 40 different models of electric cars available for sale in the U.S., including sports cars, sedans, SUVs, and minivans.[8] Of those, 30 different EV models are available today in the Northeast.[9] Most major vehicle manufacturers have invested significantly in electrification and have announced that exciting new products are on the way, including more EVs with four-wheel drive, longer ranges, and electric pickup trucks.

[6] NESCAUM (2017). Multi-State Zero Emission Vehicle Action Plan, http://www.nescaum.org/documents/2018-zev-action-plan.pdf, (Last accessed December 19, 2019).

[7] BNEF (2019). 2019 Electric Vehicle Outlook, Bloomberg NEF, https://about.bnef.com/electric-vehicle-outlook/, (Last accessed December 16, 2019).

[8] Plug In America, (2019). EV model availability webpage, https://plugstar.com/cars, (Last accessed December 18, 2019).

Q. Please describe the EV market and fleet in the broader Northeast, including New England and Eastern Canada, whose residents visit or pass through New Hampshire seasonally.

A. Vehicle electrification is transforming transportation across the region. All other New England states and many other Northeast states have adopted policies and regulations, and are offering incentives, that will result in increased adoption of EVs in our region in the coming years. As of 2019, more than 40,000 EVs were registered in the New England states surrounding New Hampshire.[10] The largest growth in EVs has occurred in New Hampshire's neighbor to the North, in the Canadian province of Quebec where, since 2014, EVs have grown from just under 3,000 vehicles on the road to more than 43,000 EVs in 2019 (as of March). The 2019 registrations represent 0.83% of all vehicles,[11] with total EV registrations rising 75 percent between 2018 and 2019.[12]

Q. How is the Northeast regional market expected to change?

A. All of the New England states except New Hampshire, as well as New York, are signatories to California's Zero Emission Vehicle (ZEV) regulation[13]. In 2013, the four New England states and New York agreed to a target of 15 percent of vehicles being ZEV by 2025, meaning BEV, PHEV, or fuel cell.[14] Recent projections for the Boston Metro area, including New Hampshire and Rhode Island, estimate there will be 266,000 EVs on our roads by 2030.[1] However, the ZEV program targets are minimum

[10] NEG/ECP Transportation and Air Quality Committee 2019 Annual Report, forthcoming.

[11] Data provided by Ministry of Sustainable Development, Environment, and Fight Against Climate Change, Ministry of Sustainable Development, Environment, and Fight Against Climate Change, http://www.environnement.gouv.qc.ca/index_en.asp, (Last accessed December 19, 2019).

[12] Institut de la Statistique du Québec (2019). *Panorama des régions du Québec. Édition 2019*, [En ligne], Québec, L'Institut, 162 p. http://www.stat.gouv.qc.ca/statistiques/profils/panorama-regions-2019.pdf

[13] NESCAUM (2018). Multi-State Zero Emission Vehicle Action Plan, http://www.nescaum.org/documents/2018-zev-action-plan.pdf, (Last accessed December 19, 2019).

[14] Shulock, C. (2016). Manufacturer Sales Under the Zero Emission Vehicle Regulation: 2012 Expectations and Governors' Commitments Versus Today's Likely Outcomes, Shulock Consulting , https://www.nrdc.org/sites/default/files/media-uploads/nrdc_commissioned_zev_report_july_2016_0.pdf, (Last accessed December 19, 2019).

percentages. The State of Massachusetts alone has set a goal of having 300,000 EVs on the road by 2025.[15]

Quebec has also set targets of 100,000 EVs on the road by 2020 and 300,000 on the road by 2025.[16] With New Hampshire's natural resources attracting so many visitors from around the region, the economic pressure to build infrastructure to "fuel up" EVs will be great.

Q. What is the status of EV adoption in New Hampshire?

A. As of the end of 2018, a little over 3,300 EVs were registered in New Hampshire: with around 2,000 plug-in hybrid electric vehicles PHEVs and nearly 1,300 BEVs. This represented only 0.23 percent of all vehicles in New Hampshire and 0.28 percent of the light-duty vehicles in New Hampshire. However, the growth from 2017 to 2018 was 58 percent, up from 37 percent growth between 2016 and 2017.[17] With many new models in a variety of body types coming out, along with longer ranges, and falling purchase price, the rate of EV adoption in New Hampshire is expected to increase.

As noted, electric buses are another use case. Nashua Transit recently held a ribbon cutting for their two new hybrid-electric Transit Buses equipped with BAE Systems HybriDrive Electric Propulsion System.[18] School systems across the state have also expressed interest in electrifying portions of their school bus fleets.

Q. What are the known and potential benefits of EVs to the state's environmental and public health?

[15] Press Release, Governor Baker Signs Electric Vehicle Promotion Legislation, https://www.mass.gov/news/governor-baker-signs-electric-vehicle-promotion-legislation, (Last accessed December 20, 2019).

[16] Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques. *Analyse d'impact réglementaire du règlement d'application de la Loi visant l'augmentation du nombre de véhicules automobiles zéro émission au Québec afin de réduire les émissions de gaz à effet de serre et autres polluants.* 2017, 57 p. [En ligne]. http://www.mddelcc.gouv.qc.ca/changementsclimatiques/ vze/AIR-reglement201712.pdf, (Last accessed December 19, 2019).

[17] NHDES analysis of NH DMV registration data query run December 31, 2018.

[18] GSCCC (2018). Nashua Transit System and BAE Systems Partner to Bring Hybrid Diesel-Electric Transit Buses to the Streets of New Hampshire, http://www.fuelsfix.com/2018/12/nashua-transit-system-and-bae-systems-partner-to-bring-hybrid-diesel-electric-transit-buses-to-the-streets-of-new-hampshire/, (Last accessed December 19, 2019).

A. EVs present economic, energy, and environmental opportunities for the state, region, and nation by reducing overall energy consumption, reliance on energy imports from out of state, and the emission of air pollutants.

The transportation sector is responsible for over half of the emissions of oxides of nitrogen (NOx) and volatile organic compounds in New Hampshire[19], which lead to the formation of ground level ozone, a respiratory irritant that can pose a significant health risk to susceptible people including children, the elderly, and those with respiratory ailments such as asthma. This sector also is responsible for over 40 percent of the state's greenhouse gas (GHG emissions). Global GHG emissions are the primary contributor to climate change.[20]

In comparison to gasoline and diesel vehicles, EVs operating in the Northeast emit fewer NOx and GHG emissions, even when factoring in the power plant emissions from charging the batteries. This is in part because the electric grid in the Northeast is relatively "clean" as compared to other regions, and because EVs are much more efficient than ICE vehicles, using 25 percent of the energy of a conventional ICE vehicle to travel the same distance. As the ISO-New England grid becomes even cleaner, through the interconnection of distributed energy resources (DERs) and large renewable energy projects, the net environmental benefit of EVs will grow larger. This is why transportation electrification is a key strategy for achieving air quality and climate goals and for integrating renewable energy into the transportation sector.

Q. What are the known and potential benefits of EVs to state's economy?

A. The energy and economic impacts of EVs are also increasingly positive, for the individual consumer and for the state and region. While the upfront costs of EVs are still high enough that the lifecycle costs of an EV have not reached parity with conventional ICE vehicles, the operation and maintenance costs of EVs are considerably lower than

[19] NHDES (2017). State of New Hampshire Air Quality - 2017: Air Pollution Trends, Effects and Regulation, https://www.des.nh.gov/organization/commissioner/pip/publications/documents/r-ard-17-01.pdf, (Last accessed December 19, 2019).

[20] NHDES (2017). State of New Hampshire Air Quality - 2017: Air Pollution Trends, Effects and Regulation, https://www.des.nh.gov/organization/commissioner/pip/publications/documents/r-ard-17-01.pdf, (Last accessed December 19, 2019).

their counterparts. EVs are, as noted above, 77 percent efficient compared to 17–21 percent efficient than and gasoline ICE vehicle. This gives EVs a cost of operation of $1.53 per gas gallon equivalent[21] compared to a New Hampshire average price of $2.46 per gallon.[22]

New Hampshire imported 16.6 million barrels of motor gasoline and 2.3 million barrels of diesel fuel in 2017,[23] resulting in combined expenditures of just under $2 billion.[24] As New Hampshire has no fossil fuel reserves, the purchase of transportation fuels result in a net export of energy dollars from the state and the region as a whole. Expanding the use of EVs can reduce the scale of this expenditure, a reduction that will again be compounded as the state and region expands the deployment of DERs and large-scale renewable energy resources.

Q. What are the known and potential benefits and impacts of EVs to state's energy sector?

A. While the impact of EVs on the environment and economy is likely to be a net positive, the impact to the energy sector and specifically the electric sector has the potential to be mixed. As the EV fleet in New Hampshire grows, it will displace motor gasoline and on-road diesel consumption, reducing total energy consumption and total imported energy, while increasing electricity consumption and potentially driving growth in demand.

Based on NHDES calculations, it is estimated that EVs registered in the state in 2018, representing 0.28 percent of the passenger vehicle population, consume 10,100 MWH. If

[21] Assumes 3.5 miles/KWH in a BEV, 30 miles per gallon fuel economy in gas-powered ICE vehicles, and an Eversource residential electric rate of 0.17924/KWH. Rate obtained from Eversource website:

https://www.eversource.com/content/docs/default-source/rates-tariffs/nh-summary-rates.pdf?sfvrsn=2947c862_2, (Last accessed December 16, 2019)

[22] AAA Gas Prices, NH Average Gas Price, https://gasprices.aaa.com/?state=NH, (Last accessed December 16, 2019)

[23] EIA (2019). Table CT7. Transportation Sector Energy Consumption Estimates, Selected Years, 1960-2017, New Hampshire, https://www.eia.gov/state/seds/sep_use/tra/pdf/use_tra_NH.pdf, (Last accessed December 16, 2019).

[24] EIA (2019). Table ET6. Transportation Sector Energy Price and Expenditure Estimates, Selected Years, 1970-2017, New Hampshire, https://www.eia.gov/state/seds/sep_prices/tra/pdf/pr_tra_NH.pdf, (Last accessed December 16, 2019).

EVs rose to 30 percent of the passenger fleet, all else being equal, that could require an additional 1,100 GWH of generation.[25]

This growth in consumption has potential positive and negative consequence. As EVs continue to increase in their share of the New Hampshire fleet and the share of vehicles carrying visitors, the rise in electric power consumption has the potential, if not properly managed, to increase the total ISO-NE daily and seasonal peaks, as well as New Hampshire's share of that peak. This has the potential to impact all New Hampshire ratepayers by increasing both the energy supply charge and the transmission charge.

However, the three investor-owned utilities, including Eversource, observed, in joint comments on the Grid Modernization Docket, IR-296, that while EVs have the potential to grow electric loads, this load growth can result in savings to all customers if forecasted and managed properly. As EVs consume more electricity, there are more KWHs over which to spread Eversource's and the other utilities' fixed costs.[26] This was independently supported by Eversource analysis provided in this docket.[27]

Q. What is involved in charging EVs and PHEVs?

A. Electric vehicles need to be charged with electricity to "fuel" their batteries. An EV "charging station," typically referred to as "Electric Vehicle Supply Equipment" (EVSE), utilizes an electric cord to funnel electric current to the vehicle. The actual charger, typically called the "onboard vehicle charger," is a device that is located in the vehicle. This onboard device receives the electric current from the EVSE and charges the battery.

EV drivers typically behave differently with regard to refueling than ICE drivers do. Rather than waiting until the fuel gauge is near empty to refuel, EV drivers often take advantage of opportunities to "top off." While it takes longer to charge your car with electricity, it can be accomplished while drivers are doing something else. While most

[25] NHDES calculations, December 2019. Assumes EV-registration fraction equal to EV passenger-miles fraction and 3.5 miles per KWH.

[26] Page 13. Joint Comments of Liberty Utilities (Granite State Electric) Corp. D/B/A Liberty Utilities, Public Service Company of New Hampshire D/B/A Eversource Energy, And Unitil Energy Systems, Inc. Re: Order No. 26,254. http://www.puc.state.nh.us/regulatory/docketbk/2015/15-296/letters-memos-tariffs/15-296_2019-09-06_gsec_eversource_unitil_joint_comments.pdf, (Last accessed December 18, 2019).

[27] Eversource Response to PUC (Staff 13-013a), October 25, 2019.

charging is typically done at home or at work (if the workplace has installed charging stations for employees), public charging plays a vital role in driving EV adoption.

There are three levels of charging: Level 1, Level 2, and Direct Current Fast Charging (DCFC). Level 1 charging consists of plugging the cord that comes with the car into a standard 120-volt AC wall outlet. Level 1 typically provides about 2 to 5 miles of range per hour and is best for overnight charging. Level 2 charging requires a 240-volt outlet, the same kind used by a clothes dryer or electric stove, and delivers 10 to 25 miles of range per hour of charging. This is best for use in homes, workplaces, fleet facilities and public facilities where people park for several hours. The cost of installation is highly dependent on location and existing power supply.

DCFC requires a three-phase 480-volt AC electric circuit, with the DCFC equipment converting AC to DC, and delivers a significantly faster charge. Most existing DCFC stations are 50 kilowatts (KW), delivering 60 to 80 miles of range in 20 minutes and are used primarily to charge BEVs. However, there are now much faster DCFC stations, including ones that deliver up to 350 KW, a wattage capable of delivering 200 miles of range in 10 minutes.

DCFC stations are an essential component of the EV charging ecosystem. While it is generally understood that DCFC is needed to facilitate long distance travel, there are many DCFC applications for local EV drivers as well. DCFC stations provide a viable charging option for people without the ability to charge at home, such as those who live in apartment buildings, and are also used by EV drivers looking to top off their battery.

Q. What is the status of EVSE deployment in New Hampshire?

A. There are currently over 19,000 publicly accessible, non-Tesla, EV charging locations in the United States, 80 of which are in New Hampshire.[28] These figures do not include the number of Level 1 and Level 2 chargers used for home charging, which is not known. It is likely very close to the total number of registered EVs and PHEVs.

The number of publically-accessible chargers is expected to grow as automakers bring more EVs to the market and the demand for charging increases. Moreover, there are

[28] US DOE (2019). Alternative Fueling Station Locator, Office of Energy Efficiency & Renewable Energy, https://afdc.energy.gov/stations/#/find/nearest, (Last accessed December 20, 2019).

billions of dollars of planned investment in EV charging equipment from electric utilities, states, and private EVSE companies. Therefore, there will likely be more applications for EV charging stations in the coming months and years.

Q. How has the New Hampshire policy landscape changed recently with respect to EVs?

A. New Hampshire is behind, as compared to neighboring states, in our planning and installation of infrastructure to support EV travel to and within New Hampshire, but that trend is changing. In 2018, an Electric Vehicle Charging Stations Infrastructure Commission[29] was established by SB517[30] to provide recommendations on a number of issues related to EV charging, with the goal of making charging more accessible in New Hampshire. State policies, including enabling and encouraging the development of adequate EVSE in the state will help minimize the "range anxiety" that often hinders the purchase of these cleaner advanced technology vehicles.

The Commission, which has been meeting since the fall of 2018, is timely given the recent settlement agreement between Volkswagen and the Federal Department of Justice.[31] New Hampshire has received approximately $31 million from the Volkswagen Settlement, and Governor Sununu has committed 15 percent or approximately $4.6 million – the maximum allowed under the settlement – to be used for EV charging stations. Recently the Governor's Office of Strategic Initiatives, New Hampshire's VW lead agency, released a competitive solicitation for charging along New Hampshire's principal travel corridors.

[29] Electric Vehicle Charging Stations Infrastructure Commission, https://www.des.nh.gov/organization/divisions/air/tsb/tps/msp/sb517.htm, (Last accessed December 18, 2019).

[30] Senate Bill 517, An Act Establishing an Electric Vehicle Charging Stations Infrastructure Commission, http://gencourt.state.nh.us/bill_Status/billText.aspx?sy=2018&id=1829&txtFormat=pdf&v=current, (Last accessed December 18, 2019).

[31] United States of America vs Volkswagen AG, Docket No. 16-CR-20394, https://www.justice.gov/usao-edmi/us-v-volkswagen-16-cr-20394, (Last accessed December 16, 2019).

In 2018, another bill, SB575,[32] was also signed into law. This bill directed the NH PUC to consider and determine whether it is appropriate for electric companies and public service companies to implement any of a variety of specified rate design standards.

IV. Relationship Between EVs and Rates

Q. How does rate design influence EV adoption and charging behavior?

A. Electric rates can, based on how they are structured, influence both the adoption rate of EVs, as well as their impact on the regional grid by influencing charging behavior.

As noted previously, EVs currently cost more than conventional vehicles. One mitigating factor is that "fuel" costs can be lower for EVs, thus providing some relief from the higher vehicle cost. If those "fuel" costs are lowered, such as through TOU rates for Level 1 and 2 charging, or are increased due to demand charges on DCFC (which currently limit the availability of DCFC), the calculus for EV adoption can be either positively or negatively impacted.

Rates can have an even more significant influence on charging behavior, and can be used to assist the utilities in reducing EV charging during peak demand periods. Just as drivers shop around for less expensive gasoline, EV owners, given information and an incentive, will "fuel" when prices are lower when possible. TOU rates that discourage charging during peak demand and encourage charging during low demand periods will send the necessary price signal to consumers to elicit this behavior.

This can help to mitigate the impact that rising EV numbers will have on overall seasonal peak as well as New Hampshire's share of the load. By offering TOU rates with strong price signals, utilities increase the likelihood that EVs will hold off on charging until the daily peaks have passed. In addition, TOU rates that shift EV charging, or any electric load to times of lowest demand, may also avoid or reduce the need for distribution system investments. Shifting EV charging to off peak periods can have positive impacts on seasonal peak and distribution investments, and, therefore, affect energy supply, distribution, and transmission rates.

[32] Senate Bill 575, An Act Relative to Electric Vehicle Charging Stations, http://gencourt.state.nh.us/bill_Status/billText.aspx?sy=2018&id=1828&txtFormat=pdf&v=current, (Last accessed December 18, 2019).

Another aspect of rate design, demand charges, have an enormous influence on the business case, or value proposition, for owning and operating DCFC. As DCFC stations increase in both number and geographic distribution across the state, they reduce the range anxiety that EV drivers, from in and outside the state, may feel. Reduced range anxiety can contribute to greater comfort in purchasing an EV.[33] However, NHDES has heard from industry participants that the demand charges incurred by DCFC stations, at current and near term levels of penetration, undermine the business case for installing and operating this essential EV infrastructure. Currently, with relatively few EVs on the road, a DCFC may be used by only a few vehicles each day, or in remote areas, a few vehicles each week. But EVs can draw a significant amount of power and, particularly if multiple vehicles are charging at the same time, result in a significant demand charge. With few users to absorb this fixed cost, the cost per kWh that a station owner must charge to recoup their costs is unreasonable and will discourage the use of that station. This results in fewer stations being built, reducing the viability of owning an EV, reducing the business case for owning DCFC, and the cycle continues. Addressing the impact that demand charges can have on profitability of DCFC stations, and therefore increasing their economic viability, is likely to result in a greater number of stations across the state. This issue has been documented independently. [34,35,36]

Q. What is your position regarding TOU rates in this proceeding?

A. NHDES would support the inclusion of a TOU rate for EVs by Eversource.

[33] UCS (2016). Electric Vehicle Survey Methodology and Assumptions: Driving Habits, Vehicle Needs, and Attitudes toward Electric Vehicles in the Northeast and California, https://www.ucsusa.org/sites/default/files/attach/2016/05/Electric-Vehicle-Survey-Methodology.pdf, (Last accessed December 15, 2019).

[34] Utility Dive (2019). PG&E wants EV demand charges to mimic smartphone plans. Regulators are skeptical, https://www.utilitydive.com/news/pge-wants-ev-demand-charges-to-mimic-smartphone-plans-regulators-are-skep/563757/, (Last accessed December 19, 2019).

[35] Fitzgerald, G. and Nelder, C., (2017). From Gas to Grid: Building Charging Infrastructure to Power Electric Vehicle Demand. Rocky Mountain Institute, https://www.rmi.org/insights/reports/from_gas_to_grid, (Last accessed December 20, 2019).

[36] Fitzgerald, G. and Nelder, C., (2017). EVgo Fleet and Tariff Analysis: Phase 1: California, Rocky Mountain Institute, https://rmi.org/wp-content/uploads/2017/04/eLab_EVgo_Fleet_and_Tariff_Analysis_2017.pdf, (Last accessed December 7, 2019).

Q. Has a similar rate been established elsewhere?

A. The Commission does not presently mandate or regulate any specific EV programs operated by the three investor owned utilities. However, EV rates already exist in New Hampshire and another EV rate has been proposed. Numerous other examples of EV TOU rates have been compiled from around the country.[37]

The NH Electric Cooperative offers the Residential Off-Peak Electric Vehicle Charging Station Program. This program enables participating members to utilize an on and off-peak rate.[38] Liberty Utilities has proposed offering, as part of its rate case 19-064, Rate D-EV, a TOU rate. This rate was approved in Docket No. DE 17-189, the battery storage docket, and was designed to be technology agnostic for residential EV charging.[39] Rate D-EV would, if approved, be available as a residential rate and not available for other applications.

Also, as noted during the Discovery Response NHDES 1-001, Eversource already has a time of day rate which is available as an option for an entire service.[40] While not intended for EVs at the time of development, Mr. Edward Davis with Eversource noted this time of day could be applied to residential EVs charging.[41]

Q. What is your position regarding DCFC and demand charges in this proceeding?

[37] SEPA (2018). Utilities and Electric Vehicles: Evolving to Unlock Grid Value, https://sepapower.org/resource/utilities-electric-vehicles-evolving-unlock-grid-value/, (Last accessed December 5, 2019).

[38] NHEC (2019). NH Electric Cooperative's (NHEC) 2019 Residential Off-Peak Electric Vehicle Charging Station Program, https://www.nhec.com/wp-content/uploads/2019/01/2019-Residential-Off-Peak-EV-Charging-Station-Instructions.pdf, (Last accessed December 16, 2019).

[39] See direct testimony of Ms. Heather Tebbetts, Bates II-239, http://www.puc.state.nh.us/regulatory/docketbk/2019/19-064/initial%20filing%20-%20petition/19-064_2019-04-30_gsec_dtestimony_tebbetts_perm_rates.pdf, (Last accessed December 16, 2019).

[40] Eversource Response to NHDES (NHDES 1-001), October 25, 2019.

[41] Verbal response during questioning at DE 19-057 Technical Session at NH PUC on October 29, 2019.

A. NHDES does not take a position on any specific rate or tariff that Eversource should offer. Instead, NHDES observes that other jurisdictions have proposed DCFC-specific rate classes or customer classes.

Q. Have demand-based alternative rates been established elsewhere?

A. Yes. The Connecticut Public Utilities Regulatory Authority has approved an EV Rate Rider for Eversource. The EV Rate Rider eliminates demand charges by converting them to a per kWh usage charge.[42]

Q. Why is it important to consider rates relative to EVs now, when EVs represent such a small part of the total vehicle fleet?

A. EVs are here and will only become more common as prices fall and drivers become more familiar. EVs are having a marginal impact on daily and seasonal peak demand and total generation today, but these impacts will grow as penetration rate increases. By offering specific EV TOU rates now, before EV numbers increase to a significant percentage of the on-road fleet and begin to register a significant impact to the grid, Eversource and other utilities can better establish off-peak charging as the norm for EV owners from the very beginning.

Also, by offering a broader class of rates now, which include EV rates, Eversource will have access to data that will inform the next generation of EV specific rates; rates developed based on New Hampshire specific data. This data may be used by Eversource directly, or by the energy sector more broadly through the newly approved statewide, multi-use online energy data platform, signed into law during the 2019 legislative session. As noted in SB284 findings, "[s]uch a program of robust data is also likely to be useful in local planning, conducting market research, fostering increased awareness of

[42] The Connecticut Light and Power Company, d/b/a Eversource Energy, Electric Vehicle Rate Rider, Docket No. 17-10-46RE01, http://www.dpuc.state.ct.us/dockcurr.nsf/8e6fc37a54110e3e852576190052b64d/78a25b4e83776981852583b50057c9d1/$FILE/171046RE01-030619.pdf, (Last accessed December 19, 2019).

energy consumption patterns, and the adoption of more efficient and sustainable energy use.[43]

In the context of this rate case, addressing EV charging now matters because this is the first base-rate proceeding that the Eversource has filed in 10 years. As noted in testimony of Purington and Lajoie, "a vast sea-change has occurred in terms of the need for the distribution system to be more reliable and resilient to meet the growing expectations of customers; for protection from the impacts of climate change experienced by customers in terms of the significant ramp-up in the frequency and severity of major weather events and the imperative to reduce GHG emissions; for changes in service alternatives arising as a result of the transition to a digital economy; and for options to participate in climate change response through the installation of distributed energy solutions and other opportunities.[44] This speaks not only to the importance of addressing climate change, but also of the technological changes that have occurred across that decade. To assure that the impact of a rapidly emerging market segment is addressed, at least in part, it stands that this rate case should consider rate design for EVs as the timing of the next rate case is indeterminate.

This was emphasized in September 2019, the three investor-owned utilities, including Eversource, submitted joint comments on the Grid Modernization Docket, IR-296. In this filing, the utilities responded to a recommendation PUC Staff Report, regarding rate design in proposed Integrated Distribution Plan (IDPs). PUC Staff recommended that each utility's IDP contain a proposal for rate design and that address issues including: demand charges and TOU rates, inclusive of generation, transmission, and/or distribution charges.[45] The three utilities noted that, while utility rate design may be informed by IDPs, they are not the most appropriate forum for redesign of utility rates. Instead

[43] SB284 (2019). http://gencourt.state.nh.us/bill_status/billText.aspx?sy=2019&id=1077&txtFormat=pdf&v=current, (Last accessed December 19, 2019).

[44] See direct testimony of Mr. Joseph Purington's and Mr. Lee Lajoie's, Bates 000391-392, http://www.puc.state.nh.us/regulatory/docketbk/2019/19-057/initial%20filing%20-%20petition/19-057_2019-05-28_eversource_dtestimony_purington_lajoie.pdf, (Last accessed December 19, 2019).

[45] PUC (2019). Staff Recommendation on Grid Modernization, IR 15-296 Investigation into Grid Modernization, http://www.puc.state.nh.us/Regulatory/Docketbk/2015/15-296/LETTERS-MEMOS-TARIFFS/15-296_2019-02-12_STAFF_REPORT_AND_RECOMMENDATION.PDF (Last accessed December 17, 2019).

amendments to rate design and the implementation of new rate designs should remain as issues in individual utility rate cases.[46]

Tom Frantz, the Director, Electric Division, also noted during a presentation to the Electric Vehicle Charging Stations Infrastructure Commission (SB517 2018) that issues related to DCFC demand chargers should be addressed in a rate case.[47]

V. Conclusion

Q. Does this conclude your testimony?

A. Yes.

[46] Joint Comments of Liberty Utilities (Granite State Electric) Corp. D/B/A Liberty Utilities, Public Service Company of New Hampshire D/B/A Eversource Energy, And Unitil Energy Systems, Inc. Re: Order No. 26,254. http://www.puc.state.nh.us/regulatory/docketbk/2015/15-296/letters-memos-tariffs/15-296_2019-09-06_gsec_eversource_unitil_joint_comments.pdf, (Last accessed December 18, 2019).

[47] PUC Presentation to the Electric Vehicle Charging Stations Infrastructure Commission, Overview of Electric Utility Rulemaking, October 4, 2019, https://www.des.nh.gov/organization/divisions/air/tsb/tps/msp/sb517.htm, (Last accessed December 19, 2019).

Addendum RO-1

Qualification of Rebecca E. Ohler

My name is Rebecca E. Ohler. I am employed as the Administrator of the Technical Services Bureau with the New Hampshire Department of Environmental Services, Air Resources Division (NHDES). My business address is 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095.

I earned a Bachelor of Science in Environmental Conservation from the University of New Hampshire in 1982. Starting in 1989 I was employed as a field inspector for four years by the Harris County Pollution Control Department in Pasadena, Texas. I subsequently was employed by the Texas Air Control Board (now the Texas Council on Environmental Quality) for 6 years where I conducted compliance inspections on major petrochemical and energy facilities in the Houston area.

In 1998 I was employed by NHDES as a stationary source inspector in the Compliance Bureau, moving to the Technical Services Bureau in 1999 where I worked in the Mobile Sources Section. In this position I facilitated the Transportation and Land Use working group in the development of the state's Climate Action Plan.

Since 2010, I have been the Transportation and Energy Programs manager and then the Technical Services Bureau Administrator for NHDES, overseeing the work of the Mobile Sources Section as well as managing many aspects of the department's climate and energy programs. In these positions, I have worked closely with the Public Utilities Commission in evaluation of proposals for funding under the former Greenhouse Gas Emission Reduction Fund as well as the Renewable Portfolio Standard's Renewable Energy Fund. I represent the department on the state's Interagency Energy Efficiency Committee, the New England Governors/Eastern Canadian Premiers Transportation and Air Quality Committee (co-chair), the NEG/ECP Climate Change Steering Committee, and the Northeast/Mid-Atlantic Transportation Climate Initiative. On behalf of the department I assist in development of policy positions relative to energy and climate issues, and prepare and present testimony to the New Hampshire General Court on these issues.

Addendum CS-1

Qualification of Christopher J. Skoglund

My name is Christopher J. Skoglund. I am employed as the Climate and Energy Program Manager in the Technical Services Bureau with the New Hampshire Department of Environmental Services, Air Resources Division (NHDES). My business address is 29 Hazen Drive, PO Box 95, Concord, NH 03302-0095.

I earned a Bachelor's of Arts in Biology from Johns Hopkins University in 1997 and a Master's of Science in Natural Resources from the University of New Hampshire in 2012. In between those degrees, I was principally employed teaching environmental and science education to middle and high school students across the country.

In 2007, I began working part-time as a Climate Program Specialist working on developing background data and analysis and planning tools to support a potential state climate action plan. In 2008, I was hired full time as an Energy and Transportation Analyst, primarily coordinating the development of the 2009 NH Climate Action, which included managing the analysis of the electric power, building, and transportation sectors. In this position, I was also engaged in transportation planning and analysis, working with the NH Department of Transportation and the four Metropolitan Planning Organizations in the southeast corner of the state.

In 2010, I moved into the Energy and Climate Analyst position, focusing more on building and electric sectors with high-level energy and climate-change planning focused at the local, state and regional level. In 2012, I oversaw the state's Energy Efficiency and Sustainable Energy Board's development of the 2012 EESE Board Review on the Independent Study of Energy Policy Issues ("SB 323 (2010) Study").

In 2016, I moved to Climate and Energy Program Manager position at NHDES. In this roll, I regularly tracked legislation and testified before the state legislature. I have also been a regular participant in PUC dockets, including Grid Mod, Net-Metering, the EERS, and more recently the two active rate cases and the Liberty Utilities Least Coast Integrated Resource Plan.

I am also a member of the New England Governor's Eastern Canadian Premiers (NEG/ECP) Climate Change Steering Committee, and helped lead efforts in 2015 and

2016 to establish a new regional GHG target for 2030. In 2016 and 2017, I lead the successful effort to develop an update to the region's 2001 climate action plan, a plan that was economy wide and inclusive of the electric power, building, and transportation sectors.

Throughout this my time at NHDES, I have maintained the statewide GHG inventory, inclusive of the electric power, building, and transportation sectors and taken a lead role in the GHG inventory for the entire NEG/ECP region.