

**STATE OF NEW HAMPSHIRE**  
**BEFORE THE NEW HAMPSHIRE PUBLIC UTILITIES COMMISSION**

**Docket No. DE 21-078**

**Public Service Company of New Hampshire D/B/A Eversource Energy**

**DIRECT TESTIMONY OF CHRISTOPHER R. VILLARREAL**

**ON BEHALF OF**

**CLEAN ENERGY NEW HAMPSHIRE AND CONSERVATION LAW FOUNDATION**

**FEBRUARY 25, 2022**

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1 **I. INTRODUCTION & QUALIFICATIONS**

2 **Q. Please state for the record your name, position, and business address.**

3 A. My name is Christopher Villarreal. I am the President of Plugged In Strategies, located at  
4 9492 Olympia Drive, Eden Prairie, Minnesota, 55347.

5 **Q. On whose behalf is this testimony being offered?**

6 A. I am testifying on behalf of Clean Energy New Hampshire (CENH) and the Conservation  
7 Law Foundation (CLF).

8 **Q. Please summarize your experience in the field of utility regulation.**

9 A. I have over 20 years of experience working for and before state regulatory bodies, including  
10 nine years as Senior Regulatory Analyst at the California Public Utilities Commission and  
11 two years as Director of Policy at the Minnesota Public Utilities Commission. I started  
12 Plugged In Strategies in 2017 and since then I have advised state commissions around the  
13 country on issues related to rate design, grid modernization, advanced metering  
14 infrastructure, interoperability, electric vehicles, distribution system planning, and data  
15 access and privacy.

1 **Q. Can you describe your experience with the issues raised in this proceeding?**

2 A. On rate design issues, I worked on a number of rate design policy decisions and  
3 proceedings when I was a staff member at the California Public Utilities Commission,  
4 including assisting the Assigned Commissioner's dynamic pricing guidance issued in  
5 Decision 08-07-045<sup>1</sup> and development of the Order Instituting Rulemaking that led to a  
6 review of existing rate design in California.<sup>2</sup> As Director of Policy for the Minnesota  
7 Public Utilities Commission, I participated in the development of the Minnesota  
8 Commission's review of its rate design policies.<sup>3</sup>

9 Additionally, from 2016-2017, I was staff chair of the National Association of Regulatory  
10 Utility Commissioners (NARUC) Staff Subcommittee on Rate Design, and led the effort  
11 to publish the NARUC manual on Distributed Energy Resources (DER) Rate Design and  
12 Compensation. This document was one of the first comprehensive looks at the impacts  
13 rate design has on DER, which includes EVs.

14 Recently, I facilitated an effort for the Connecticut Public Utilities Regulatory Authority,  
15 with funding from NARUC, to look at the interoperability considerations for EV

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<sup>1</sup> *Application of Pacific Gas and Electric Company To Revise Its Electric Marginal Costs, Revenue Allocation, and Rate Design*, Decision 08-07-045, California Public Utilities Commission (July 31, 2008), [https://docs.cpuc.ca.gov/PublishedDocs/WORD\\_PDF/FINAL\\_DECISION/85984.PDF](https://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/85984.PDF).

<sup>2</sup> *Order Instituting Rulemaking on the Commission's Own Motion to Conduct a Comprehensive Examination of Investor Owned Electric Utilities' Residential Rate Structures, the Transition to Time Varying and Dynamic Rates, and Other Statutory Obligations*, Order Instituting Rulemaking, California Public Utilities Commission, Docket No. R.12-06-013 (June 28, 2012), [https://docs.cpuc.ca.gov/PublishedDocs/WORD\\_PDF/FINAL\\_DECISION/169782.PDF](https://docs.cpuc.ca.gov/PublishedDocs/WORD_PDF/FINAL_DECISION/169782.PDF).

<sup>3</sup> See *In the Matter of an Alternative Rate Design Stakeholder Process for Xcel Energy*, Notice Seeking Comment on Procedural Schedule, Minnesota Public Utilities Commission, Docket No. E002/M-15-662 (February 16, 2016), <https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={AAB14AE3-EEDF-4188-8AE3-BD5BDA9EE5BA}&documentTitle=20162-118338-01>.

1 deployment in Connecticut, including the interaction between EVs, electric vehicle supply  
2 equipment (EVSE), and the utilities.

3 My work experience is summarized in my resume, provided as Exhibit CRV-1.

4 **Q. Have you testified before the New Hampshire Public Utilities Commission**  
5 **(Commission) or participated as an expert in any other proceeding before this**  
6 **Commission?**

7 A. Yes, I submitted pre-filed testimony in Docket Nos. DE 20-170 and DE 21-030 and  
8 participated as a witness in the hearing in Docket No. DE 20-170. Additionally, I  
9 participated in several workshops before the Commission in Docket No. IR 15-296,  
10 Investigation into Grid Modernization.

11 **Q. Have you testified before any other commission?**

12 A. Yes, I have previously testified before the Colorado Public Utilities Commission,  
13 Massachusetts Department of Public Utilities, Michigan Public Service Commission,  
14 Public Utilities Commission of Nevada, and the South Carolina Public Service  
15 Commission. In general, I testified regarding utility distribution system planning efforts  
16 and the role of DER, including EVs, on those planning efforts, deployment of advanced  
17 metering infrastructure, and EV rate design.

18 **Q. What is the purpose of your testimony?**

19 A. I am testifying on behalf of CENH/CLF regarding the electric vehicle (EV) rate design  
20 proposals of Eversource Energy in DE 21-078.

21 **Q. What is being considered in this docket?**

1 A. In its Order of Notice establishing this docket, the Commission stated that these  
2 proceedings raise issues:

3 [R]elated to whether Eversource’s proposed Make-Ready Program  
4 and [demand charge alternative (DCA)] are consistent with the  
5 settlement agreement approved by the Commission in Order No.  
6 26,443 (December 15, 2020); whether Eversource’s proposed  
7 Make-Ready Program and associated, estimated capital  
8 investments in EV charging infrastructure are reasonable and  
9 consistent with the New Hampshire Energy Policy stated in RSA  
10 378:37, as well as existing state EV policies; whether Eversource’s  
11 DCA is consistent with the New Hampshire Energy Policy stated  
12 in RSA 378:37, as well as existing state EV policies; and whether  
13 Eversource’s DCA, if approved, would result in rates that are just  
14 and reasonable, as required by RSA 374:2, and by RSA 378:5 and  
15 :7.

16 **Q. Are you sponsoring any exhibits?**

17 A. Yes, I am sponsoring the following exhibits:

- |    |                |  |
|----|----------------|--|
| 18 | Exhibit CRV-1: | Resume of Christopher R. Villarreal                    |
| 19 | Exhibit CRV-2: | Eversource Response to CLF 1-04 (Docket No. DE 21-078) |
| 20 | Exhibit CRV-3: | Eversource Response to CLF 1-01 (Docket No. DE 21-078) |
| 21 | Exhibit CRV-4: | Eversource Response to CLF 1-06 (Docket No. DE 21-078) |
| 22 | Exhibit CRV-5: | Eversource Response to CLF-CENH 2-003 and Attachment   |
| 23 |                | 1 (Docket No. DE 20-170)                               |

1     **II.     TESTIMONY OVERVIEW**

2     **Q.     What is the purpose of your testimony?**

3     A.     My testimony discusses key components of rate design and rate design principles, impacts  
4           of rate design on adoption of EVs, and addresses the demand charge alternative proposal  
5           of Eversource as submitted in docket number DE 21-078. I recommend the following:

6           1. The Commission modify Eversource’s rate design proposal as described in my  
7           testimony;

8           2. The Commission should require Eversource to collect information regarding EV  
9           adoption and usage rates to help inform the pace of evolution for rate design for  
10          EVs until such time as utilization rates for Direct Current Fast Chargers (DCFCs)  
11          reach a level at which demand charges can be recovered across more usage; and,

12          3. The Commission should require Eversource to make available public hosting  
13          capacity maps to help identify optimal locations for the siting of EV charging  
14          infrastructure, including DCFCs.

15     **III.    ELECTRIC VEHICLE POLICY**

16     **Q.     How should the Commission address EV policy?**

17     A.     A good first step in this effort is to focus on the rate design, as the Commission has directed.  
18           However, with the current levels of EV adoption across New Hampshire, the Commission  
19           should consider taking additional actions that will do much to support the growth of EVs  
20           in New Hampshire. For example, at this early stage of adoption, making a statement that  
21           adoption of EVs is a priority of the Commission would show that the Commission is ready  
22           and willing to take necessary steps to support the EV market in New Hampshire.

1 **Q. What justification exists for the Commission to make EVs a policy priority in New**  
2 **Hampshire?**

3 A. EVs present economic, energy, and environmental opportunities for the state, region, and  
4 nation as they are a vital method to lower air pollution and greenhouse gas emissions from  
5 the transportation sector, therefore providing important societal benefits. In addition, EVs  
6 can provide important grid services, which will be discussed in further detail below. The  
7 adoption of EVs across the state fleet has the potential to vastly reduce the state’s overall  
8 energy consumption as electric motors are nearly four times as efficient as internal  
9 combustion engines.<sup>4</sup> Moreover, as transportation electrification accelerates, it will result  
10 in increased electricity consumption, which will lower electricity rates for all consumers  
11 by spreading fixed costs over more KWh sales.<sup>5</sup> Finally, support for EV adoption is critical  
12 to New Hampshire’s tourism-based economy.

13 Because increased EV adoption will result in lower electricity rates and fuel costs for all  
14 ratepayers and will provide numerous environmental benefits, support for EVs is consistent  
15 with the New Hampshire Energy Policy, set forth in RSA 378:37, which states that it is  
16 *“the energy policy of this state to meet the energy needs of the citizens and businesses of*  
17 *the state at the lowest reasonable cost while providing for the reliability and diversity of*  
18 *energy sources . . . and to protect the safety and health of the citizens [and] the physical*  
19 *environment of the state.”*<sup>6</sup> Further, as pertains to the consideration of demand charge

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<sup>4</sup> Where the Energy Goes: Electric Cars, Office of Energy Efficiency & Renewable Energy, US DOE (2020), <https://fuelconomy.gov/feg/atv-ev.shtml>.

<sup>5</sup> See Jason Frost, Melissa Whited, and Avi Allison, *Electric Vehicles Are Driving Electric Rates Down*, Synapse Energy Economics, Inc. (June 2020), [https://www.synapse-energy.com/sites/default/files/EV\\_Impacts\\_June\\_2020\\_18-122.pdf](https://www.synapse-energy.com/sites/default/files/EV_Impacts_June_2020_18-122.pdf).

<sup>6</sup> RSA 378:37 (emphasis added).

1 alternatives in this docket and Eversource’s proposal to establish a new rate applicable to  
2 public EV charging stations that would eliminate demand charges, RSA 236:133 mandates  
3 that the Commission “determine whether it is appropriate to implement . . . [d]emand  
4 charges” for commercial customers, including for public EV charging station operators.<sup>7</sup>

5 In addition, support for EV adoption is documented in two independent New Hampshire  
6 reports on the matter. In October 2020, the Electric Vehicle Charging Stations  
7 Infrastructure Commission, which was created by SB 517 (2020), issued a final report that  
8 recommended:

9 The state should commit to the development of Zero Emission  
10 Vehicle (ZEV) technology and infrastructure, including the state,  
11 private and rental residence, business, and municipal installation of  
12 EV charging stations to reduce air pollution emissions and stimulate  
13 the transformation to a lower carbon transportation system.<sup>8</sup>

14 Moreover, in July 2019, the New Hampshire Department of Business and Economic  
15 Affairs (BEA), issued a final report that observed:

16 Establishing a robust charging infrastructure will not only serve the  
17 needs of New Hampshire drivers, but will sustain New Hampshire’s  
18 tourism industry as EV drivers from surrounding states realize they  
19 can visit the Granite State’s mountains, lakes, forests, towns, and  
20 beaches.<sup>9</sup>

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<sup>7</sup> RSA 236:133.

<sup>8</sup> EVSE Commission (2020). Electric Vehicle Charging Stations Infrastructure Commission (Senate Bill 517) Final Report (2018), <https://www.des.nh.gov/sites/g/files/ehbemt341/files/inline-documents/2020-12/20201030-final-report.pdf>.

<sup>9</sup> Evaluating Electric Vehicle Infrastructure in New Hampshire, New Hampshire Department of Business and Economic Affairs (July 2019), <https://www.nh.gov/osi/resource-library/documents/nh-ev-infrastructure-analysis.pdf>.

1 As such, EVs should be considered for the full range of potential benefits and impacts. The  
2 rate designs that the state ultimately elects to follow will have environmental, economic,  
3 and energy impacts while affecting its competitiveness within the northeast region.

4 **Q. What are some benefits of making EV adoption a policy priority?**

5 A. By making EV adoption a priority, the Commission can ensure that EV adoption and  
6 growth is considered across Commission actions. Additionally, making such a statement  
7 would allow further discussion and action on identifying opportunities to leverage EVs on  
8 the electric system and creating a more efficient distribution system.

9 Adoption of EVs provides a benefit to New Hampshire's customers and residents by  
10 electrifying transportation, be it single-vehicle EVs, a town's transit system, or electric  
11 school buses. The costs of operating EVs are lower than internal combustion engines, and  
12 EVs do not emit emissions, creating cleaner air for all who live and visit New Hampshire.

13 **Q. What is the status of electric vehicle adoption in New Hampshire?**

14 A. At this time, low. For example, Eversource conducts an annual forecast that estimates EV  
15 adoption 10 years into the future. Its forecast is based on a series of assumptions related  
16 to federal tax policies, battery and gas price forecasts, and state and regional needs and  
17 forecasts. Through 2030, Eversource forecasts less than 20,000 battery-powered EVs, of  
18 which some portion of those will be fleet vehicles.<sup>10</sup>

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<sup>10</sup> Ex. CRV-5.

1           Nevertheless, even though expanded EV production targets have been announced by the  
2           major EV producers and EVs will make up an increasing amount of the transportation  
3           sector in New Hampshire in the coming decade, Eversource estimates a rather low  
4           projection of EV deployment in New Hampshire, which provides the Commission with a  
5           significant opportunity to enact policies that support EV adoption at this early stage and  
6           that will help grow the EV market in New Hampshire. Furthermore, the passage of the  
7           federal infrastructure bill provided \$5 billion in funding to support the deployment of EV  
8           charging infrastructure, some of which will be made available to New Hampshire.<sup>11</sup> This  
9           funding tranche is available for the purpose of creating “a network of EV charging stations  
10          along designated Alternative Fuel Corridors, particularly along the Interstate Highway  
11          System.”<sup>12</sup> CENH Witness Skoglund’s testimony provides additional details on available  
12          EV infrastructure funding. Ensuring that there are no unnecessary barriers to EV adoption  
13          at this stage will help the EV market mature, support EV adoption, and allow New  
14          Hampshire residents to benefit from the savings and environmental benefits that  
15          electrification of transportation promises. Providing policy support to help this transition,  
16          such as avoiding demand charges, can go a long way to make EV adoption a priority for  
17          the state.

18   **Q.     Can you explain the benefit of acting while adoption rates are low?**

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<sup>11</sup> *President Biden, USDOT and USDOE Announce \$5 Billion over Five Years for National EV Charging Network, Made Possible by Bipartisan Infrastructure Law* (February 10, 2022), <https://highways.dot.gov/newsroom/president-biden-usdot-and-usdoe-announce-5-billion-over-five-years-national-ev-charging>

<sup>12</sup> *Id.*

1 A. Yes. With low adoption of EVs, any risk of cross-subsidization or impacts on its revenue  
2 requirements is likely to be minimal. Simply put, at low adoption levels, the risk of cost  
3 shifting to all customers is low. As such, any potential subsidization from other customer  
4 classes is likely to be minimal; even then, with EV adoption a priority for the state, and the  
5 Commission, it would be reasonable to allow for customers to bear some of the uncollected  
6 costs from these rates to support such a policy priority as supporting EV development in  
7 New Hampshire. Not collecting demand charges, as proposed by Eversource, should not  
8 have a substantial impact either to the site host or to customers since the low utilization  
9 rates of EV charging infrastructure means substantial costs are not being incurred.  
10 Furthermore, as proposed by Eversource, its demand charge alternative is optional, which  
11 means customers can choose to remain on their otherwise applicable general service tariff.

12 **Q. What types of actions should the Commission consider to support EV adoption?**

13 A. First, it is important that the Commission use this time to support EV adoption across the  
14 state. This would include identification of locations for the siting of DCFCs that will not  
15 have significant impacts on the electric system, and ensuring that distribution utilities do  
16 not leverage their own market power to interfere with a competitive marketplace. For  
17 example, encouraging Eversource to develop and make public EV hosting capacity maps  
18 would go a long way to minimizing customer and system costs while maximizing  
19 efficiency and leveraging available locations to locate DCFCs.

20 Second, by proactively stating that EV adoption is a priority for the Commission, it can  
21 recognize that EV adoption and deployment is at a nascent stage, so its policies and  
22 principles can reflect that determination.

1 Lastly, the Commission can adopt forecasting and reporting metrics regarding EV adoption  
2 so that Eversource, the Commission, and the public can project an adoption rate over time.  
3 This forecast is important as it can be used by utilities and the Commission to identify when  
4 certain policies can sunset and new policies adopted.

5 **Q. Can you describe the different types of EV use cases?**

6 A. Yes. I identify six basic use cases for EV adoption.

- 7           ▪ Residential Level 1, 110 volt charging
- 8           ▪ Residential Level 2, 220 volt charging
- 9           ▪ Commercial/Public Level 2, 220 volt charging
- 10          ▪ Commercial/Public Level 3, DCFC
- 11          ▪ Commercial Fleet, Level 2, 220 volt charging, and
- 12          ▪ Transit, DCFC

13 Each of these use cases comes with different technology options, rate design options,  
14 impacts on utility systems, and pace of adoption. As such, questions remain regarding  
15 which rate to apply to which use case. Different rate designs can also apply to these  
16 different use cases. For example, for residential customers, a utility could offer a whole  
17 home rate, where the energy used to charge an EV is rolled into the total consumption of  
18 the premise, or an EV-only tariff, where the energy used to charge the EV is measured  
19 separately from the home and billed at a different rate. However, the impacts of each use  
20 case can be very different.

21 **Q. Please explain.**

1 A. A cluster of residential Level 2 charging will have a different impact on utility operations  
2 and cost recovery than public DCFC, which will have a different impact from transit and  
3 fleet charging use cases. Residential customers are served by one size of transformer,  
4 typically, so changing the size of the residential transformer may be needed to address  
5 increased demand from EV charging. Of course, a residential transformer may also need  
6 to be upgraded in response to any number of new residential investments like installing a  
7 hot tub or a pool, adding a new refrigerator and freezer, or building an addition. None of  
8 those investments require the homeowner to notify the utility, and any costs incurred by  
9 the utility in response to those types of customer actions are recovered through rate base.

10 On the other hand, DCFC, which could draw up to 1 MW of demand per DCFC in the  
11 future, can only be located in certain areas across the distribution and transmission system  
12 and where there is available capacity to add such demand. Being able to identify those  
13 locations will help customers and developers install DCFC in locations that will not  
14 exacerbate potential constraints or overwhelm the location, and will minimize project  
15 development costs for charger installers and site hosts. In this case, having access to a  
16 utility's hosting capacity map would be useful to identify those locations with available  
17 capacity to cite a DCFC. Eversource currently provides hosting capacity information for  
18 its Massachusetts service territories. While hosting capacity does not guarantee  
19 interconnection, identifying areas of available capacity that can be provided by a hosting  
20 capacity map, that is updated regularly, can guide deployment of EV infrastructure, notably  
21 DCFC, to areas that will not negatively impact utility reliability or service, which will be a  
22 benefit to customers and the utility.

1 In addition to the impacts that this equipment can have on a system, these policies will also  
2 have an effect on adoption. If the tariffs include burdensome requirements or otherwise  
3 act as a barrier to adoption, then there will be a delay in customers installing charging  
4 equipment and purchasing EVs. This may also negatively impact the ability of New  
5 Hampshire to attract tourists who may prioritize locations with available charging  
6 infrastructure and policies to support development of EV charging infrastructure. This was  
7 a specific issue highlighted by BEA in its 2019 report.<sup>13</sup> Further as New Hampshire  
8 businesses transition to EV fleets due to the reduced operation and maintenance costs, they  
9 will need a robust charging network in place. Without a robust public charging network,  
10 the reach of these commercial EVs is generally limited to destinations within half their  
11 range from their central depot. With a public charging network, they do not have to keep  
12 half the battery “in reserve” and can visit customers farther away.

13 **Q. How does EV policy impact the Electric Vehicle Supply Equipment (EVSE)?**

14 A. The EVSE is likely the main point of engagement between the customer and the grid, so  
15 the EVSE will need to be able to communicate information to the customer about the cost  
16 to charge, length of time to charge, and, potentially, other signals to better manage the  
17 charging of the vehicle. However, for DCFC, it is unlikely that usage will be elastic as the  
18 role of the DCFC is different than a Level 2 charger. Notably, the use of a DCFC means  
19 that the customer needs a fast charge in order to get home or continue on their trip; in other  
20 words, the DCFC needs to provide customers with a charge in under 20 minutes. A Level

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<sup>13</sup> *Evaluating Electric Vehicle Infrastructure in New Hampshire*, New Hampshire Department of Business and Economic Affairs (July 2019). <https://www.nh.gov/osi/resource-library/documents/nh-ev-infrastructure-analysis.pdf>

1           2 charger, on the other hand, will take several hours to completely charge a customer's  
2           battery. In this case, demand is more elastic and can be responsive to price or grid signal  
3           needs or managed by a third party. Level 2 EVSEs for fleets or public or workplace  
4           charging where a customer may be connected to the equipment for several hours would  
5           likely fit into this category. As such, understanding how rate design impacts adoption and  
6           utilization of the type of charger being installed and the application is important. For  
7           example, in certain situations, a time of use rate may be the most optimal way for a utility  
8           to recover its costs and send a price signal that reflects the marginal cost to serve at that  
9           location, without focusing on the demand.<sup>14</sup> However, time-of-use rates are ill-suited for  
10          DCFCs at this time given that the demand for DCFCs is inelastic, there are currently few  
11          DCFCs operating in New Hampshire, and the DCFCs that are operating in New Hampshire  
12          have low utilization rates.

13   **IV. RATE DESIGN**

14   **Q.    Please describe the set of principles that cover rate design.**

15   A.    It is important to ensure that any rate design offerings are done in accordance with a set of  
16          goals and principles. Generally speaking, commissions around the country tend to rely  
17          upon the rate design principles first detailed by Professor James C. Bonbright in 1961.<sup>15</sup>  
18          These principles are fairly broad and require the regulator to make some tradeoffs. For

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<sup>14</sup> "EVGo Fleet and Tariff Analysis: Phase 1 California," Rocky Mountain Institute at 21 (April 2017), ([RMI California Report](https://rmi.org/wp-content/uploads/2017/04/eLab_EVgo_Fleet_and_Tariff_Analysis_2017.pdf)), [https://rmi.org/wp-content/uploads/2017/04/eLab\\_EVgo\\_Fleet\\_and\\_Tariff\\_Analysis\\_2017.pdf](https://rmi.org/wp-content/uploads/2017/04/eLab_EVgo_Fleet_and_Tariff_Analysis_2017.pdf).

<sup>15</sup> James C. Bonbright, "Principles of Public Utility Rates" (New York: Columbia University Press, 1961). *See also*, "Distributed Energy Resources Rate Design and Compensation: A Manual Prepared by the NARUC Staff Subcommittee on Rate Design," NARUC at 20-21 (November 2016), (NARUC Manual), <https://pubs.naruc.org/pub/19FDF48B-AA57-5160-DBA1-BE2E9C2F7EA0>.

1 example, one principle addresses rate stability, but another addresses cost causation; that  
2 is, the person who caused the cost should pay for it. Clearly, the principles may conflict,  
3 which is why it is important to balance the principles.

4 While cost causation is an important component of rate design, it is not the only one, and  
5 is often balanced against other principles such as fairness and equity. For example, with  
6 average cost ratemaking, one customer class, say the residential class, will pay the same  
7 for electricity regardless of the actual cost to serve each individual customer. This leads to  
8 intraclass subsidies to ensure certain public goals—affordability and accessibility. For EV  
9 rate design, other public purposes are also important, in addition to cost causation.

10 Similarly, rigidly applying the cost causation principle to EV rate design may not strike the  
11 right balance between conflicting regulatory principles. In order to achieve the public  
12 policy priority of increased EV adoption, the Commission should consider other rate-  
13 making principles, such as “diffusion of benefits.” That is to say, increased EV adoption  
14 will benefit the community as a whole, and as such at this early phase in the adoption of  
15 EVs, charging infrastructure need not be held strictly to cost causation.

16 As I discussed above, making EV adoption a policy priority for New Hampshire would  
17 mean that the Commission can balance the rate design principles in ways that better align  
18 with the societal and policy goals. In essence, with EV adoption as a goal of the state, other  
19 rate design principles, like supporting public policy or conservation, may be weighted more  
20 favorably than other principles, like cost causation, in order to support the policy goal. So,  
21 the Commission can decide that for some period of time, developing rates that will promote  
22 EV adoption should be prioritized over other rate design principles. This also applies to

1 goals for revenue neutrality in rates—that is, that rates should recover the costs and not be  
2 recovered by other rate classes. Much like how residential rates subsidize those customers  
3 with higher costs to serve (*i.e.*, rural customers), and lower cost to service customers (*i.e.*,  
4 city customers) pay more than their cost to service, such cross-subsidies are done on  
5 purpose in order to promote equity, affordability, and access to electricity.<sup>16</sup>

6 Cost causation is an important principle that commissions, including this Commission,  
7 point to regarding the development of any particular rate or program. However, it is  
8 important to note that while cost causation is an important principle, it is often relegated  
9 below other principles as a commission sees fit, such as for residential rates. In the  
10 development of appropriate rates, a commission may request or require the utility to submit  
11 a class cost of service study, which attempts to identify which customer class is responsible  
12 for some percentage of a utility’s revenue requirement. The ultimate determination of that  
13 responsibility is litigated before state commissions, so any rate that is ultimately adopted  
14 by a commission includes a balancing and weighting of principles by the commission itself.  
15 This also is apparent when looking at the rates inside each class. For the residential class,  
16 all customers inside the class usually pay the same price for electricity, regardless of the  
17 actual costs to serve. So, a residential customer who lives in an apartment, or lives in a  
18 house in the suburbs, or lives in a rural area will all pay the same price for electricity. In  
19 this instance, the regulator has decided that affordability or equity is more important than  
20 strictly sticking to cost causation as the main principle. To be sure, some states may have

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<sup>16</sup> NARUC Manual at 107-108.

1 variations of this model; for example, in Xcel Energy’s territory in Minnesota, customers  
2 who live in areas with underground distribution lines pay a higher customer charge.<sup>17</sup>

3 **V. EVERSOURCE’S DEMAND CHARGE ALTERNATIVE PROPOSAL**

4 **Q. Please provide your perspective on Eversource’s demand charge alternative proposal.**

5 A. Eversource’s demand charge alternative proposal would be available to public-charging  
6 sites that are eligible for Eversource’s Rate GV, which is for customers with a peak demand  
7 up to 1,000 kW that receive primary distribution service.<sup>18</sup> Eversource’s proposal differs  
8 from Unitil’s and Liberty’s commercial EV rate proposals in DE 20-170 and DE 21-030,  
9 which would apply to *all* commercial EV users. In contrast, here, Eversource proposes a  
10 rate that would only apply to EV public charging stations. This is notable as the economics  
11 of public charging stations are more likely to be impacted by low-utilization rates as they  
12 may be stand-alone operations.

13 Eversource notes its rate “is intended to be implemented in the near term, as a complement  
14 to [Eversource’s] make ready proposal,” also proposed in this filing.<sup>19</sup> Finally, this rate  
15 does not include a demand charge and Eversource has designed this rate for utilization  
16 factors up to 10 percent.<sup>20</sup> At a 10 percent utilization factor, the customer would be paying  
17 roughly the same under either this proposed rate or the otherwise applicable Rate GV tariff.

18 Above a 10 percent utilization rate, Eversource expects that the customer will then switch

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<sup>17</sup> Northern States Power Company, Residential Service, Rate Code A03, Section No. 5, 31<sup>st</sup> Revised Sheet No. 1, [https://www.xcelenergy.com/staticfiles/xcel-responsive/Archive/Me\\_Section\\_5.pdf](https://www.xcelenergy.com/staticfiles/xcel-responsive/Archive/Me_Section_5.pdf).

<sup>18</sup> Davis, Rice, Boughan Testimony at 16.

<sup>19</sup> Exhibit CRV-3.

<sup>20</sup> Davis, Rice, Boughan Testimony at 18.

1 to the Rate GV tariff as it would be more economical for the customer compared to the  
2 proposed tariff.<sup>21</sup>

3 However, I do have a few concerns regarding this proposal, notably the durability of this  
4 rate, its relationship to Eversource's managed charging proposal, and tying the rate to a 10  
5 percent utilization factor.

6 **Q. Does Eversource define utilization factor?**

7 A. Yes. For Eversource, utilization factor or load factor, which is used interchangeably  
8 throughout its testimony, refers to the peak demand of a station multiplied by the number  
9 of hours charged, then the monthly usage is divided by that number.<sup>22</sup> On the other hand,  
10 I use utilization rate as the metric to measure usage of a location, which is based on the  
11 RMI definition from its report for the Colorado Energy Office, which defines utilization  
12 rate "as the total time a charger is actively charging divided by the duration being  
13 evaluated."<sup>23</sup> In the RMI Report for the Colorado Energy Office, RMI "use[s] a one-month  
14 time period to calculate station utilization" and provides the following example: "in a  
15 month with 30 days, there are 720 hours. If a charger were in use for a total of 36 hours  
16 over the course of the month (on average, 72 minutes a day), the charger would have a 5%  
17 utilization rate (5% of 720 hours is 36 hours)."<sup>24</sup>

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<sup>21</sup> Id. at 18-19.

<sup>22</sup> Ex. CRV-4.

<sup>23</sup> DCFC Rate Design Study for Colorado Energy Office, Rocky Mountain Institute at 12 (Revised February 2020), [https://rmi.org/wp-content/uploads/2019/09/DCFC\\_Rate\\_Design\\_Study.pdf](https://rmi.org/wp-content/uploads/2019/09/DCFC_Rate_Design_Study.pdf).

<sup>24</sup> Id.

1 **Q. Do you agree with Eversource’s rationale for not including a demand charge in this**  
2 **proposal?**

3 A. Yes. I agree with Eversource that demand charges at low utilization factors can have a  
4 significant negative impact on site hosts’ bills.<sup>25</sup> Demand charges at low utilization factors  
5 can make up a significant portion of a customer’s bill and cause that customer to either  
6 remove or not install DCFCs, which are vital to supporting EV adoption. By excluding  
7 demand charges in its proposal, Eversource provides a positive starting point for supporting  
8 EV growth in New Hampshire.

9 **Q. To what extent do demand charges impact rate design principles?**

10 A. Demand charges can play a significant role in delaying EV infrastructure roll-out,  
11 especially at low utilization rates, as New Hampshire is currently experiencing. EV  
12 charging can result in substantial demand when the EVSE is in use, which can trigger high  
13 demand charges. However, as Eversource notes, if a public charger is used only  
14 occasionally it will not generate enough sales to pay for the high demand charge.<sup>26</sup> As  
15 such, demand charges can be crippling to the economics of public EV charging.

16 At low utilization rates, a location charged a demand charge for EV charging, especially  
17 for DCFC, may see their bill rise substantially. In an analysis done by RMI for EVGo  
18 looking at their locations in California, RMI determined that in some locations site hosts  
19 could incur a bill of up to \$3,114 a month with 94 percent of that bill due to demand

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<sup>25</sup> Davis, Rice, Boughan Testimony at 17-18.

<sup>26</sup> *Id.*

1 charges.<sup>27</sup> As further detailed by RMI, under the different proposals by the California  
2 utilities, those rate designs that included demand charges would continue to be a significant  
3 component of the site hosts' bills. Even at 15 percent utilization, RMI estimates that  
4 locations could see 70 percent to 88 percent of their bill be attributable to demand charges.<sup>28</sup>

5 What this research shows is that as utilization rates go up, the impacts of the demand charge  
6 are reduced, but that even at 15 percent utilization, it remains a substantial part of the bill  
7 for that location. All of this is to say that at low utilization factors, demand charges act as  
8 a penalty for installing EV charging infrastructure, especially DCFC, when the state should  
9 be trying to encourage deployment of EV charging infrastructure, including DCFC.

10 **Q. Can you describe your concerns with Eversource's proposal?**

11 A. I have three concerns with their proposal.

12 First, Eversource notes that this proposal is designed to work with locations that participate  
13 in its proposed make-ready program.<sup>29</sup> While I support Eversource's focus on applying this  
14 rate to public charging locations, by tying its demand charge alternative proposal to its  
15 proposed make-ready proposal, I believe that they have limited the applicability and  
16 durability of this rate to the success or failure of that program, rather than focusing on the  
17 success of EV adoption more broadly. As Eversource notes in response to CLF discovery,  
18 "the demand charge alternative remains integral to the make ready program, as each is

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<sup>27</sup> RMI California Report at 16-17.

<sup>28</sup> *Id.*

<sup>29</sup> Davis, Rice, Boughan Testimony at 18; Ex. CRV-3.

1 necessary for the success of the other.”<sup>30</sup> Further, Eversource states that this rate is focused  
2 on the short-term needs to address market barriers that demand charges impose, and that  
3 this rate “could be limited based on purpose.”<sup>31</sup> Supporting EV adoption, as I discussed  
4 above, should be a broader policy goal of New Hampshire and limiting the focus of this  
5 rate to participants in a proposed make-ready program may limit Eversource’s promotion  
6 of the rate to other participants and unnecessarily introduces uncertainty to the duration  
7 and availability of this rate. Even the 10 percent utilization factor level is tied to the  
8 proposed make-ready program.<sup>32</sup>

9 My second concern is about the durability of this rate. Since Eversource states that it is  
10 tied to a specific proposal and that it may be changed at any time, there are no metrics or  
11 other ways to determine when this proposal has served its purpose. Is it upon full  
12 subscription of the make-ready program? Is it tied to utilization factors? Is the  
13 determination of a sunset for this offering based on all sites that signed up for the tariff or  
14 only those on the proposed make-ready program? Eversource describes collecting data  
15 “from a sufficient number of stations” on the proposed rate leading to “further evaluation”  
16 but does not detail any metrics or data regarding when a successor tariff would be  
17 developed or proposed.<sup>33</sup> This does not provide certainty to the market or customers  
18 regarding the availability of this rate and will make it more challenging for customers to  
19 run costs and billing efforts to determine the billing impacts from this rate, which includes

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<sup>30</sup> Ex. CRV-3.

<sup>31</sup> *Id.*

<sup>32</sup> Ex. CRV-2. Eversource states that the 10 percent level was selected “as a level of utilization reasonably expected to be achieved approximately halfway through the development of charging stations under the proposed make-ready program would occur.” *Id.*

<sup>33</sup> *Id.*

1           how long a customer can be on this rate. I believe a more durable rate design would be  
2           one that is broadly applied to supporting EV adoption across New Hampshire, rather than  
3           tying it to a limited number of locations under a short-term program.

4           My third concern is Eversource tying the break-even point for the rate to a 10 percent  
5           utilization factor at a location. As the RMI research notes, a demand charge can still be a  
6           significant portion of a customer's bill over 15 percent utilization. However, after 10  
7           percent utilization, Eversource expects a customer to then switch from its proposed demand  
8           charge alternative volumetric rate over to Rate GV, which charges a full demand charge.  
9           What this means is that a customer that signs up for this proposed rate and has no demand  
10          charge, but pays a high volumetric rate, would then be subject to a demand charge with  
11          lower volumetric rates and higher overall energy bills, with no transition period between  
12          the two choices. In order for this demand charge alternative rate to be more broadly  
13          applied, Eversource should, instead, consider a rate design that scales demand charges  
14          based on utilization rates. This would mean that for utilization rates above 10 percent, the  
15          location would still incur a higher volumetric rate, as well as a demand charge that is  
16          reduced from the full demand charge under Rate GV. As utilization increases, those rate  
17          components would balance out—in other words, as utilization goes up, the volumetric rate  
18          would go down and demand charges would increase.

19   **Q.    What is the structure of Rate GV?**

1 A. As described by Eversource, Rate GV is a three-part tariff with a customer charge, a  
2 demand charge, and a volumetric charge.<sup>34</sup> For the demand charge, a customer’s demand  
3 is determined by the customer’s highest demand, with the full demand charge determined  
4 by “either the maximum demand during peak hours or 50% of the maximum demand  
5 during off-peak hours.”<sup>35</sup> In other words, if a customer’s maximum demand occurs during  
6 off-peak hours, that total demand is reduced by half and then charged the demand charge.

7 **Q. Do you have a proposed alternative?**

8 A. Yes. While there is much to like about Eversource’s proposal, I do not believe that it is an  
9 appropriate rate design offering to enable broad adoption of EVs and support the  
10 implementation of EV charging infrastructure. The goal of simplicity, which is one of the  
11 considerations identified by Eversource, does miss out on other considerations, especially  
12 considering how Eversource is tying this rate to a small-scale, make-ready program.

13 Rather, Eversource’s proposal in Massachusetts Department of Public Utilities Docket No.  
14 21-90 provides an example of an EV rate design that would be more durable and more  
15 supportive of broad adoption of EVs and EV charging infrastructure. In its Massachusetts  
16 territory, Eversource proposes an EV rate design with a demand charge based on four  
17 tranches of load factors (*i.e.*, utilization rates) that would be in place over 10 years.<sup>36</sup> From  
18 0-5 percent of load factor, the customer would not have a demand charge; from 5-10

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<sup>34</sup>Davis, Rice, Boughan Testimony at 16-17.

<sup>35</sup>*Id.* at 16.

<sup>36</sup> *Petition of NSTAR Electric Company d/b/a Eversource Energy for Approval of Phase II Electric Vehicle Infrastructure Program*, Direct Testimony of Richard D. Chin, D.P.U. 21-90 at 19 (July 14, 2021), <https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/13758161>; *Petition of NSTAR Electric Company d/b/a Eversource Energy for Approval of Phase II Electric Vehicle Infrastructure Program*, Exhibit ES-RDC-2 at 2 (July 14, 2021), <https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/13758162>.

1 percent load factor, the demand charge would be reduced by 75 percent; from 10-15 percent  
2 load factor, the demand charge would be reduced by 50 percent; above 15 percent load  
3 factor, then the full demand charge would apply.<sup>37</sup> Although Eversource’s Massachusetts  
4 proposal has several advantages to its proposal in this docket, as noted from the RMI  
5 California Report, even at a 15 percent utilization rate, demand charges can still represent  
6 a significant portion of the monthly bill .

7 While Eversource’s Massachusetts “demand charge sliding scale” proposal does not fully  
8 resolve the issue of demand charges creating a barrier to EVSE investments at utilization  
9 rates above 15 percent, that proposal is more in line with examples from around the  
10 country, notably Southern California Edison Company (SCE). SCE’s demand charge  
11 alternative has a zero demand charge for the first five years, then scales up over the next  
12 five years, and was developed for commercial and industrial customers to support the  
13 growth of EV and EV charging infrastructure in SCE’s service territory.<sup>38</sup> Even after 10  
14 years, SCE’s EV demand charge alternative only imposes 60 percent of the otherwise  
15 applicable demand charge. In other words, after 10 years, SCE will only impose up to 60  
16 percent of its full demand charge. In comparison, while the proposed rate, here, would not  
17 charge a demand charge, Eversource expects that at a 10 percent utilization rate the  
18 customer would switch from its zero demand charge alternative to Rate GV, which would  
19 have a full demand charge.

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<sup>37</sup> *Id.*

<sup>38</sup> Southern California Edison Schedules TOU-EV-8 and 9, [https://library.sce.com/content/dam/sce-doclib/public/regulatory/tariff/electric/schedules/general-service-&-industrial-rates/ELECTRIC\\_SCHEDULES\\_TOU-EV-8.pdf](https://library.sce.com/content/dam/sce-doclib/public/regulatory/tariff/electric/schedules/general-service-&-industrial-rates/ELECTRIC_SCHEDULES_TOU-EV-8.pdf); [https://library.sce.com/content/dam/sce-doclib/public/regulatory/tariff/electric/schedules/general-service-&-industrial-rates/ELECTRIC\\_SCHEDULES\\_TOU-EV-9.pdf](https://library.sce.com/content/dam/sce-doclib/public/regulatory/tariff/electric/schedules/general-service-&-industrial-rates/ELECTRIC_SCHEDULES_TOU-EV-9.pdf).

1           Designing a similar demand charge phase-in approach here could potentially result in a  
2           more durable rate design, provide more certainty to customers and EVSE providers, and  
3           more broadly support EV adoption in New Hampshire. A phased-in demand charge  
4           approach to rate design would maintain Eversource’s overall design for utilization rates  
5           under 10 percent, but keep the implementation of a demand charge tied closer to utilization  
6           rates, which is important because at some point in the future, at a certain utilization factor,  
7           some demand charge may be appropriate. This also would preserve the business case for  
8           installing EV charging infrastructure at low utilization rates and low EV adoption levels;  
9           however, as more EVs come onto the road, it would also ensure that other ratepayers are  
10          not unduly paying for the costs of the EV charging infrastructure.

11   **Q.    To what should the imposition of a demand charge be tied?**

12    A.    Again, at some point in the future, the establishment of a demand charge may be warranted.  
13          In a separate study looking at Colorado-specific DCFC rate design options, RMI suggests  
14          that a 30 percent utilization factor provides a sufficient amount of usage for the site host to  
15          spread the demand charges across.<sup>39</sup> In my opinion, that seems a reasonable threshold for  
16          the Commission to set for when full, 100 percent demand charges could be implemented  
17          for EV charging infrastructure under an EV-specific rate.

18   **Q.    How else can EV rate design be improved in New Hampshire?**

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<sup>39</sup> DCFC Rate Design Study for Colorado Energy Office, Rocky Mountain Institute at 5, 17 (Revised February 2020), [https://rmi.org/wp-content/uploads/2019/09/DCFC\\_Rate\\_Design\\_Study.pdf](https://rmi.org/wp-content/uploads/2019/09/DCFC_Rate_Design_Study.pdf).

1 A. The Commission should consider adopting reporting requirements for each utility to collect  
2 information about EV adoption, develop forecasts for EVs, and collect utilization rates for  
3 DCFCs across utilities' service territories. Collecting this information will inform the  
4 utilities, the Commission, and stakeholders about trends and can help identify when it is  
5 time to transition to an alternate rate design, including imposition of full demand charges.

6 **VI. RECOMMENDATIONS**

7 **Q. Please provide your recommendations for the EV proposals.**

8 A. I recommend that the Commission:

9 1. Modify Eversource's rate design proposal to support more durable and widespread  
10 adoption of EVs in line with my general recommendations, above, regarding  
11 demand charges.

12 More generally, I also recommend that

13 1. Eversource should monitor EV adoption rates across its and neighboring utility  
14 service territories to help inform trends and identify timelines for rate design  
15 modifications;  
16 2. Monitor utilization rates of DCFC in its service territories to help inform trends and  
17 identify timelines for rate design modifications; and  
18 3. Eversource should make available hosting capacity maps that can help inform  
19 developers and customers identify optimal locations for the placing of EV charging  
20 infrastructure, especially DCFC.

1 **Q. Does that complete your testimony?**

2 **A. Yes.**

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**EMPLOYMENT**

NON-RESIDENT (ENERGY AND ENVIRONMENTAL POLICY) ASSOCIATE FELLOW SEPTEMBER 2019-CURRENT  
*R Street Institute* *Washington, D.C.*

- Provide regulatory and policy support on topics including performance-based ratemaking, development of rules for integrated resource planning, distributed energy resources, and market-oriented solutions for customer choice and development of clean energy resources.
- Develop written materials summarizing regulatory actions on topics related to performance-based ratemaking, customer choice, distribution system planning, distributed energy resources, and other topics as needed.
- Participate in state and federal regulatory proceedings and working groups on development of performance-based ratemaking mechanisms, net energy metering, and integrated resource planning, including the review of utility proposals, participating in working groups to review and recommend metrics for performance-based ratemaking frameworks, and providing comments to state regulatory commissions on performance-based ratemaking metrics and frameworks.

PRESIDENT APRIL 2017-CURRENT  
*Plugged In Strategies* *Eden Prairie, MN*

- Provide regulatory and policy analysis and consulting services related to evolution of electricity grid, distribution system planning, emerging customer and grid-connected technologies, and regulatory strategies
- Provide facilitation and moderation services for groups, workshops, and working groups
- Provide research and analysis services regarding utility and regulatory matters and structures
- Provide additional expert analysis on matters affecting electricity and regulatory structures, including topics such as data privacy, data access, rate design, interoperability, advanced technologies, performance-based ratemaking, and convergence of technology, industries, and markets.
- Provide expert testimony and presentations before state utility commissions on topics including distribution system planning, distributed energy resources, data privacy and data access, performance-based ratemaking, and grid modernization.
- Prepare training materials on distributed energy resources, interoperability, and grid modernization for international regulatory and policy decision-makers.

DIRECTOR OF POLICY MAY 2015- APRIL 2017  
*Minnesota Public Utilities Commission* *Saint Paul, MN*

- Maintained high profile inside and outside the state representing the Commission on electricity matters.
- Assisted Commissioners with policy analysis to support decision-making options.
- Provided policy analysis to support development of record in proceedings.
- Provided subject matter expertise on specific topics, including rate design, energy storage, grid modernization, data privacy, data access, interconnection, and security.
- Organized workshops, including preparing agendas, inviting speakers, and moderating public panels.
- Engaged and interact with several national organizations, including National Association of Regulatory Utility Commissioners, Department of Energy, Federal Energy Regulatory Commission, National Institute of Standards and Technologies, North American Energy Standards Board, and Smart Grid Consumer Collaborative.
- Regularly spoke and participated in panels, conference, webinars, and other international, national, and state conferences on behalf of the Minnesota Public Utilities Commission.
- Engaged and worked with several state-level projects, including e21 Initiative and 2025 Energy Action Plan
- Participated in actions related to Midcontinent Independent System Operator product development, including demand response and energy storage.
- Chaired NARUC Staff Subcommittee on Rate Design, and managed development of Distributed Energy

Resources Rate Design and Compensation manual, which included meeting specific deadlines, organize and manage a group of seven staff from around the country to develop, draft, and finalize manual on time.

- Maintained an awareness and understanding of electricity policy developments across the country, including at national and state level; provide an analysis of these developments for Commissioners.

SENIOR REGULATORY ANALYST

MARCH 2006- APRIL 2015

*California Public Utilities Commission*

*San Francisco, CA*

Major Accomplishments:

- Staff lead on Commission Smart Grid rulemaking: responsible for coordinating Staff work on rulemaking, working with ALJ and Assigned Commissioner's Office, organizing and facilitating workshops on a number of Smart Grid-related topics, including cybersecurity, privacy, customer data access and other customer issues, and ensuring proceeding met legislatively mandated time-frame.
- Prepared initial Orders Instituting Rulemaking on energy storage, rate design reform, and Smart Grid, and assisted in completion of final Commission decisions on Smart Grid, rate design, customer access to data, and privacy.
- Named as a Top 50 Smart Grid Pioneers for 2013 by Smart Grid Today.
- Managed and facilitated Commission workshops on emerging topics, such as privacy, cybersecurity, energy storage, and customer data access.
- Provided lead and support analysis on many electricity issues affecting customers, market participants, and utilities, including dynamic pricing, demand response, energy efficiency, rate design, electric energy storage, direct access and retail/wholesale integration.
- Responsible for monitoring activities, preparing analyses of policies, and preparing and submitting comments related to specific subject areas before FERC, U.S. Congress, California State Legislature, CEC, DOE, NIST, and Office of Science and Technology Policy.
- Participated in standard making process, and prepared and submitted comments to FERC, NIST, and NAESB.
- Chair of NAESB Energy Services Provider Interface Task Force, and a member of NAESB Executive Committee.
- Lead author and contributor on White Papers related to several emerging topics, such as Pre-Pay, cybersecurity, and microgrids.
- Presented at conferences on updates and summaries of Commission position on Smart Grid issues, such as customer education, privacy, cybersecurity, customer access to usage, rate design and tariffs, and general regulatory policy.

PARALEGAL

NOVEMBER 2005-FEBRUARY 2006

*Patton Boggs*

*Washington, D.C.*

- Performed research at FERC, other Federal agencies, Congressional legislative history, and various state agencies.
- Cite-check, proofread, and shepardize pleadings filed at FERC and various U.S. Courts of Appeals.
- Organized and maintained discovery files.

PARALEGAL

JULY 2004- OCTOBER 2005

*McCarthy, Sweeney & Harkaway*

*Washington, D.C.*

- Performed research for FERC, other Federal agencies, U.S. Congress, state legislatures and state regulatory agencies.
- Obtained and summarized pleadings filed at FERC and courts for clients and attorneys.
- Performed energy-related research (*e.g.*, monitor Energy news, obtain FERC and U.S. Court cases and opinions) and maintained extensive knowledge of many energy issues (*e.g.*, RTOs, deregulation/competition, and California/Pacific Northwest refund proceedings at FERC and U.S. Courts).
- Prepared testimony and discovery-related materials for hearing before FERC Administrative Law Judge, and provided proofreading, cite-checking, and shepardizing assistance for documents filed at FERC, U.S.

- Supreme Court, U.S. Court of Appeals and U.S. District Courts.
- Prepared briefs and appendices, and maintained and organized case files for proceedings before FERC and U.S. Court of Appeals.
- Monitored energy-related legislation and hearings before U.S. Congress and state legislatures, as well as energy-related activities at state PUC levels (*e.g.*, electric competition/deregulation activities).

PARALEGAL

MARCH 2003- JUNE 2004

*Duane Morris, LLP**Washington, D.C.*

- Performed research at FERC and other Federal agencies. Monitored FERC meetings and prepared summaries of meeting for attorneys and clients.
- Obtained and summarized pleadings filed at FERC and courts for clients and attorneys.
- Performed energy-related research (*e.g.*, monitor Energy news, obtain FERC and U.S. Court cases and opinions) and maintained knowledge base on many energy issues (*e.g.*, RTOs, deregulation/competition, and California/Pacific Northwest refund proceedings at FERC and U.S. Courts).
- Prepared testimony and discovery-related materials for hearing before FERC Administrative Law Judge, and provided proofreading, cite-checking, and shepardizing assistance for documents filed at FERC, U.S. Supreme Court, U.S. Court of Appeals, and U.S. District Courts.
- Monitored energy-related legislation and hearings before U.S. Congress and state legislatures, as well as energy-related activities at state PUC levels (*e.g.*, electric competition/deregulation activities).

LEGAL ASSISTANT

APRIL 2001-MARCH 2003

*McGuireWoods LLP**Washington, D.C.*

- Performed research at FERC and other Federal agencies. Monitored FERC meetings and prepared summaries of meeting for attorneys and clients.
- Performed energy-related research (*e.g.*, monitor energy news, obtain FERC and U.S. Court cases and opinions) and responsible for monitoring energy issues for attorneys (*e.g.*, RTOs, deregulation/competition, generation interconnection, and California/Pacific Northwest refund proceedings at FERC and U.S. Courts).
- Prepared testimony and discovery-related materials for hearing before FERC Administrative Law Judge, and provided proofreading, cite-checking, and shepardizing assistance for documents filed at FERC, U.S. Supreme Court, U.S. Court of Appeals for D.C. Circuit and 9<sup>th</sup> Circuit, and U.S. District Court for D.C.
- Monitored energy-related legislation and hearings before U.S. Congress and state legislatures, as well as energy-related activities at state PUC levels (*e.g.*, electric competition/deregulation activities).

ENERGY SPECIALIST

MARCH 1998- APRIL 2001

*Verner, Liipfert, Bernhard, McPherson, & Hand**Washington, D.C.*

- Performed research at FERC, SEC, Library of Congress, U.S. Congress, NRC, Department of Interior, National Archives, EPA, U.S. Supreme Court, U.S. Court of Appeals for D.C. Circuit, U.S. District Court for D.C., and other state agencies.
- Performed and monitored energy and environmental-related research.
- Made filings at FERC, U.S. Court of Appeals for D.C. Circuit, U.S. District Court for D.C., and SEC.
- Provided proofreading assistance, including cite-checking and shepardizing of documents.
- Attended U.S. Congress hearings on Energy issues and summarized for attorneys.
- Organized and maintained Energy Group library and trade press.
- Supervised Energy Group Summer intern.

## EDUCATION

BACHELOR OF ARTS IN HISTORY  
Baylor University1993-1997  
Waco, Texas

## ASSOCIATIONS

- Board of Directors, Minnesota Conservative Energy Forum
- Board of Directors, Minnesota Solar Energy Industries Association
- Associate Member, GridWise Architecture Committee
- Planning Commission, City of Eden Prairie, MN (2017-2020)
- Board of Directors, Emeritus, North American Energy Standard Board
- Executive Committee, Emeritus, Retail Markets Quadrant, North American Energy Standards Board
- Board of Directors, Emeritus, Smart Grid Consumer Collaborative
- Chair, Staff Subcommittee on Rate Design, National Association of Regulatory Utility Commissioners (November 2015-April 2017)
- Co-Chair, Business and Policy Domain Expert Working Group, Smart Grid Interoperability Panel (2014-2016)

## PUBLICATIONS

- *Investigating Interoperability for Electric Vehicles: A Case Study from Connecticut*, National Association of Regulatory Utility Commissioners, on behalf of the Connecticut Public Utilities Regulatory Authority (October 2021)  
[http://www.dpuc.state.ct.us/2nddockcurr.nsf/4b3c728dd1c0d642852586db0069aa70/4bbe04558990992285258764005afb5e/\\$FILE/NARUC%20CT%20Case%20Study%20on%20EV%20Interoperability-submission.pdf](http://www.dpuc.state.ct.us/2nddockcurr.nsf/4b3c728dd1c0d642852586db0069aa70/4bbe04558990992285258764005afb5e/$FILE/NARUC%20CT%20Case%20Study%20on%20EV%20Interoperability-submission.pdf)
- *AMI in Review: A Lens into an Unfolding Future*, T&D World (March 5, 2021)  
<https://www.tdworld.com/smart-utility/metering/article/21157103/ami-in-review-a-lens-into-an-unfolding-future>
- *Enabling and Benefiting from Distributed Energy Resources in Texas*, R Street Policy Study No. 211, R Street Institute (November 2020)  
<https://www.rstreet.org/wp-content/uploads/2020/11/Final-No-211-DErs.pdf>
- *Net Metering and Distributed Energy Resources Policy: R Street Shorts No. 93*, R Street Institute (August 2020)  
<https://www.rstreet.org/wp-content/uploads/2020/08/Short-No.-93-Net-Metering.pdf>
- *AMI in Review: Informing the Conversation*, U.S. Department of Energy, Advanced Grid Research (July 2020)  
[https://smartgrid.gov/files/documents/AMI\\_Report\\_7\\_8\\_20\\_final\\_compressed.pdf](https://smartgrid.gov/files/documents/AMI_Report_7_8_20_final_compressed.pdf)
- *Smart Grid Interoperability: Prompts for State Regulators to Engage Utilities*, National Association of Regulatory Utility Commissioners (April 2020).  
<https://pubs.naruc.org/pub/28950636-155D-0A36-313C-73CCEA2D32C1>
- *Framework and Roadmap for Smart Grid Interoperability Standards Regional Roundtables Summary Report*, NISTIR 8284, National Institute of Standards and Technology, *et al.* (February 2020).  
<https://doi.org/10.6028/NIST.IR.8284>

- *Distributed Energy Resources Rate Design and Compensation Manual*, National Association of Regulatory Utility Commissioners, Staff Subcommittee on Rate Design (November 10, 2016).  
<http://pubs.naruc.org/pub/19FDF48B-AA57-5160-DBA1-BE2E9C2F7EA0>
- *Microgrids: A Regulatory Perspective*, California Public Utilities Commission, Policy and Planning Division (April 14, 2014).  
<http://www.cpuc.ca.gov/NR/rdonlyres/01ECA296-5E7F-4C23-8570-1EFF2DC0F278/0/PPDMicrogridPaper414.pdf>
- *Utility Investment Valuation Strategies: A Case for Adopting Real Options Valuation*, California Public Utilities Commission, Policy and Planning Division (October 3, 2013).  
<http://www.cpuc.ca.gov/NR/rdonlyres/D5C63A2B-40F2-468D-964A-F265B90346B1/0/Final2RRM.pdf>
- *Cybersecurity and the Evolving Role of State Regulation: How it Impacts the California Public Utilities Commission*, California Public Utilities Commission, Grid Planning and Reliability/Policy and Planning Division Policy Paper (September 19, 2012).  
<http://www.cpuc.ca.gov/NR/rdonlyres/D77BA276-E88A-4C82-AFD2-FC3D3C76A9FC/0/TheEvolvingRoleofStateRegulationinCybersecurity9252012FINAL.pdf>
- *A Review of Pre-Pay Programs for Electricity Service*, California Public Utilities Commission, Policy and Planning Division Policy Paper (July 26, 2012).  
<http://www.cpuc.ca.gov/NR/rdonlyres/152ED1D4-DD85-4D6F-984B-B84847933A18/0/Prepaypolicypaper0712.pdf>
- *Electric Energy Storage: An Assessment of Potential Barriers and Opportunities*, California Public Utilities Commission, Policy and Planning Division (July 9, 2010).  
<http://www.cpuc.ca.gov/NR/rdonlyres/71859AF5-2D26-4262-BF52-62DE85C0E942/0/CPUCStorageWhitePaper7910.pdf>

## TESTIMONY

- *In the matter of the application of Consumers Energy Company for authority to increase its rates for the generation and distribution*, Direct Testimony of Christopher Villarreal on Behalf of Michigan Environmental Council, Natural Resources Defense Council, and Sierra Club, before the Michigan Public Service Commission, Case No. U-20134 (September 10, 2018)  
<https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t0000002ftVkaAI>
- *In the matter of the application of DTE ELECTRIC COMPANY for authority to increase its rates, amend its rate schedules and rules governing the distribution and supply of electric energy, and for miscellaneous accounting authority*, Direct Testimony of Christopher Villarreal on Behalf of Michigan Environmental Council, Natural Resources Defense Council, and Sierra Club, before the Michigan Public Service Commission, Case No. U-20162 (November 7, 2018)  
<https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t000000329ckAAA>
- *Application of Duke Energy Carolinas, LLC for Adjustments in Electric Rate Schedules and Tariffs and Request for an Accounting Order*, Direct Testimony of Christopher Villarreal on Behalf of South Carolina Solar Business Alliance, before the Public Service Commission of South Carolina, Docket No. 2018-319-E (February 26, 2019)  
<https://dms.psc.sc.gov/Attachments/Matter/499c7e9c-65b6-4469-afbd-9d7614711b84>

- *Application of Duke Energy Progress, LLC for Adjustments in Electric Rate Schedules and Tariffs and Request for an Accounting Order*, Direct Testimony of Christopher Villarreal on Behalf of South Carolina Solar Business Alliance, before the Public Service Commission of South Carolina, Docket No. 2018-318-E (March 1, 2019)  
<https://dms.psc.sc.gov/Attachments/Matter/ce0917d7-35f2-4bb0-8715-5c2345a5026c>
- *In the matter of the Application of Indiana Michigan Power Company for authority to increase its rates for the sale of electric energy and for approval of depreciation rates and other related matters*, Direct Testimony of Christopher Villarreal on Behalf of the Environmental Law and Policy Center, the Ecology Center, the Solar Energy Industries Association, and Vote Solar, before the Michigan Public Service Commission, Case No. U-20359 (October 17, 2019)  
<https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t00000077IYRAA2>
- *In the matter of the Application of DTE Electric Company for authority to increase its rates, amend its rate schedules and rules governing the distribution and supply of electric energy, and for miscellaneous accounting authority*, Direct Testimony of Christopher Villarreal on Behalf of the Environmental Law & Policy Center and the Natural Resources Defense Council, before the Michigan Public Service Commission, Case No. U-20561 (November 6, 2019)  
<https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t0000007X6ZiAAK>
- *In the matter of the Application of Consumers Energy Company for authority to increase its rates for the generation and distribution of electricity and for other relief*, Direct Testimony of Christopher Villarreal on Behalf of Michigan Environmental Council, Natural Resources Defense Council, Sierra Club, and Citizens Utility Board of Michigan, before the Michigan Public Service Commission, Case No. U-20697 (June 24, 2020).  
<https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t000000CIwhzAAD>
- *In the matter of the Application of Consumers Energy Company for authority to increase its rates for the generation and distribution of electricity and for other relief*, Direct Testimony of Christopher R. Villarreal on Behalf of Michigan Environmental Council, Natural Resources Defense Council, Sierra Club, and Citizens Utility Board of Michigan, before the Michigan Public Service Commission, Case No. U-20963 (June 22, 2021).  
<https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t000000Pvx0LAAR>
- *Electric Distribution Utilities Electric Vehicle Time of Use Rates*, Direct Testimony of Christopher R. Villarreal on Behalf of Clean Energy New Hampshire and Conservation Law Foundation, before the New Hampshire Public Utilities Commission, Docket No. DE 20-170 (October 13, 2021).  
[https://www.puc.nh.gov/Regulatory/Docketbk/2020/20-170/TESTIMONY/21-170\\_2021-10-13\\_CENH\\_CLF\\_DIR-TESTIMONY-VILLARREAL.PDF](https://www.puc.nh.gov/Regulatory/Docketbk/2020/20-170/TESTIMONY/21-170_2021-10-13_CENH_CLF_DIR-TESTIMONY-VILLARREAL.PDF)
- *Application of Nevada Power Company d/b/a NV Energy and Sierra Pacific Power Company d/b/a NV Energy for approval of their joint Economic Recovery Transportation Electrification Plan*, Testimony of Christopher R. Villarreal on Behalf of Bureau of Consumer Protection, before the Public Utilities Commission of Nevada, Docket No. 21-09004 (October 25, 2021).  
[http://pucweb1.state.nv.us/PDF/AxImages/DOCKETS\\_2020\\_THRU\\_PRESENT/2021-9/13470.pdf](http://pucweb1.state.nv.us/PDF/AxImages/DOCKETS_2020_THRU_PRESENT/2021-9/13470.pdf)
- *Unitil Energy Systems, Inc.*, Direct Testimony of Christopher R. Villarreal on Behalf of Clean Energy New Hampshire and Conservation Law Foundation, before the New Hampshire Public Utilities Commission, Docket No. DE 21-030 (November 23, 2021).  
[https://www.puc.nh.gov/Regulatory/Docketbk/2021/21-030/TESTIMONY/21-030\\_2021-11-23\\_CENH\\_CLF\\_TESTIMONY-VILLARREAL.PDF](https://www.puc.nh.gov/Regulatory/Docketbk/2021/21-030/TESTIMONY/21-030_2021-11-23_CENH_CLF_TESTIMONY-VILLARREAL.PDF)

- *Petition of NSTAR Electric Company d/b/a Eversource Energy for approval of its Grid Modernization Plan for calendar years 2022 to 2025, et al.*, Direct Testimony of Christopher R. Villarreal on behalf of the Conservation Law Foundation, before the Massachusetts Department of Public Utilities, D.P.U. 21-80, *et al.* (January 14, 2022).  
<https://fileservice.eea.comacloud.net/FileService.Api/file/FileRoom/14405896>
- *In the Matter of the Application of Public Service Company of Colorado for Approval to Amend the Certificate of Public Convenience and Necessity for its Advanced Grid Intelligence and Security (AGIS) Initiative*, Cross Answer Testimony of Christopher R. Villarreal on Behalf of Colorado Solar and Storage Association and Solar Energy Industries Association, before the Colorado Public Utilities Commission, Proceeding No. 21A-0279E (January 25, 2022).  
[https://www.dora.state.co.us/pls/efi/efi.show\\_document?p\\_dms\\_document\\_id=964954&p\\_session\\_id=](https://www.dora.state.co.us/pls/efi/efi.show_document?p_dms_document_id=964954&p_session_id=)

**Public Service Company of New Hampshire d/b/a Eversource Energy**  
**Docket No. DE 21-078**

**Date Request Received: November 15, 2021**  
**Data Request No. CLF 1-04**

**Date of Response: December 03, 2021**  
**Page 1 of 1**

**Request from: Conservation Law Foundation**

**Witness: Davis, Edward A**

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**Request:**

Please explain why Eversource's demand charge alternative rate in this docket is designed for utilization of up to 10 percent? Did Eversource consider designing its demand charge alternative based on a different and/or higher utilization rate and, if, so, why was this not selected? If other utilization rates were considered, please provide any analyses performed or work papers created by the Company in relation to such evaluations

**Response:**

The Company selected 10% as a level of utilization reasonably expected to be achieved approximately halfway through the development of charging stations under the proposed make ready program would occur. This midpoint was selected because it is during the initial period (e.g., the first 3-4 years; see figures 2-3, testimony of Davis, Rice and Boughan, Bates 22 and 23) that low utilization and sensitivity to demand charges was considered to be greatest. Various levels of utilization were considered, but as different levels are applied, the effective rate per kWh also changes. Thus, another consideration is whether a higher or lower rate per kWh than that proposed would be appropriate. The 10% utilization rate also strikes the best balance regarding rate per kWh for charging stations during the initial period. Then once a 10% utilization rate is reached, a switch to Rate GV could be made by customers to avoid higher costs than would be incurred on the demand charge alternative at utilization rates above 10%. With data collected from a sufficient number of stations taking service under the proposed demand charge alternative, further evaluation could be made regarding the utilization levels and ramp rates, the volumetric rate design, cost of providing service, and more detailed utilization characteristics to determine whether it's appropriate to continue the rate offering as is, modify the rate design, or develop a successor rate design reflecting information gathered and evolution of the market.

**Public Service Company of New Hampshire d/b/a Eversource Energy**  
**Docket No. DE 21-078**

**Date Request Received: November 15, 2021**  
**Data Request No. CLF 1-01**

**Date of Response: December 03, 2021**  
**Page 1 of 1**

**Request from: Conservation Law Foundation**

**Witness: Davis, Edward A**

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**Request:**

Please provide the duration of the demand charge alternative proposed in this docket? How was this determined? Did Eversource consider a longer duration for its demand charge alternative proposal and, if so, why is that not proposed in this docket?

**Response:**

The Company's demand charge alternative is intended to be implemented in the near term, as a complement to the Company's make ready proposal. The demand charge alternative remains integral to the make ready program, as each is necessary for the success of the other. As discussed in the prefiled testimony in this docket (Testimony of Edward A. Davis, Brian J. Rice and Kevin M. Boughan, Bates 25-27), the proposal is intended to address immediate customer needs and the state's goals and provide a demand charge alternative to currently available rates that include demand charges, as those charges currently present a market barrier to potential commercial charging customers in New Hampshire. The Company has not proposed a sunset on the term of service for the demand charge alternative. While the Company has not proposed a duration for the rate offering, the duration of the rate could be limited based on purpose, particularly to support near-term market growth, with a successor rate designed around future goals and objectives as the market develops. As indicated in the portion of testimony cited above, the Company recognizes there are existing and evolving alternatives and market growth that will occur over time, and that "variations of its proposed design or consideration of more complex approaches may be more suited for development of next generation designs, following deployment and growth of public EV charging applications in New Hampshire." See also, Bates 26, line 12 through Bates 27, line 6.

**Public Service Company of New Hampshire d/b/a Eversource Energy**  
**Docket No. DE 21-078**

**Date Request Received: November 15, 2021**  
**Data Request No. CLF 1-06**

**Date of Response: December 03, 2021**  
**Page 1 of 1**

**Request from: Conservation Law Foundation**

**Witness: Davis, Edward A**

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**Request:**

Also at the October 25, 2021 technical session, Eversource's witnesses described how it defines utilization rate. Please provide that description in writing.?

**Response:**

For purposes of the Company's projection and illustrations of public charging (e.g., Figure 2 in pre-filed testimony, Bates 22) and billing, utilization rate represents the load factor of a charging station. Thus, in the year 2025 in Figure 2, a station with a peak demand of 200 kW and average monthly usage of 14,600 kWh has a 10% load factor, or utilization rate ( $14,500 \text{ kWh} / (200 \text{ kW} \times 730 \text{ hours})$ ). The terms "load factor" ("Annual LF") in the figure, and "utilization rate" in testimony were used interchangeably in this context. To the extent utilization rate refers to the amount of kWh usage relative to the total capacity of a station, individual charging port or otherwise, it would be important to state that context for clarity of understanding.

**Public Service of New Hampshire d/b/a Eversource Energy**  
**Docket No. DE 20-170**

**Date Request Received: 08/13/2021**

**Date of Response: 08/27/2021**

**Request No. CLF-CENH 2-003**

**Page 1 of 1**

**Request from: Conservation Law Foundation & Clean Energy New Hampshire**

**Witness: Kevin Boughan, Michael R. Goldman**

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**Request:**

Please explain whether Eversource has conducted any forecasts of expected EV adoption levels in its service territory for the next 2-, 5-, and/or 10-year periods. At the August 9, 2021 technical session, Eversource noted that it had conducted forecasts in developing its demand charge alternative proposal and for a separate NH PUC proceeding earlier this year. Please produce these forecasts, as well as any other forecasts that Eversource has conducted regarding expected EV adoption levels.

**Response:**

Yes, the Company annually conducts an internal forecast of expected EV adoption levels in its service territory in New Hampshire. The latest, prepared in September of 2020 forecasts baseline adoption through 2030, and is included below as Attachment 1.

In developing its demand charge alternative proposal, the Company was informed by the typical load factor forecast for a DC Fast Charger as estimated by the Rocky Mountain Institute in its February, 2020 report "DCFC RATE DESIGN STUDY FOR THE COLORADO ENERGY OFFICE" (Attachment 2), page 5:

- *"A 5% utilization rate for the first three years to represent a typical public DCFC load in today's early EV market*
- *A 10% utilization rate for the next three years to represent what a typical public DCFC load might be when the market begins to grow*
- *A 30% utilization rate for the next four years to represent what a typical public DCFC load might look like as the market matures"*

# Eversource Baseline NH EV Forecast (Fall 2020)

Docket No. DE 20-170  
 Data Request CLF-CENH 2-003  
 Dated 08/13/2021  
 Attachment 1, Page 1 of 1

Year	Vehicles in Operation (cumulative)		
	BEV	PHEV	Total
2011	3	27	30
2012	45	218	263
2013	146	405	551
2014	229	542	771
2015	294	658	952
2016	374	827	1,201
2017	484	1,217	1,701
2018	980	1,624	2,604
2019	1,656	1,841	3,497
2020	2,214	2,111	4,325
2021	3,070	2,507	5,577
2022	3,940	2,579	6,519
2023	4,890	2,468	7,358
2024	5,682	2,423	8,104
2025	7,312	2,951	10,263
2026	9,269	3,507	12,775
2027	11,617	4,089	15,706
2028	13,691	4,342	18,032
2029	16,514	4,714	21,228
2030	19,716	4,993	24,709

Methodology uses the following national factors:

- Battery and gas price forecasts
- New model release plans
- Federal tax and emissions standards policies

And the following regional / state factors:

- State ZEV / GWSA commitments
- Regional energy price forecasts
- State vehicle / charger rebate programs and policies
- Planned / expected EVSE investment

Other Notes:

- Historical to 2017 figures based on Auto Alliance (grey)
- Incorporates fleet turnover
- Accounts for pandemic related slowdown in vehicle sales

**Baseline forecast for a nascent market – will be revised often as more information becomes available**