

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

TESTIMONY OF EDWARD A. DAVIS

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

RESIDENTIAL ELECTRIC VEHICLE TIME-OF-USE RATES

Docket No. DE 20-170

1 **Q. Mr. Davis, please state your name, business address and position.**

2 A. My name is Edward A. Davis. My business address is 107 Selden Street, Berlin, CT
3 06037. My position is Director, Rates at Eversource Energy Service Company and in that
4 position I provide rate and tariff related services to the operating companies of
5 Eversource Energy including Public Service Company of New Hampshire d/b/a
6 Eversource Energy (“Eversource” or “the Company”).

7 **Q. Have you previously testified before the New Hampshire Public Utilities**
8 **Commission?**

9 A. Yes. I have on many occasions testified before the New Hampshire Public Utilities
10 Commission (“Commission”) on behalf of Eversource, and at the state utility

1 commissions in Connecticut and Massachusetts on behalf of other Eversource Energy
2 affiliates on rate related matters.

3 **Q. Please describe your educational background and professional experience.**

4 A. I hold a Bachelor of Science degree in Electrical Engineering from the University of
5 Hartford and Master of Business Administration from the University of Connecticut. I
6 joined Northeast Utilities, now Eversource Energy, in 1979 and have held various
7 positions in the areas of consumer economics, engineering and operations, wholesale and
8 retail marketing and rate design, regulation and administration.

9 **Q. What is the purpose of this testimony?**

10 A. The purpose of my testimony is to submit and discuss the design for a residential electric
11 vehicle (EV) time-of-use (TOU) rate. This design has been developed pursuant to the
12 Commission's guidelines in Order 26,394 in Docket No. IR 20-004¹ (Order). The
13 implementation of this proposed rate design, and the Company's proposed managed
14 charging initiative are discussed in the testimony of Messrs. Moore, Goldman and Rice
15 also submitted in this docket.

16 **Q. Please summarize the Company's rate design proposal.**

17 A. The Company has developed a residential EV TOU rate consisting of time-differentiated
18 rates for the distribution, transmission and company-provided energy service components
19 of rates. TOU pricing for peak, mid-peak and off-peak periods have been determined,

¹ IR 20-004, Investigation into Rate Design Standards for Electric Vehicle Charging Stations and Electric Vehicle Time of Day Rates, Order No. 26,394 dated August 18, 2020.

1 based on the marginal cost of providing service for each of these components. The
2 Company has aligned the cost of service and rate design of each component to achieve a
3 five-hour peak period from 2 pm - 7pm, weekdays (excluding holidays), a daily mid-peak
4 period from 7 am through 11 pm (excluding peak periods), and a daily off-peak from 11
5 pm each day through 7 am the following day. A summary of this rate structure and
6 associated pricing is provided in Table 1, below.

Table 1
3-Period Residential EV TOU Rate Summary

	Off Peak	Mid-Peak	Peak
Distribution	\$ 0.02065	\$ 0.05988	\$ 0.06402
Transmission	0.01199	0.02070	0.08746
Energy Service	0.05026	0.06229	0.10294
Total	\$ 0.08290	\$ 0.14287	\$ 0.25442

Time of Use Periods

Peak: Weekdays: 2 pm -7 pm (excl. holidays)

Mid-Peak: Weekdays: 7am-2pm and 7pm-11pm ;Weekends: 7am - 11 pm

Off-Peak: Daily, 11 pm - 7 am

Notes:

Distribution pricing reflects adjustment to implement a \$16.50/month customer charge with local facilities costs included in peak & mid-peak

7

8 **Q. Please discuss the overall characteristics of this rate design.**

9 A. In the Order, the Commission provided guidance and directives emphasizing the use of
10 marginal costs as much as possible. The Order further requires separate TOU rates for
11 the distribution, transmission and generation components of service, and provides several
12 key measures that should be reflected in the overall design.

13 As an initial matter, in developing the proposed rate design the Company reviewed the

1 service to be provided and the associated costs of providing that service for a residential
2 customer. The proposed Residential EV TOU Rate (Rate R-EV) assumes a residential
3 customer's charging equipment will be separately metered but connected to the same
4 service as the primary residence. This service arrangement is comparable to that for
5 residential water heating service, which was discussed as a framework for residential EV
6 charging during technical sessions in this docket. Accordingly, the Company has
7 developed TOU rates for each component of service, based on a revenue neutral design
8 that looks at the prevailing residential rates for these components, but allocates costs to
9 peak, mid peak, and off-peak periods based on the respective marginal costs for each
10 component.

11 For distribution marginal costs, in particular, the hourly marginal distribution substation
12 costs used for this purpose were obtained from the Company's 2019 Distribution
13 Marginal Cost of Service (MCS) study conducted by the Company's marginal cost
14 consultant, Amparo Nieto, and the marginal generation and transmission cost estimates
15 were obtained from an analysis conducted by the same MCS consultant, under Docket
16 No. DE 19-057. These estimates were updated to 2021 dollars and were used to inform
17 rates by time of day period, adjusted to meet revenue targets.²

18 An important consideration in developing these designs is to recognize the different types
19 of marginal costs and when they occur within each component of service, and in defining
20 each of the three periods (both duration and beginning/end times) for which to set rates,

² Details of the Distribution Marginal Costs are available in Attachment MCOSS-1 to Amparo Nieto's Direct Testimony on Marginal Costs, submitted to the Commission in Docket DE 19-057. The marginal generation and transmission costs by period are available in Attachment EAD-1 to this testimony.

1 based on these costs. The Company's consultant evaluated where the strongest
2 alignment of costs occurred among the three components of service, for three TOU
3 periods as designated by the Commission.³ Marginal cost differentials for each
4 component of service and across those components were applied to achieve this
5 alignment while taking into account a number of other objectives, including
6 establishment of a five-hour peak period; attaining a minimum overall, annual average
7 3:1 peak/off-peak ratio, and assuring that off-peak rates did not include the local fixed
8 cost component. Attachment EAD-1 provides the details of the design that meet these
9 objectives.

10 **Q. Please explain in more detail your proposed rate design and the guidelines and**
11 **methodologies applied in developing this proposed rate design**

12 A. In developing distribution rates, the Company first evaluated the existing customer
13 related costs as reflected in the customer charge of the optional residential TOD rate (R-
14 OTOD). The marginal per-customer cost of local distribution facilities, as per the MCS in
15 Docket No. DE 19-057, was removed from the existing Rate R-OTOD customer charge
16 and included for recovery through the mid-peak and peak period volumetric rates. This
17 resulted in a lower customer charge as compared to the R-OTOD rate, but the customer
18 charge retained other customer costs, including that of the current TOU meter. The
19 proposed approach is consistent with the service configuration previously described for
20 the EV connection. Recovering the costs of the local transformer in the volumetric rate

³ The Company engaged Ms. Nieto, author of the Distribution MCS, to produce these peak, mid peak and off peak transmission costs.

1 component outside of the off-peak period provides price signals that encourage off-peak
2 (overnight) EV charging and discourages charging at times that may cause the need for
3 additional local facilities' capacity and thereby cause incremental costs to be incurred at
4 the individual customer level (e.g., increased transformer/service requirements). The
5 remaining costs of providing distribution service have been delineated on a TOU basis
6 utilizing the marginal costs of the distribution system, provided in the Company's
7 distribution marginal cost of service. As a result, the company has provided a marginal
8 cost-based, three-period TOU rate for the distribution component of service, as
9 summarized in Table 1 and detailed in Attachment EAD-1.

10 Three-period transmission TOU rates were developed using the probability of peak
11 methodology applied from Docket No. DE 19-057, applied to the rate being billed to the
12 Company for transmission service (i.e., the RNS rate) as the marginal unit cost of
13 transmission service. The Company has developed the three-period TOU rate for
14 transmission service using time-differentiated marginal costs of providing transmission
15 service to residential customers at various times using this method, as shown in Table 1
16 and detailed in Attachment EAD-1.

17 To determine the component of the EV rate that reflects the "Energy Supply service" by
18 time of day, the Company applied current and forward-looking estimates of marginal
19 costs of energy, capacity and other components of supply, as developed by the
20 Company's consultant, adjusted as necessary to meet the revenue target for those
21 components. The marginal cost of energy billed to customers is the price paid pursuant
22 to the Company's procurement of that supply. This is a flat rate per kWh across all

1 hours, which changes twice a year. For purposes of setting a TOU rate for EV, the
2 average energy price was time-differentiated (by time of day) using the average historical
3 variation in locational marginal prices (i.e., locational marginal prices, or LMP) in the
4 ISO-NE market. Finally, the Company applied time of day estimates of forward capacity
5 prices in designing a rate for each of the three periods shown in Table 1, and detailed in
6 Attachment EAD-1. In support of the rate design calculations provided in Attachment
7 EAD-1, the Company plans to provide a supplement which will be made in a separate
8 supporting filing to this docket on or around June 21, 2021.

9 It should be noted that this design aligns with marginal costs across all three components
10 of service to achieve a greater than 3:1 peak/off-peak ratio. While the Commission
11 recognized in its Order that a differential other than that of the marginal cost can be
12 imputed into rates (e.g., the 3.5 cents/kWh differential under the CT two-period TOU
13 rate), this design does not necessitate such an approach given the results produced on a
14 marginal cost basis. Another important note for the energy supply portion of rates is,
15 while the design addresses pricing of company-provided Energy Service, it does not
16 resolve the issue of how to set or bill prices on a TOU basis for competitive supply. The
17 Company's proposed rate design is cost reflective for each component of service by time
18 of day. Competitive supply rates, however, are not required to be set on a TOU basis.
19 Furthermore, where a competitive supplier bills customers directly, such rates would not
20 be known by the Company at all. Where competitive supply rates are billed by the
21 Company, while the rates are known by the company, the supplier determines the rates
22 Eversource bills.

1 Regarding seasonality, the Company's design is set on a twice annual basis, using
2 prevailing rates. Using the methodologies applied by the Company in this design, such
3 rates would be updated as underlying rates (and where applicable or known, including
4 associated marginal and reconciling costs) for each component change. As discussed in
5 the Commission's Order, the cost of Energy Service would change twice annually (e.g.,
6 February 1 and August 1). The marginal cost differential applied within the design of
7 such rates would be an important factor in determining what the peak/off-peak ratio
8 might be during a given year. The Company notes that further seasonality could be
9 explored within both the distribution and transmission components of rates, based on the
10 marginal cost of service analyses it has performed.

11 It should also be noted that the customer components of costs, whether in the customer
12 charge or volumetric rates as discussed above, do not fully reflect additional costs of
13 metering, meter reading, data collection, etc. that would be required to provide service to
14 EV customers under the proposed EV TOU design. While the three-part EV TOU rate
15 design discussed above reflects the cost of deploying a current TOU meter, incremental
16 costs are addressed in the previously noted joint testimony of Dennis Moore, Michael
17 Goldman and Brian Rice.

18 **Q. Please discuss the tariff requirements of the proposed rate design**

19 A. As required by the Commission in the Order, the Company is providing an illustrative
20 tariff reflecting the proposed rate design. Please see Attachment EAD-2. This tariff
21 provides the general form of tariff and a schedule of rates. Detailed availability and other
22 provisions are to be determined, but are anticipated to be based on service provisions of

1 the current residential tariff, and requirements for providing electric service to residential
2 EV chargers as reflected in rate design.

3 **Q. Does the Company recommend implementing the proposed rate design at this time?**

4 A. No. As previously noted and discussed more thoroughly in accompanying testimony of
5 Dennis Moore, Michael Goldman and Brian Rice, the Company does not recommend the
6 near-term implementation of a separately-metered EV TOU rate. Making the rate
7 structure described in this testimony available to customers would require substantial
8 modification to many of the Company's current enterprise systems and comparable
9 outcomes can be achieved at much lower cost through a proposed managed charging
10 initiative

11 **Q. Please discuss bill savings under the proposed Residential EV TOU rate design and
12 how that data informs the Company's proposed load management initiative.**

13 A. Attachment EAD-3 provides an analysis of the reduction in a residential EV customer's
14 bill by moving to a TOU rate and charging only during the off-peak period. There are
15 clear savings due to the volumetric TOU rate differential, but those savings are offset by
16 fixed costs of implementing a separate rate. Thus, there are questions about how much is
17 ultimately and comparatively saved compared with charging an EV as part of the whole
18 house rate and factoring in incentives such as those available under the management
19 charging program. The analysis in Attachment EAD-3 shows volumetric bill savings for
20 a hypothetical residential EV charger on the EV TOU rate that are offset by the additional
21 service charge under that rate. In that example, a BEV that meets 80% of their charging
22 requirements at home would consume 260 kWh. If all charging were performed during

1 the off-peak period, this customer would be able to reduce their per kWh rate by
2 approximately 6.5 cents/kWh, and realize a \$16.81 bill savings, when compared with
3 charging under the Company's whole house rate, Rate R (which employs a flat rate for all
4 hours, for all components of service). Given the charging occurs under a separately
5 metered TOU rate, there is an additional customer charge (\$16.50 per month), which
6 offsets the volumetric savings for a net savings of \$0.31. As discussed further in the
7 testimony of Messrs. Moore, Goldman and Rice, additional fixed costs will be required to
8 implement this design, which would further reduce net savings to the point where it's
9 doubtful that there would be any savings at all.

10 **Q. Please summarize the Company's proposed, three-period rate design.**

11 A. The Company believes it has been important to develop the three-period EV TOU
12 proposal to obtain insights into pricing of the various time-differentiated services
13 applicable to EV charging. While the EV TOU rate has been designed to meet objectives
14 directed by the Commission's Order, it is important to recognize the contextual and
15 practical considerations and challenges in implementing such rates. This includes
16 consideration of the relative benefits possible for a customer charging under an EV TOU
17 rate compared with charging at rates for overall service to their residence, whether Rate R
18 or Rate R-OTOD, plus the possible benefits of adding managed charging incentives to
19 these overall service rates. The net savings from the EV TOU rate design appear to be
20 relatively small compared with other rate alternatives such as managed charging. The
21 additional metering and billing requirements and costs to implement the EV TOU rate
22 need to be weighed against savings that are more directly and readily achievable through

1 the managed charging program. Even without the additional fixed costs associated with
2 EV TOU implementation, savings are small. Nonetheless, TOU rates can eventually
3 bring benefit when the market develops further.

4 **Q. Does this conclude your testimony?**

5 A. Yes. It does.