Memorandum

TO: OLIVIA CAMPBELL ANDERSEN, RENEWABLE ENERGY VERMONT

FROM: MELISSA WHITED AND THOMAS VITOLO, PHD, SYNAPSE ENERGY ECONOMICS

DATE: JUNE 26, 2018

RE: VERMONT PUC ORDER AND COMMENTS IN CASE NO. 18-0086-INV REGARDING SYNAPSE REPORT

The Vermont Public Utility Commission (PUC) published its final order in Case No. 18-0086-INV regarding the biennial update of the net-metering program on May 1, 2018. In this memo, we address several of the technical points in the Commission's final order concerning the Commission's interpretation of the Synapse Report.

At the outset, we note that there is general agreement across all parties that a significant quantity of new solar PV is needed in Vermont to meet Comprehensive Energy Plan goals. For this reason, it is important to ensure that the avoided costs associated with solar are appropriately accounted for and valued. At the same time, it is equally important to avoid unreasonable rate impacts for non-participating customers. For this reason, Synapse conducted a study of cost shifting due to net metering 2.0 in Vermont. In response to several Commission concerns with the Synapse report, we provide additional information below regarding three points:

1) Whether the values provided by the Avoided Energy Supply Cost (AESC) studies are appropriate for estimating the avoided costs of solar;

2) Whether AESC transmission and distribution avoided costs are applicable to solar; and

3) Whether Synapse's accounting for renewable energy certificate adjustors was appropriate.

1. Regarding Whether AESC Is Appropriate to Use for Avoided DG Costs

For the instant proceeding, Synapse conducted a study of cost shifting due to net metering in Vermont utilizing avoided costs previously approved for energy efficiency. These avoided costs were derived from the *Avoided Energy Supply Costs in New England* reports.[1] In its order, the Commission found the Synapse analysis "unreliable" because the avoided costs "come from a report that was not intended to be used as an estimate of the avoided cost of solar energy."[2] Synapse respectfully disagrees with the

1 At the time of the analysis, the most current avoided cost estimates were those approved in October 2017 in Docket EEU-2015-04.

2 Order at 42.

Commission that the *Avoided Energy Supply Costs in New England* reports are unsuited for estimating the avoided costs of solar energy for the reasons described below.

First, the Commission appears to be concerned that the AESC avoided costs are not applicable because the AESC costs assume "a future scenario that is different from what is expected to occur," – i.e. a future in which there is no incremental energy efficiency (but with continued installation of other demand resources, such as distributed solar). Synapse agrees that the AESC values represent a future that is unlikely to occur. However, as noted in our report, we believe that these values are nonetheless indicative of the avoided costs of solar.[3] This is because neither the purpose of the AESC study nor the Synapse Report was to reflect actual market prices. Instead, both the AESC analysis and the Synapse analysis are intended to reflect the avoided costs due to load reductions. These load reductions are similar for energy efficiency and distributed generation. That is, comparing a future without energy efficiency (but with distributed generation) can be thought of as a rough approximation to comparing a future without distributed generation (but with energy efficiency).[4]

Second, even if continued investments in energy efficiency were included in the analysis of avoided costs, it would only change the avoided cost results slightly. This is evidenced by the results reported in the newly-released *Avoided Energy Supply Components in New England: 2018 Report*, which modeled a sensitivity that includes energy efficiency. The result is a difference in levelized avoided costs of only 4 percent relative to the scenario in which no new energy efficiency is installed.[5] Therefore, even though the AESC avoided costs represent a hypothetical future without energy efficiency, they are only slightly different than a future that includes energy efficiency.

Finally, avoided energy costs associated with distributed generation may even be higher than those estimated for energy efficiency, on average. The AESC 2018 report states that the avoided energy costs "are applicable to demand side management (DSM) programs reducing load roughly in proportion to existing load. Other resources, such as load management and distributed generation, may have very different load shapes and significantly different avoided energy costs.... Peaking resources, such as most non-CHP distributed generation and load management, would tend to have higher avoided costs per kWh."[6] Thus, although the value of distributed solar energy could be higher than energy efficiency, distributed solar in Vermont is not being credited for these higher avoided costs. For example, GMP bases its assertion that the value of solar has declined on low "forward prices for deliveries of round-

3 Synapse Report, footnote 13 states that these avoided costs might be higher than what will actually be experienced, but are nevertheless indicative of the avoided costs of solar.

4 It is a rough approximation because the quantity and values associated with energy efficiency and distributed generation may be somewhat different. For example, the (avoided) generation profile of energy efficiency typically spans all 24 hours of the day, whereas the generation profile of solar PV is diurnal. Because of the temporal differences of these resources, the avoided energy costs of solar may be higher than energy efficiency (due to ISO-NE hourly energy prices being higher on hot summer afternoons), but the avoided transmission and distribution costs of solar are typically lower than energy efficiency due to local conditions in Vermont.

5 Synapse Energy Economics et al, "Avoided Energy Supply Components in New England: 2018 Report," March 30, 2018. Page 246.

6 Ibid, page 260.

the-clock energy," rather than on the costs of energy during peak hours.[7] "Round-the-clock" energy costs are lower than daytime-only hours costs since load is consistently higher, on average, during the daytime in New England.

2. Whether AESC Avoided Transmission and Distribution Costs Are Appropriate for Solar

Avoided transmission and distribution (T&D) capacity costs are the sum of avoided transmission capacity costs and avoided distribution capacity costs; in this subsection each will be addressed separately. We note the Commission's order did not draw any distinctions between the benefits available from avoiding distribution system investment compared to transmission system investment. Also, while we acknowledge the ability for new solar PV to reduce Regional Network Service (RNS) costs (based on embedded transmission costs) is much lower than was seen with the initial penetrations of solar PV, going-forward investment in any distribution system requirements in Vermont can, and will, be affected by feeder-specific and substation-specific conditions.

Given resource and data availability constraints, Synapse did not conduct a full value of solar study, but used publicly-available avoided transmission and distribution estimates from AESC. While the aggregate of Vermont's peak load is moving toward the evening, distribution system peaks (and the impact of solar) vary by circuit. Some circuits peak toward the middle of the day. On these circuits, the avoided distribution costs could be quite high for solar. A more detailed study that analyzes the peak hour by substation (and which substations are likely to require upgrades soon) would provide more clarity on this. Assuming zero avoided distribution capacity would likely substantially undervalue solar PV's contribution; the Commission, the Department and GMP did not address the distinction between distribution system cost avoidance, and transmission system effects.

With respect to avoided transmission capacity costs, Vermont typically peaks after sundown,[8] suggesting little or no value in avoided transmission capacity costs. Nonetheless, if zero were assumed for avoided transmission capacity costs *and* avoided distribution capacity costs, this would have an immaterial impact on the results of the cost shifting resulting from net energy metering (NEM) 2.0 installations. While Synapse finds it inaccurate for the reasons described above to assume no avoided T&D costs, our analysis shows that the impact on a typical residential customer's monthly bill would be $0.13/month if assessed in that way. This is equivalent to a bill impact of 0.2 percent.

3. Accounting for Renewable Energy Certificate Adjustors

Energy efficiency can reduce the need for Renewable Energy Standard (RES) compliance by reducing electricity sales. That is, under Vermont's 2017 RES of 55 percent, a 1 MWh reduction in electricity sales

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[7] Robert Dostis, "Green Mountain Power's response to the Public Utility Commission's January 12, 2018 order," February 1, 2018. Case No. 18-0086-INV. Page 4.

[8] Vermont's monthly peak hour of demand in each month of 2017 was hour end 18 or later, with the exception of a 3pm peak in June, 2017, as found in ISO New England's Monthly Data by Load Zone file, "Monthly Peak Demand 2017_smd_monthly.xlsx."

would reduce the number of Renewable Energy Certificates (RECs) purchased by Vermont utilities by 0.55 MWh (or, if there are surplus RECs, it would increase the number of surplus RECs available to be sold to Massachusetts or other states in the region). Thus the value of a 1 MWh reduction in energy consumption equals 0.55 MWh times the REC price. The Commission states that the AESC values approved in October 2017 (which Synapse used in our analysis) included this avoided cost. This avoided cost is applicable to both energy efficiency and distributed generation because both of these technologies reduce demand. This value that is due to a reduction in energy consumption is also independent of whether or not the customer retains or transfers RECs associated with solar generation. Thus the inclusion of this avoided cost is appropriate and does not skew our analysis.

As noted by the Commission, there are two REC adjustor values: (1) a "positive" REC adjustor of $0.03/kWh for customers who transfer RECs to their utility, and (2) a "negative" adjustor of -$0.03/kWh for customers who retain RECs. The difference between these two values ($0.06) was based on the statutory alternative compliance price for Tier II RECs under the RES.[9] Thus if the average residential rate were $0.149/kWh, the net energy metering (NEM) compensation rate (ignoring siting adjustors) would be $0.179/kWh if the REC is transferred to the utility, or $0.119/kWh if the customer retains the REC.

Synapse made no assumption regarding the transfer of RECs, and therefore used a NEM compensation value of $0.149/kWh (ignoring siting adjustors). If we assume that a customer transfers a REC to the utility, then the cost-shifting calculation should assume a NEM compensation rate of $0.179/kWh. However, the calculation should also assume that the Vermont utilities will have one additional surplus REC to sell into the market.[10] The revenue generated by the sale of this additional REC is likely to be approximately $30/MWh ($0.03/kWh),[11] which then offsets the additional compensation paid to a NEM customer. If instead we assume that the customer retains the REC, then the compensation level should be reduced to $0.119/kWh. This lower payment is offset by one less REC that the utilities can sell into the market. For this reason, the exclusion of REC adjustors from our calculation has no impact on the cost shifting analysis.

9 Order Re: biennial update of the net-metering program, Case No. 18-0086-INV, Order of 05/01/18, page 9.

10 While NEM RECs must be retired and cannot be sold, their retirement increases the availability of other Tier I RECs that can be sold into the market.

11 Patrick Knight, Ariel Horowitz, Patrick Luckow, and Tyler Comings, "An Analysis of the Massachusetts Renewable Portfolio Standard," May 2017. Prepared for NECEC in partnership with Mass Energy. Figure 13. Available at: http://www.synapse-energy.com/sites/default/files/Analysis-MA-RPS-17-004.pdf