Introduction

BED and VPPSA calculated the value of solar based on the hourly data from 29 Standard Offer Solar projects from 2016-2018 ("historical period"). All systems were installed prior to 2016 and had production for the entire historical period. We then used those systems' production and updated 2020 expected prices to calculate an expected value of solar in 2020 ("projection year"). We were able to calculate a subset of the values described in the *Review of Recent Cost-Benefit Studies Related to Net Metering and Distributed Solar*[1] report prepared for the Department of Energy. We believe that analyzing solar on an hourly basis rather than making broader assumptions about on-peak or off-peak energy is going to become more useful given the correlation in output between systems, which can lead to a decrease in value per kWh as more systems are deployed.

Values Calculated

BED and VPPSA calculated seven different value streams. We go into detail below on how those calculations were done, their results, and to whom the value flows.

Avoided Energy Generation

When a solar system produces energy, a utility no longer needs to purchase that energy from the grid. The value of that avoided purchase varies by hour, and to the extent it is predicted in a utility's load forecast in would create value at the rate of the Day-Ahead Vermont Zonal Locational Marginal Price. We calculated the value of avoided energy by first multiplying the system's historical period production in each hour by the Day-Ahead Vermont Locational Marginal Price in that hour. We then created a ratio between that value and the value of Around-

[1] https://www.icf.com/-/media/files/icf/reports/2019/icf-nem-meta-analysis_formatted-final_revised-1-17-193.pdf

The-Clock ("ATC") Energy at the ISO-NE Hub and multiplied that ratio by ATC Hub futures for 2020 settled on September 27, 2020. The value calculated was approximately $0.04/kWh. This is shown in detail on the "energy value" tab in the Solar Value 2016-2018 workbook.

Ancillary Services

Ancillary Service costs are generally assessed by ISO-NE based on Real-Time Load Obligation. Solar generation would reduce the utility's share of those costs in the short-term, and likely reduce ISO-NE's need to procure those resources. Ancillary Service value was calculated by multiplying the same historical period production by the hourly wholesale market costs from ISO-NE.[2] This was then inflated to 2020 at 2.5%. Although theoretically possible, it was assumed that Net Metered Generation would continue to not provide Ancillary Services.

Avoided Capacity Generation

Solar production during the ISO-NE peak hour reduces a utility's share of costs related to the ISO-NE Forward Capacity Market. ISO-NE takes the impact of BTM solar into account when procuring future capacity. Avoided Capacity was calculated by taking the production during the expected peak hour given the expected solar deployment in a year (in other words, had there been the amount of solar is expected to be deployed by 2020-2024, when would the 2016 through 2018 peaks have occurred). This was multiplied by an additional assumption of a 20% reserve ratio (the ratio of generation over and above the expected peak that ISO-NE procures). The coincidence during the actual peak hours was 37%, while the coincidence at expected peak hours was 27%.

Avoided Transmission Capacity

Solar production during the Vermont monthly peak hour reduces a utility's share of costs related to the ISO-NE Transmission. In the short-term those costs will be borne by other utilities in New England, to the extent future transmission is delayed or not developed costs will be reduced. The percentage of coincidence with nameplate was determined by comparing the actuals of the historical period dataset (while again attempting to calculate the impact of additional solar deployment on peak shifting) during Vermont Monthly Peaks, which determines the allocation of transmission costs.

Avoided Environmental Compliance/Avoided Cost of Carbon/Other Avoided Environmental Costs

We used $0.03 per REC as the value for any and all environmental values from these projects. A lower value may be appropriate for 100% renewably-sourced utilities as their Tier 1 obligation is reduced, and Tier 1 has an Alternative Compliance Payment Cap of just over $0.01/kWh, and generally trades for much less.

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[2] https://www.iso-ne.com/isoexpress/web/reports/load-and-demand/-/tree/whlsecost-hourly-vermont

Avoided Line Losses

We used 3% for BED based on BED experience. BED's Line Losses were 2.6% of sales in 2018. Line Losses were calculated individually for each VPPSA utility. This assumes that the net metering is sited such that it is avoiding both transmission and distribution losses.

Lost Utility Revenues

Please see answer 2.

Values not Calculated

The ICP report identifies a number of additional value and cost streams that we did not attempt to calculate a benefit or cost per kWh due to difficulty in calculating their value. Those streams are Avoided Distribution Capacity, Avoided Resiliency & Reliability, Distribution O&M, Distribution Voltage and Power Quality, Local Economic Benefit, Integration Costs, Program and Administrative Costs, Market Price Response, and Fuel Hedging.

In addition, we did not calculate a value of the reduction in VELCO Common Charges as discussed below.

VELCO Charges

Reducing a utility's annual peak will result in a decrease in that utility's share of the VELCO "Common" costs. The calculation of this value is complicated and ultimately only results in a cost-shift between VT distribution utilities.