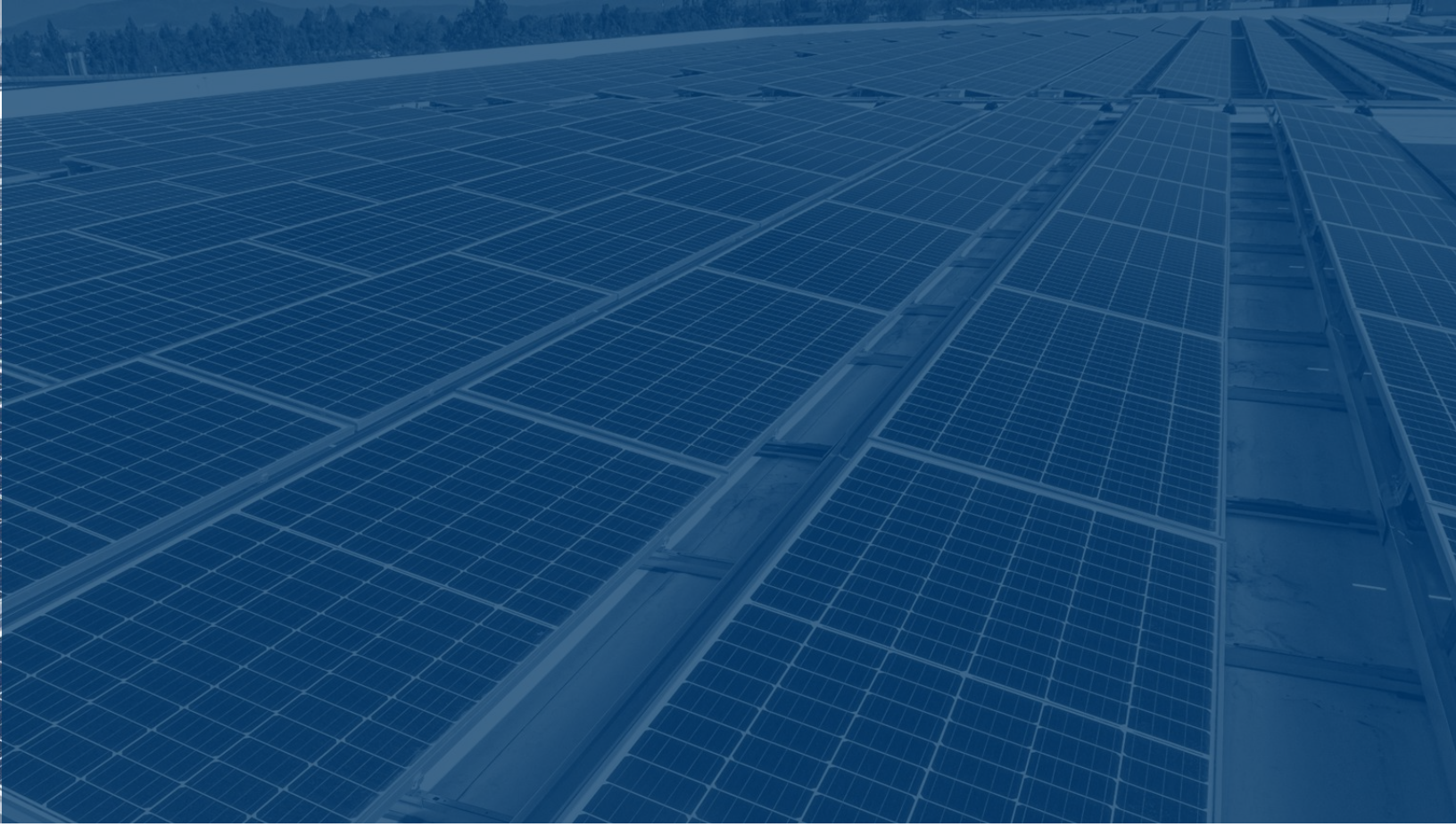

New Hampshire Value of Distributed Energy Resources

Addendum

Submitted to:

New Hampshire Department of Energy

New Hampshire Department of Energy

www.energy.nh.gov

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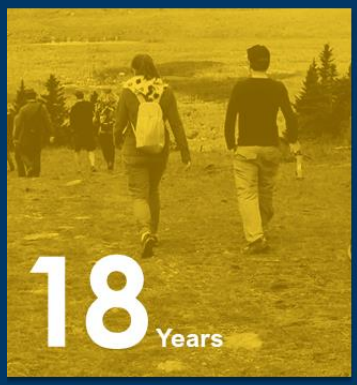
With support from Power Advisory

About Dunsky



Founded in 2004, Dunsky supports leading governments, utilities, corporations and non-profits across North America in their efforts to **accelerate the clean energy transition**, effectively and responsibly.

Working across buildings, industry, energy and mobility, we support our clients through three key services: we **quantify** opportunities (technical, economic, market); **design** go-to-market strategies (plans, programs, policies); and **evaluate** performance (with a view to continuous improvement).

Dunsky is proudly Canadian, with offices and staff in Montreal, Toronto, Vancouver, Ottawa and Halifax.

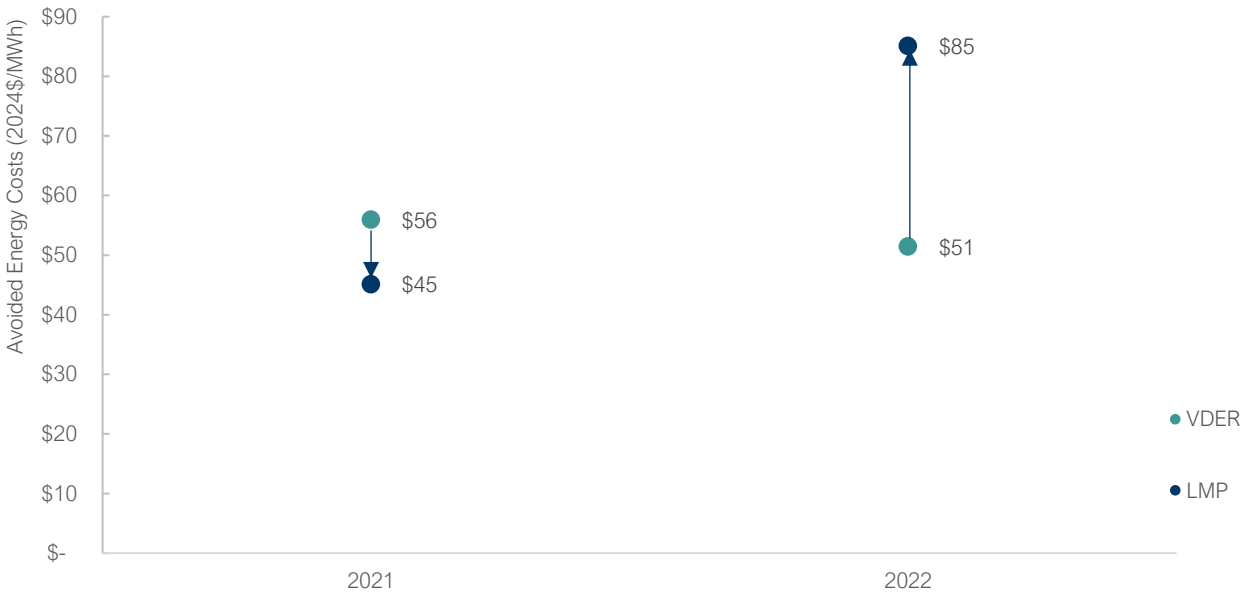
Table of Contents

A. Introduction

Since the completion of the New Hampshire Value of Distributed Energy Resources Study Report in October 2022, several factors, such as supply chain constraints caused by COVID-19, strained infrastructure, and the ongoing Russian invasion of Ukraine, have led to an unparalleled surge in natural gas prices and energy supply costs. To provide a more current estimate of the avoided costs captured by distributed energy resources and the resulting study findings, the below addendum updates a number of relevant study values and results.

As seen in the figure below, the historic Locational Marginal Price (LMP) prices in 2021 and 2022 varied significantly compared to the estimates used in the original study. In 2021, the average LMP observed in the ISO-NE market was 20% lower than the avoided energy cost forecasted in the original VDER study. On the other hand, in 2022, the average LMP observed in the ISO-NE market was 66% higher than the avoided energy cost forecasted in the original VDER study. Thus the study results are subject to various factors that can lead to discrepancies between predicted prices and actual historical prices, including constraints in natural gas supply, transmission, and changes in system demand.

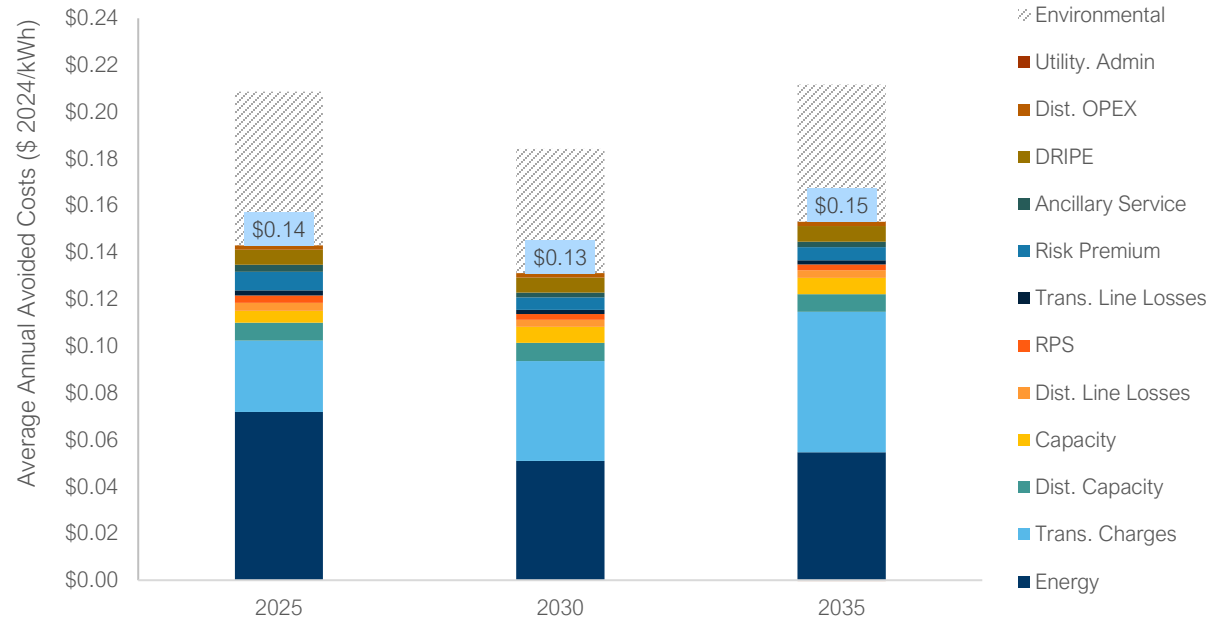
Actual v/s Predicted Avoided Energy Costs



B. Overall Results

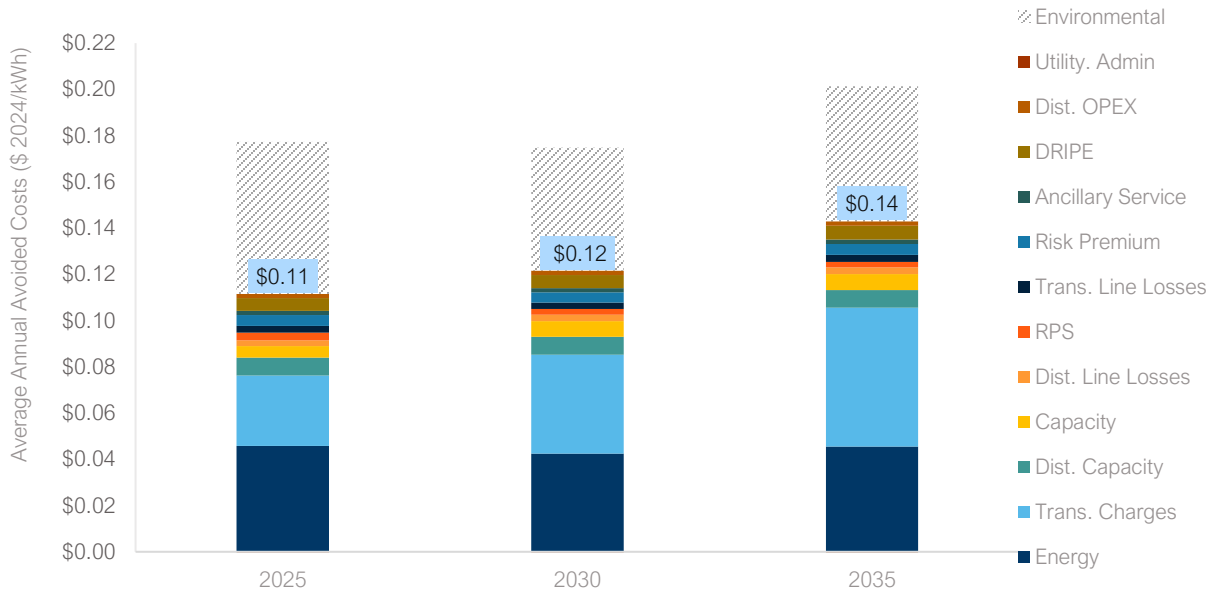
B.1 Comparison Between the Original and Updated Technology Neutral Value Stack

Updated Tech-Neutral Value Stack

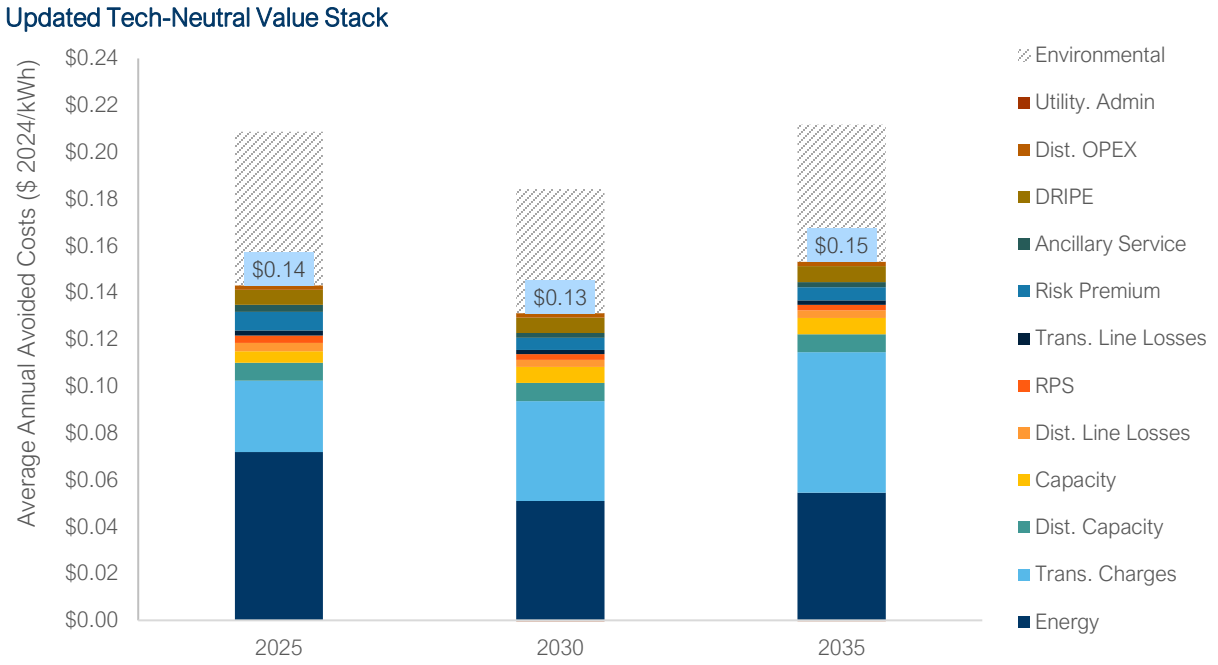


Compared to the original tech-neutral value stack, the total avoided costs (excluding environmental benefits) are, on average, about 17% higher in the initial years and about 5% higher in the later part of the study.

Original Tech-Neutral Value Stack



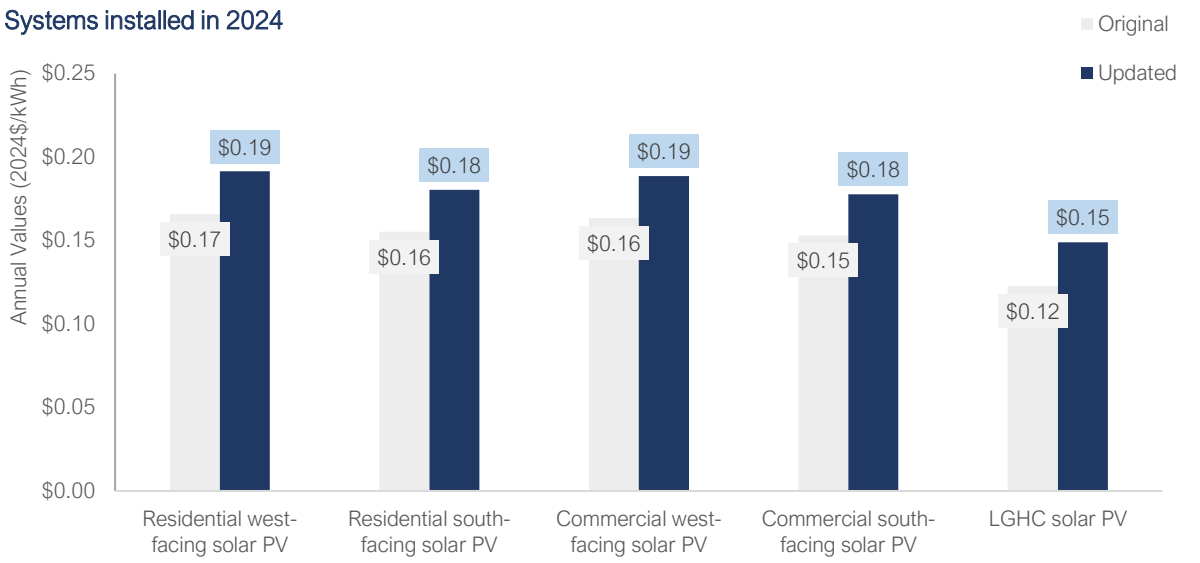
B.2 Updated Technology Neutral Value Stack

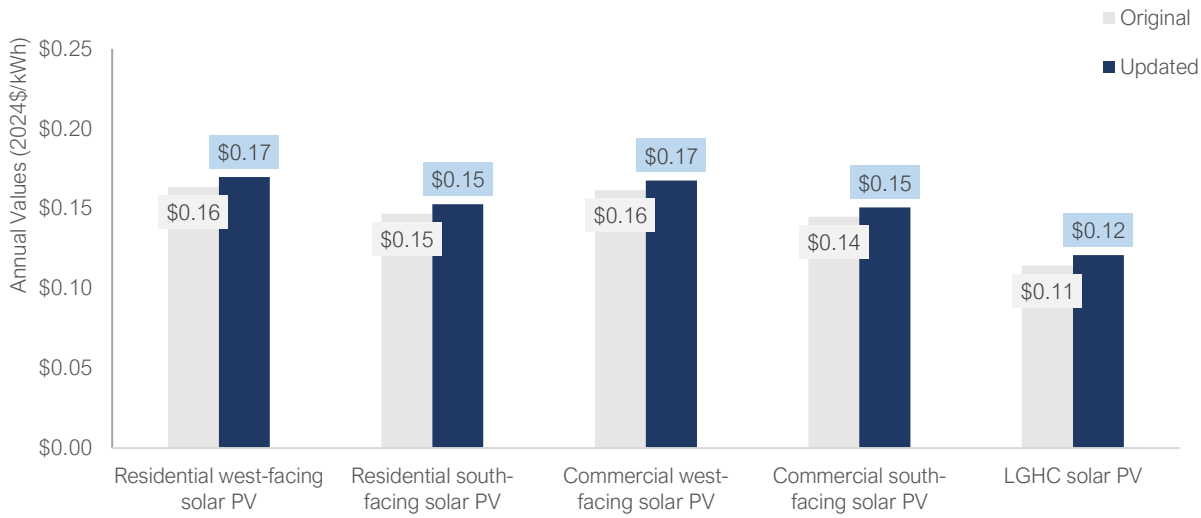


The updated avoided energy costs can make up to 50% of the overall tech-neutral value. Consistent with the original study, this value decreases gradually over time. The current high prices are due to the impact of high natural gas prices, which has been factored into the modified AESC energy forecast. However, the value of energy is expected to decrease over time as lower-cost resources like offshore wind and solar become more prevalent.

Transmission charges are forecasted to increase over time, increasing avoided cost value. Overall, Energy, Transmission Charges, Distribution Capacity, and Capacity Charges represent 80%-85% of the average annual DER avoided costs benefits (excluding environmental).

B.3 Value Captured by Solar PV Systems





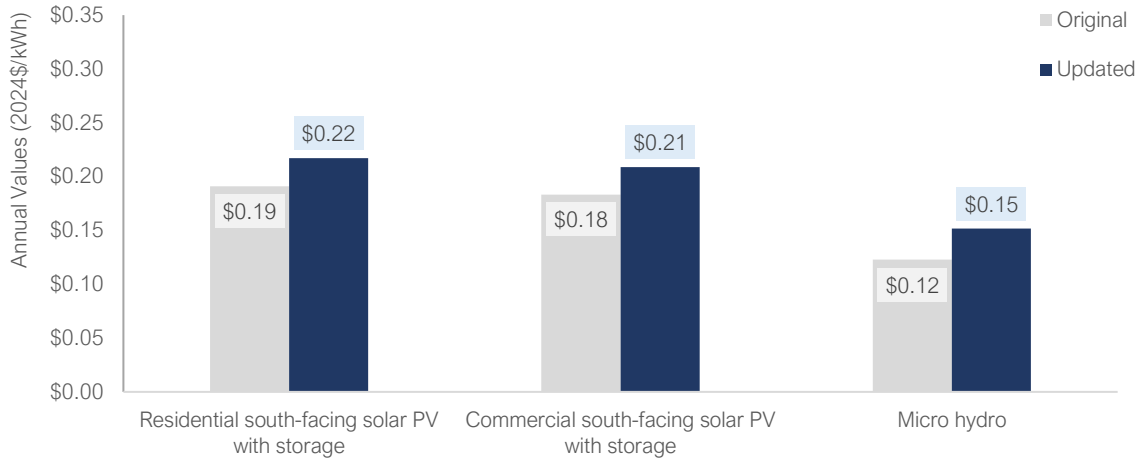
The value of solar-only systems tends to decrease over time due to the decreasing energy avoided costs. However, the updated total avoided costs in 2024 are approximately 15-20% higher than the original study. This increment gradually decreases to 5% by 2035.

Systems facing west can generate 6-11% more avoided cost value. However, the deployment of such systems is anticipated to be limited as customers are presently encouraged to prioritize south-facing installations that maximize volumetric production.

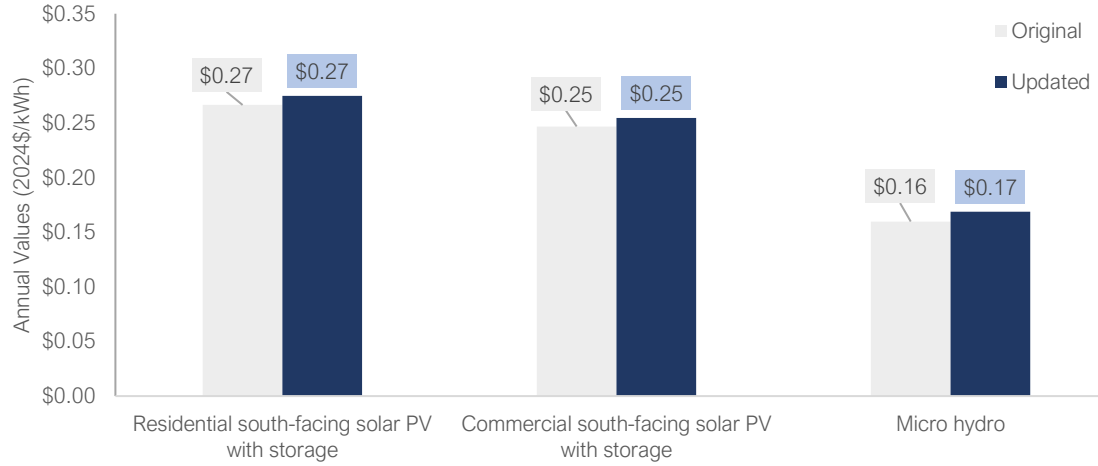
Commercial systems achieve less total value than residential systems. This is primarily due to reduced line loss and reduced RPS avoided cost value (due to a lower % of the energy consumed behind the meter) associated with commercial systems.

B.4 Value Captured by DG Systems

Systems installed in 2024



Systems installed in 2035



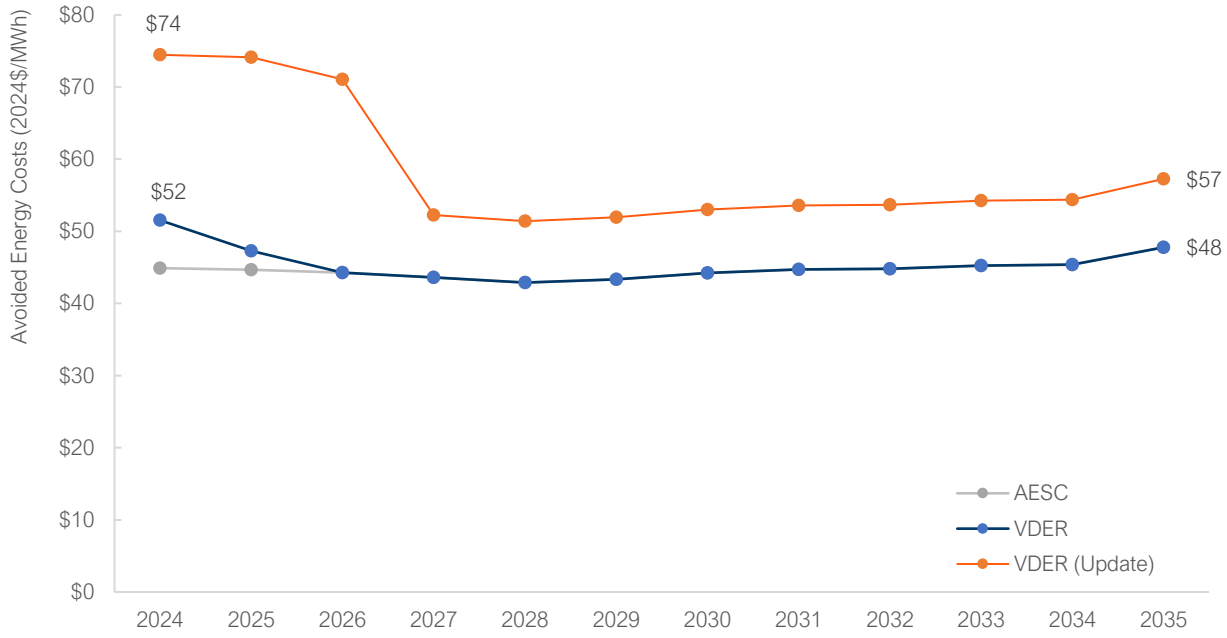
Over time, the value of solar paired with storage and micro-hydro systems increases significantly. The reason behind this is that these systems are able to capture transmission-avoided costs more effectively. Furthermore, as the transmission avoided costs continue to increase over the study period, the overall value captured by these systems also increases. Compared to the original study, solar-coupled storage assets have a total avoided cost of about 13% higher in 2024, whereas micro hydro facilities have an increased updated total avoided cost of 20%.

C. Updates to the Value Stack Components

C.1 Avoided Energy Costs

Key Update: The significant increase in natural gas prices due to COVID-19 and the conflict in Ukraine has resulted in a substantial rise in energy supply costs. To reflect this, the latest natural gas price forecast is being utilized to determine updated projections for wholesale energy costs. Consequently, we anticipate an expected increase of 20-60% in avoided energy costs compared to the initial projections in the VDER study. The results have been updated to reflect $2024 real values[1].

Near term escalations in avoided energy costs



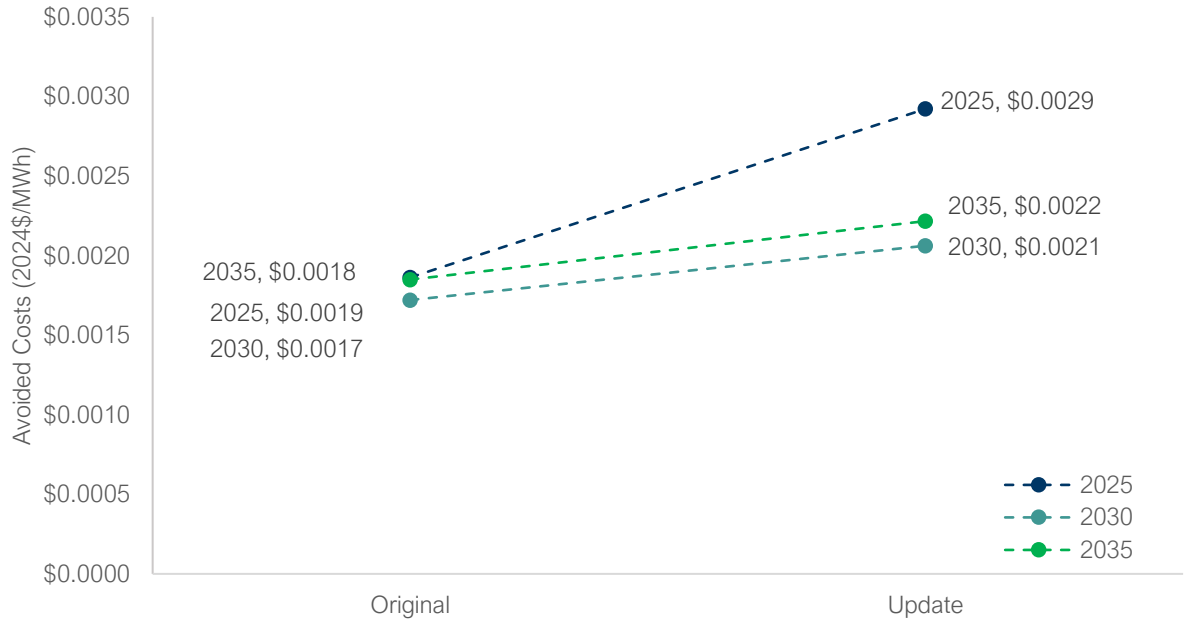
C.2 Avoided Capacity Costs

Key Updates: Updated to $2024 real values.

[1] The $2024 real was estimated based on a change in the CPI from first quarter of 2023 to 2024 based on historical trends. The inflation was based on the relative change in the 2021 CPI (271) to 2024 CPI (estimated 317).

C.3 Ancillary Services and Load Obligation Charges

Key Updates: The model assumes that ancillary services and load obligation charges are tied to energy costs – an update in wholesale energy costs will result in updated values to this value stack component. Further, the results were updated to $2024 real values.



C.4 RPS Compliance

Key Updates: Updated to $2024 real values.

C.5 Transmission Charges

Key Updates: Updated to $2024 real values.

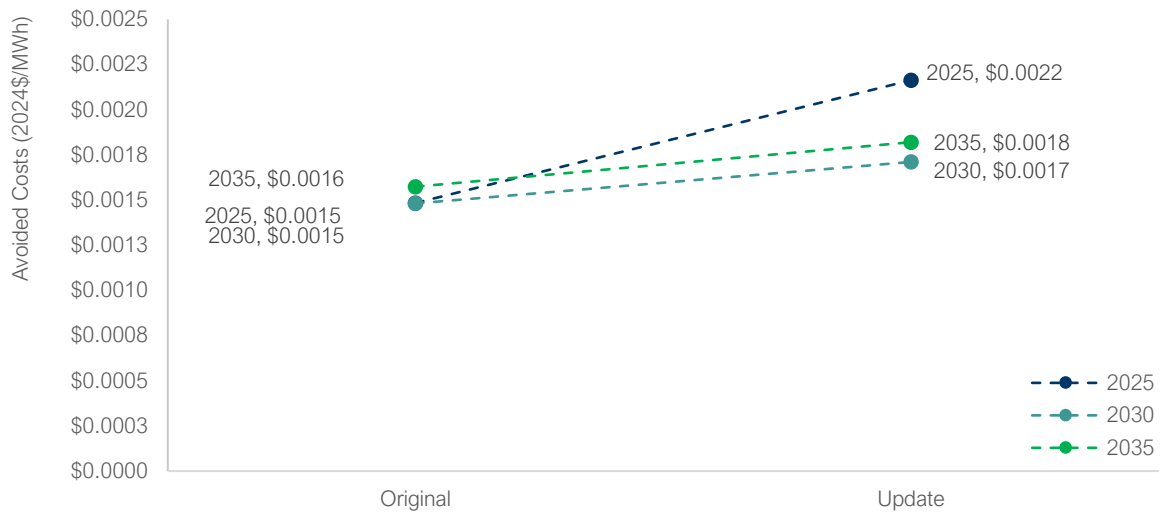
C.6 Distribution System Operating Expenses

Key Updates: Updated to $2024 real values.

C.7 Transmission Line Losses

Key Updates: The avoided transmission line loss is a cumulative value, incorporating line loss values from all relevant avoided cost criteria: energy, capacity, and wholesale market price suppression. An update to wholesale energy costs will result in an update to the avoided transmission line loss component.

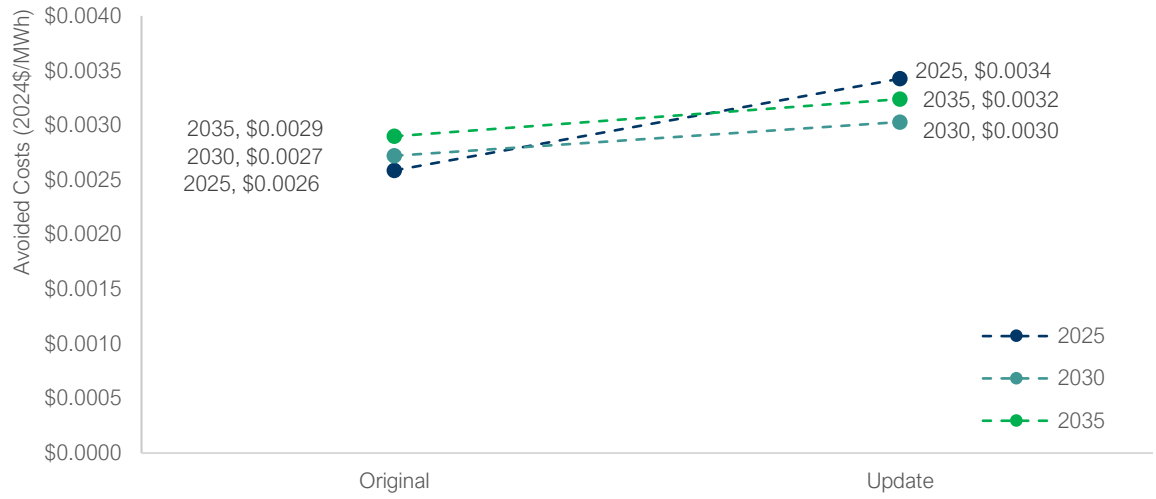
Transmission Line Loss



C.8 Distribution Line Losses

Key Updates: The avoided distribution line loss is a cumulative value, incorporating line loss values from all relevant avoided cost criteria: energy, capacity, and wholesale market price suppression. An update to wholesale energy costs will result in an update to the avoided distribution line loss component.

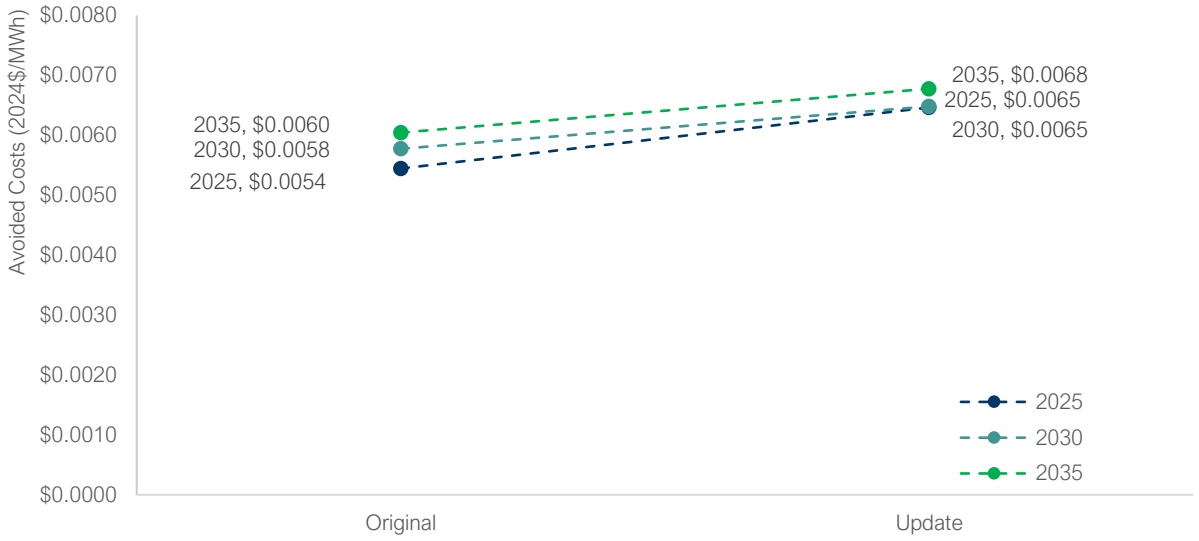
Distribution Line Loss



C.9 Wholesale Market Price Suppression

Key Updates: The electricity produced at the customer-generator's site reduces the overall energy and capacity procured through wholesale, resulting in lower market clearing prices. This price suppression effect, the Demand Reduction Induced Price Effect, or DRIPE, is ultimately passed on to all market participants. Since DRIPE is tied to wholesale energy costs, updated values are provided for this component. Further, the results were updated to $2024 real values.

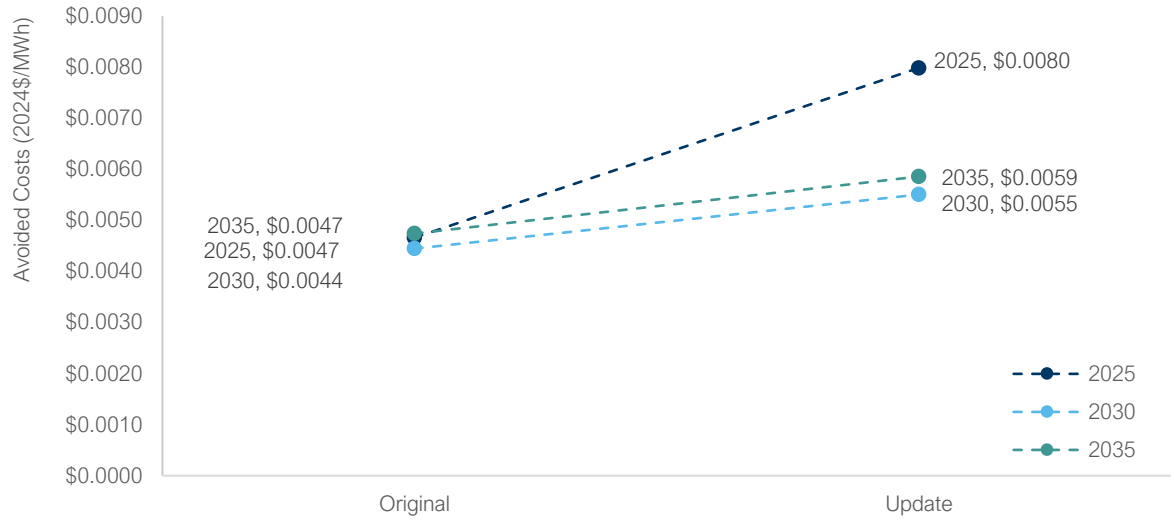
DRIPE



C.10 Wholesale Risk Premium

Key Updates: The full retail price of electricity is generally greater than the sum of the wholesale market prices for energy, capacity, and ancillary services. This is partly because the wholesale suppliers of retail customer load requirements incur various market risks when they set contract prices before supply delivery periods. Therefore, every wholesale energy and capacity obligation reduction may reduce the supplier's cost to mitigate such risks. As a result, an update to wholesale energy and ancillary service costs will result in an update to the wholesale risk premium charges. To account for increased risk in fuel supply in the near term, the near-term wholesale risk premiums were assumed to be 11%, higher than in the original study, leading to higher avoided costs. Over the study period, it was assumed that risk premiums would fall back to the default assumption in the AESC (8%). Further, the results were updated to $2024 real values.

Wholesale Risk Premium



C.11 Distribution Utility Administration Costs

Key Updates: Updated to $2024 real values.

C.12 Environmental Externalities

Key Updates: Updated to $2024 real values.

C.13 Distribution Grid Support Services

Key Updates: Updated to $2024 real values.

C.14 Resilience Services

Key Updates: Updated to $2024 real values.

C.15 Customer Installed Net Costs

Key Updates: Updated to $2024 real values.

D. Results Tables (Updated)

D.1 Technology-Neutral Value Stack

Table 1: Average Annual Technology-Neutral Value Stack ($/kWh) (2024$)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Energy	0.073	0.072	0.069	0.051	0.050	0.050	0.051	0.051	0.051	0.052	0.052	0.055
Transmission Charges	0.028	0.030	0.033	0.035	0.037	0.040	0.043	0.046	0.049	0.052	0.056	0.060
Distribution Capacity	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
Capacity	0.005	0.005	0.005	0.006	0.006	0.006	0.007	0.007	0.007	0.007	0.008	0.007
Distribution Line Losses	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003
RPS	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002
Transmission Line Losses	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Risk Premium	0.010	0.008	0.007	0.005	0.005	0.005	0.006	0.006	0.006	0.006	0.006	0.006
Ancillary Services	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
DRIPE	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.007	0.007
Distribution OPEX	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Utility Admin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Environmental Externality	0.065	0.066	0.064	0.060	0.057	0.057	0.053	0.055	0.055	0.056	0.057	0.058
Total – Excluding Environmental	0.143	0.143	0.140	0.122	0.123	0.127	0.131	0.135	0.138	0.142	0.147	0.153
Total – Including Environmental	0.208	0.208	0.204	0.182	0.180	0.183	0.184	0.189	0.193	0.198	0.204	0.211

Table 2. Average Annual Technology-Neutral Value, Minimum Hourly Value, and Maximum Hourly Value ($/kWh) (2024$)

	2025			2030			2035		
	Average Annual Value ($/kWh)	Minimum Hourly Value ($/kWh)	Maximum Hourly Value ($/kWh)	Average Annual Value ($/kWh)	Minimum Hourly Value ($/kWh)	Maximum Hourly Value ($/kWh)	Average Annual Value ($/kWh)	Minimum Hourly Value ($/kWh)	Maximum Hourly Value ($/kWh)
Energy	0.072	0.0168	0.1409	0.051	-0.0118	0.2030	0.055	-0.0115	0.2229
Transmission Charges	0.030	-	22.8093	0.043	-	32.0500	0.060	-	45.0344
Distribution Capacity	0.008	-	0.7197	0.008	-	0.7183	0.008	-	0.7057
Capacity	0.005	-	43.3843	0.007	-	59.8000	0.007	-	60.9725
Distribution Line Losses	0.003	0.0003	5.8434	0.003	-0.0001	6.7546	0.003	-0.0001	6.8874
RPS	0.003	0.0032	0.0032	0.002	0.0025	0.0025	0.002	0.0024	0.0024
Transmission Line Losses	0.002	0.0004	1.9425	0.002	-0.0003	2.2448	0.002	-0.0003	2.2890
Risk Premium	0.008	0.0017	1.4468	0.006	-0.0010	0.8698	0.006	-0.0009	0.9733
Ancillary Services	0.003	0.0005	0.0095	0.002	-0.0008	0.0082	0.002	-0.0008	0.0129
DRIPE	0.006	0.0002	8.3451	0.006	-0.0009	9.4254	0.007	-0.0009	10.0161
Distribution OPEX	0.002	-	0.1741	0.002	-	0.1741	0.002	-	0.1741
Utility Admin	-	-0.0019	-	-	-0.0020	-	-	-0.0020	-
Environmental Externality	0.066	-0.0094	0.1875	0.053	-	0.1399	0.058	-	0.1315

D.2 Residential and Commercial Solar PV

Table 3. Average Annual Avoided Cost Value for Residential South-Facing Solar PV Array Installed in 2024 ($/kWh) (2024$)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Energy	0.065	0.062	0.058	0.041	0.038	0.038	0.038	0.038	0.037	0.037	0.037	0.040
Transmission Charges	0.042	0.044	0.047	0.045	0.048	0.052	0.055	0.058	0.049	0.041	0.044	0.043
Distribution Capacity	0.022	0.022	0.023	0.023	0.023	0.023	0.022	0.022	0.021	0.021	0.021	0.021
Capacity	0.018	0.019	0.018	0.023	0.023	0.023	0.026	0.026	0.026	0.027	0.030	0.026
Distribution Line Losses	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
RPS	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002
Transmission Line Losses	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Risk Premium	0.011	0.009	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Ancillary Services	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
DRIPE	0.008	0.008	0.007	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006
Distribution OPEX	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Utility Admin	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Environmental Externality	0.057	0.054	0.048	0.044	0.039	0.038	0.036	0.036	0.036	0.037	0.038	0.041
Total – Excluding Environmental	0.185	0.183	0.178	0.161	0.161	0.164	0.169	0.172	0.161	0.155	0.161	0.157
Total – Including Environmental	0.242	0.237	0.225	0.205	0.200	0.203	0.205	0.207	0.197	0.192	0.199	0.198

Table 4. Average Annual Avoided Cost Value for Residential West-Facing Solar PV Array Installed in 2024 ($/kWh) (2024$)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Energy	0.066	0.064	0.059	0.042	0.040	0.039	0.039	0.039	0.039	0.039	0.039	0.041
Transmission Charges	0.047	0.049	0.052	0.048	0.051	0.054	0.057	0.061	0.050	0.046	0.049	0.051
Distribution Capacity	0.025	0.024	0.025	0.025	0.025	0.025	0.024	0.024	0.023	0.023	0.023	0.023
Capacity	0.020	0.021	0.020	0.025	0.025	0.026	0.028	0.029	0.029	0.030	0.033	0.028
Distribution Line Losses	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.005
RPS	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002
Transmission Line Losses	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Risk Premium	0.011	0.009	0.008	0.007	0.006	0.006	0.007	0.007	0.007	0.007	0.007	0.007
Ancillary Services	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
DRIPE	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.007
Distribution OPEX	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Utility Admin	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Environmental Externality	0.057	0.055	0.049	0.046	0.042	0.041	0.038	0.038	0.039	0.040	0.040	0.043
Total – Excluding Environmental	0.196	0.195	0.191	0.172	0.172	0.175	0.181	0.184	0.171	0.169	0.175	0.174
Total – Including Environmental	0.253	0.250	0.240	0.218	0.214	0.216	0.219	0.222	0.210	0.208	0.216	0.217

Table 5. Average Annual Avoided Cost Value for Commercial South-Facing Solar PV Array Installed in 2024 ($/kWh) (2024$)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Energy	0.065	0.062	0.058	0.041	0.038	0.038	0.038	0.038	0.037	0.037	0.037	0.040
Transmission Charges	0.042	0.044	0.047	0.045	0.048	0.052	0.055	0.058	0.049	0.041	0.044	0.043
Distribution Capacity	0.022	0.022	0.023	0.023	0.023	0.023	0.022	0.022	0.021	0.021	0.021	0.021
Capacity	0.018	0.019	0.018	0.023	0.023	0.023	0.026	0.026	0.026	0.027	0.030	0.026
Distribution Line Losses	0.003	0.004	0.003	0.004	0.003	0.004	0.004	0.004	0.004	0.004	0.004	0.004
RPS	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001
Transmission Line Losses	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Risk Premium	0.011	0.009	0.007	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Ancillary Services	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
DRIPE	0.008	0.008	0.007	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.006
Distribution OPEX	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Utility Admin	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Environmental Externality	0.057	0.054	0.048	0.044	0.039	0.038	0.036	0.036	0.036	0.037	0.038	0.041
Total – No Environmental	0.182	0.180	0.175	0.159	0.159	0.162	0.167	0.170	0.159	0.153	0.159	0.155
Total – Including Environmental	0.239	0.234	0.223	0.203	0.198	0.201	0.203	0.205	0.195	0.190	0.197	0.196

Table 6. Average Annual Avoided Cost Value for Commercial West-Facing Solar PV Array Installed in 2024 ($/kWh) (2024$)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Energy	0.066	0.064	0.059	0.042	0.040	0.039	0.039	0.039	0.039	0.039	0.039	0.041
Transmission Charges	0.047	0.049	0.052	0.048	0.051	0.054	0.057	0.061	0.050	0.046	0.049	0.051
Distribution Capacity	0.025	0.024	0.025	0.025	0.025	0.025	0.024	0.024	0.023	0.023	0.023	0.023
Capacity	0.020	0.021	0.020	0.025	0.025	0.026	0.028	0.029	0.029	0.030	0.033	0.028
Distribution Line Losses	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.005	0.004
RPS	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001
Transmission Line Losses	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Risk Premium	0.011	0.009	0.008	0.007	0.006	0.006	0.007	0.007	0.006	0.007	0.007	0.007
Ancillary Services	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
DRIPE	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.007	0.007	0.007
Distribution OPEX	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Utility Admin	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Environmental Externality	0.057	0.055	0.049	0.046	0.042	0.041	0.038	0.038	0.039	0.040	0.040	0.043
Total – No Environmental	0.193	0.192	0.188	0.170	0.170	0.173	0.179	0.181	0.169	0.167	0.173	0.172
Total – Including Environmental	0.250	0.247	0.237	0.216	0.211	0.214	0.217	0.220	0.208	0.206	0.214	0.215

Table 7. Average Hourly Seasonal Avoided Cost Values for Residential South-Facing Solar PV Array Installed in 2024 – Spring ($/kWh) (2024$)

		2024					2035				
Season	Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Spring	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-
	6	0.045	-	0.003	0.117	0.103	0.025	-	0.002	0.035	0.026
	7	0.047	-	0.003	0.096	0.081	0.029	-	0.002	0.051	0.042
	8	0.058	-	0.004	0.068	0.051	0.033	-	0.002	0.044	0.034
	9	0.060	-	0.004	0.066	0.049	0.031	-	0.002	0.037	0.028
	10	0.059	-	0.004	0.061	0.045	0.025	-	0.002	0.025	0.017
	11	0.057	-	0.004	0.055	0.039	0.022	-	0.002	0.022	0.014
	12	0.057	-	0.004	0.057	0.041	0.023	-	0.002	0.026	0.018
	13	0.057	-	0.004	0.056	0.040	0.023	-	0.002	0.027	0.019
	14	0.058	-	0.223	0.057	0.041	0.023	-	0.002	0.027	0.019
	15	0.059	-	0.004	0.059	0.043	0.024	-	0.002	0.025	0.016
	16	0.061	-	0.004	0.068	0.051	0.030	-	0.002	0.035	0.025
	17	0.064	-	0.004	0.081	0.063	0.041	-	0.003	0.067	0.055
	18	0.064	-	0.004	0.082	0.063	0.048	-	0.003	0.086	0.072
	19	0.061	-	0.077	0.072	0.054	0.051	-	0.004	0.089	0.075
	20	0.055	-	0.004	0.062	0.044	0.049	-	0.003	0.093	0.079
	21	0.054	-	0.004	0.051	0.033	0.049	-	1.361	0.093	0.078
	22	-	-	-	-	-	-	-	-	-	-
	23	-	-	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-	-	-

Table 8. Average Hourly Seasonal Avoided Cost Values for Residential South-Facing Solar PV Array Installed in 2024 – Summer ($/kWh) (2024$)

		2024					2035				
Season	Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Summer	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-
	6	0.047	-	0.003	0.116	0.103	0.032	-	0.002	0.061	0.053
	7	0.048	-	0.003	0.096	0.082	0.038	-	0.003	0.071	0.061
	8	0.055	-	0.004	0.085	0.069	0.042	-	0.003	0.064	0.053
	9	0.055	-	0.004	0.080	0.064	0.042	-	0.003	0.064	0.053
	10	0.055	-	0.006	0.078	0.063	0.040	-	0.006	0.058	0.048
	11	0.055	-	0.051	0.077	0.061	0.038	-	0.050	0.054	0.044
	12	0.056	-	0.073	0.078	0.062	0.039	-	0.071	0.056	0.046
	13	0.056	-	0.086	0.077	0.061	0.041	-	0.084	0.059	0.049
	14	0.056	-	0.355	0.078	0.062	0.042	-	0.612	0.063	0.053
	15	0.057	0.433	0.675	0.183	0.064	0.042	0.663	0.233	0.071	0.052
	16	0.058	-	0.124	0.080	0.063	0.046	-	0.122	0.071	0.059
	17	0.059	-	0.121	0.074	0.057	0.055	-	1.098	0.198	0.070
	18	0.060	-	0.095	0.062	0.044	0.063	-	0.094	0.089	0.073
	19	0.060	-	0.067	0.058	0.040	0.071	-	0.067	0.087	0.070
	20	0.059	-	0.012	0.064	0.046	0.066	-	0.012	0.089	0.073
	21	0.058	-	0.004	0.063	0.046	0.059	-	0.004	0.088	0.073
	22	-	-	-	-	-	-	-	-	-	-
	23	-	-	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-	-	-

Table 9. Average Hourly Seasonal Avoided Cost Values for Residential South-Facing Solar PV Array Installed in 2024 – Fall ($/kWh) (2024$)

		2024					2035				
Season	Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Fall	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	-	-	-	-	-
	7	0.049	-	0.003	0.087	0.072	0.044	-	0.003	0.081	0.070
	8	0.060	-	0.004	0.085	0.066	0.051	-	0.004	0.079	0.065
	9	0.060	-	0.004	0.083	0.064	0.050	-	0.004	0.072	0.058
	10	0.059	-	0.004	0.083	0.065	0.043	-	0.003	0.059	0.046
	11	0.058	-	0.004	0.081	0.063	0.042	-	0.003	0.056	0.044
	12	0.058	-	0.004	0.080	0.063	0.043	-	0.003	0.059	0.047
	13	0.058	-	0.004	0.079	0.062	0.044	-	0.003	0.064	0.051
	14	0.057	-	0.004	0.080	0.062	0.045	-	0.003	0.069	0.056
	15	0.056	-	0.004	0.081	0.064	0.044	-	0.003	0.067	0.054
	16	0.055	-	0.004	0.079	0.062	0.048	-	0.003	0.081	0.067
	17	0.054	-	0.466	0.071	0.054	0.051	-	0.004	0.094	0.080
	18	0.053	-	0.007	0.055	0.038	0.052	-	0.003	0.095	0.081
	19	0.053	-	0.003	0.053	0.038	0.052	-	0.003	0.096	0.083
	20	0.053	-	0.003	0.047	0.031	0.051	-	1.505	0.096	0.083
	21	-	-	-	-	-	-	-	-	-	-
	22	-	-	-	-	-	-	-	-	-	-
	23	-	-	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-	-	-

Table 10. Average Hourly Seasonal Avoided Cost Values for Residential South-Facing Solar PV Array Installed in 2024 – Winter($/kWh) (2024$)

		2024					2035				
Season	Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Winter	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	-	-	-	-	-
	7	0.116	-	0.007	0.093	0.063	0.078	-	0.005	0.086	0.067
	8	0.123	-	0.008	0.104	0.071	0.085	-	0.006	0.089	0.067
	9	0.121	-	0.008	0.102	0.069	0.085	-	0.006	0.086	0.063
	10	0.119	-	0.008	0.098	0.066	0.071	-	0.005	0.067	0.048
	11	0.117	-	0.008	0.095	0.064	0.067	-	0.005	0.061	0.042
	12	0.117	-	0.008	0.095	0.063	0.066	-	0.005	0.062	0.043
	13	0.117	-	0.008	0.095	0.064	0.065	-	0.005	0.061	0.042
	14	0.118	-	0.008	0.096	0.064	0.067	-	0.005	0.063	0.044
	15	0.119	-	0.008	0.098	0.065	0.068	-	0.005	0.062	0.042
	16	0.122	-	0.008	0.102	0.067	0.078	-	0.006	0.077	0.055
	17	0.126	-	0.008	0.102	0.068	0.094	-	0.007	0.100	0.076
	18	0.127	-	0.008	0.106	0.073	0.099	-	0.007	0.104	0.080
	19	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	-	-	-	-	-	-	-
	21	-	-	-	-	-	-	-	-	-	-
	22	-	-	-	-	-	-	-	-	-	-
	23	-	-	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-	-	-

D.3 Residential and Commercial Solar PV Paired with Storage

Table 11. Average Annual Avoided Cost Value for Residential South-Facing Solar PV Array Paired with Storage Installed in 2024 ($/kWh) (2024$)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Energy	0.067	0.066	0.063	0.045	0.045	0.045	0.046	0.046	0.046	0.046	0.047	0.049
Transmission Charges	0.075	0.085	0.091	0.092	0.098	0.104	0.111	0.118	0.120	0.126	0.134	0.149
Distribution Capacity	0.023	0.022	0.023	0.023	0.023	0.023	0.022	0.022	0.021	0.021	0.021	0.021
Capacity	0.019	0.020	0.020	0.025	0.024	0.025	0.027	0.028	0.028	0.029	0.032	0.027
Distribution Line Losses	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.006	0.006
RPS	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002
Transmission Line Losses	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.003	0.003	0.003	0.003	0.003
Risk Premium	0.011	0.009	0.008	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.008	0.008
Ancillary Services	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
DRIPE	0.009	0.009	0.008	0.008	0.008	0.008	0.008	0.009	0.010	0.010	0.010	0.010
Distribution OPEX	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Utility Admin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Environmental Externality	0.055	0.058	0.057	0.053	0.052	0.052	0.048	0.050	0.050	0.051	0.052	0.053
Total – Excluding Environmental	0.222	0.231	0.230	0.216	0.221	0.228	0.238	0.248	0.249	0.257	0.269	0.281
Total – Including Environmental	0.277	0.289	0.287	0.270	0.273	0.281	0.286	0.297	0.299	0.307	0.321	0.334

Table 12. Average Annual Avoided Cost Value for Commercial South-Facing Solar PV Array Paired with Storage Installed in 2024 ($/kWh) (2024$)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Energy	0.067	0.065	0.062	0.045	0.044	0.044	0.045	0.045	0.045	0.045	0.045	0.048
Transmission Charges	0.070	0.079	0.084	0.085	0.090	0.096	0.102	0.109	0.109	0.113	0.121	0.133
Distribution Capacity	0.023	0.022	0.023	0.023	0.023	0.023	0.022	0.022	0.021	0.021	0.021	0.021
Capacity	0.019	0.020	0.020	0.024	0.024	0.025	0.027	0.028	0.027	0.029	0.032	0.027
Distribution Line Losses	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.005	0.004
RPS	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.001
Transmission Line Losses	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.003	0.003
Risk Premium	0.011	0.009	0.008	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007
Ancillary Services	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
DRIPE	0.009	0.009	0.008	0.008	0.008	0.008	0.008	0.009	0.009	0.009	0.009	0.009
Distribution OPEX	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Utility Admin	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Environmental Externality	0.056	0.058	0.055	0.052	0.050	0.050	0.047	0.048	0.048	0.049	0.050	0.051
Total – Excluding Environmental	0.214	0.221	0.220	0.206	0.210	0.217	0.226	0.234	0.234	0.240	0.251	0.260
Total – Including Environmental	0.269	0.279	0.275	0.258	0.260	0.267	0.272	0.282	0.282	0.288	0.301	0.312

Table 13. Average Hourly Seasonal Avoided Cost Values for Residential South-Facing Solar PV Array Paired with Storage Installed in 2024 - Spring ($/kWh) (2024$)

		2024					2035				
Season	Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Spring	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-
	6	0.045	-	0.003	0.117	0.103	0.025	-	0.002	0.035	0.026
	7	0.047	-	0.003	0.096	0.081	0.029	-	0.002	0.051	0.042
	8	0.058	-	0.004	0.068	0.051	0.033	-	0.002	0.044	0.034
	9	0.060	-	0.004	0.066	0.049	0.031	-	0.002	0.037	0.028
	10	0.059	-	0.004	0.061	0.045	0.025	-	0.002	0.025	0.017
	11	0.056	-	0.004	0.056	0.040	0.022	-	0.002	0.022	0.015
	12	0.057	-	0.004	0.057	0.042	0.023	-	0.002	0.026	0.019
	13	0.057	-	0.004	0.056	0.040	0.023	-	0.002	0.028	0.020
	14	0.058	-	0.227	0.057	0.041	0.023	-	0.002	0.027	0.019
	15	0.059	-	0.004	0.059	0.043	0.024	-	0.002	0.025	0.016
	16	0.061	-	0.004	0.068	0.051	0.030	-	0.002	0.035	0.025
	17	0.064	-	0.004	0.081	0.063	0.041	-	0.003	0.067	0.055
	18	0.067	-	0.004	0.084	0.064	0.050	-	0.003	0.085	0.071
	19	0.068	-	0.202	0.080	0.060	0.056	-	0.004	0.086	0.070
	20	0.068	-	0.004	0.077	0.058	0.057	-	0.451	0.086	0.071
	21	0.069	-	0.221	0.075	0.055	0.057	-	0.919	0.089	0.073
	22	-	-	-	-	-	-	-	-	-	-
	23	-	-	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-	-	-

Table 14. Average Hourly Seasonal Avoided Cost Values for Residential South-Facing Solar PV Array Paired with Storage Installed in 2024 - Summer ($/kWh) (2024$)

		2024					2035				
Season	Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Summer	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-
	6	0.047	-	0.003	0.116	0.103	0.032	-	0.002	0.061	0.053
	7	0.048	-	0.003	0.096	0.082	0.038	-	0.003	0.071	0.061
	8	0.055	-	0.004	0.085	0.069	0.042	-	0.003	0.064	0.053
	9	0.055	-	0.004	0.080	0.064	0.042	-	0.003	0.064	0.053
	10	0.055	-	0.006	0.078	0.063	0.040	-	0.006	0.058	0.048
	11	0.055	-	0.051	0.077	0.061	0.038	-	0.049	0.053	0.044
	12	0.056	-	0.073	0.078	0.062	0.039	-	0.071	0.057	0.046
	13	0.056	-	0.088	0.077	0.061	0.041	-	0.085	0.060	0.049
	14	0.056	-	0.358	0.078	0.062	0.042	-	0.618	0.063	0.053
	15	0.057	0.433	0.675	0.183	0.064	0.042	0.663	0.233	0.071	0.052
	16	0.058	-	0.124	0.080	0.063	0.046	-	0.122	0.071	0.059
	17	0.059	-	0.122	0.074	0.057	0.055	-	1.106	0.201	0.070
	18	0.060	-	0.098	0.062	0.044	0.064	-	0.097	0.089	0.073
	19	0.060	-	0.072	0.058	0.040	0.072	-	0.072	0.088	0.070
	20	0.060	-	0.020	0.064	0.046	0.069	-	0.021	0.091	0.073
	21	0.058	-	0.004	0.063	0.046	0.059	-	0.004	0.088	0.073
	22	-	-	-	-	-	-	-	-	-	-
	23	-	-	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-	-	-

Table 15. Average Hourly Seasonal Avoided Cost Values for Residential South-Facing Solar PV Array Paired with Storage Installed in 2024 - Fall ($/kWh) (2024$)

		2024					2035				
Season	Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Fall	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	-	-	-	-	-
	7	0.049	-	0.003	0.087	0.072	0.044	-	0.003	0.081	0.070
	8	0.060	-	0.004	0.085	0.066	0.051	-	0.004	0.079	0.065
	9	0.060	-	0.004	0.083	0.064	0.050	-	0.004	0.072	0.058
	10	0.059	-	0.004	0.083	0.065	0.043	-	0.003	0.059	0.046
	11	0.046	-	0.003	0.071	0.059	0.029	-	0.002	0.040	0.033
	12	0.052	-	0.003	0.077	0.062	0.036	-	0.003	0.050	0.040
	13	0.051	-	0.003	0.077	0.062	0.037	-	0.003	0.056	0.046
	14	0.045	-	0.003	0.073	0.061	0.032	-	0.002	0.057	0.049
	15	0.056	-	0.004	0.081	0.064	0.044	-	0.003	0.067	0.054
	16	0.055	-	0.004	0.079	0.062	0.048	-	0.003	0.081	0.067
	17	0.053	-	0.578	0.069	0.053	0.051	-	0.003	0.094	0.080
	18	0.061	-	0.211	0.061	0.041	0.059	-	0.004	0.093	0.076
	19	0.062	-	0.004	0.056	0.036	0.060	-	0.488	0.093	0.076
	20	0.062	-	0.238	0.060	0.040	0.060	-	0.994	0.095	0.077
	21	0.066	-	0.005	0.078	0.056	0.063	-	0.005	0.097	0.078
	22	-	-	-	-	-	-	-	-	-	-
	23	-	-	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-	-	-

Table 16. Average Hourly Seasonal Avoided Cost Values for Residential South-Facing Solar PV Array Paired with Storage Installed in 2024 - Winter($/kWh) (2024$)

			2024					2035				
Season		Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Winter		1	-	-	-	-	-	-	-	-	-	-
		2	-	-	-	-	-	-	-	-	-	-
		3	-	-	-	-	-	-	-	-	-	-
		4	-	-	-	-	-	-	-	-	-	-
		5	-	-	-	-	-	-	-	-	-	-
		6	-	-	-	-	-	-	-	-	-	-
		7	0.116	-	0.007	0.093	0.063	0.078	-	0.005	0.086	0.067
		8	0.123	-	0.008	0.104	0.071	0.085	-	0.006	0.089	0.067
		9	0.121	-	0.008	0.102	0.069	0.085	-	0.006	0.086	0.063
		10	0.119	-	0.008	0.098	0.066	0.071	-	0.005	0.067	0.048
		11	0.116	-	0.008	0.098	0.066	0.074	-	0.005	0.071	0.050
		12	0.113	-	0.007	0.102	0.069	0.084	-	0.006	0.085	0.062
		13	0.113	-	0.007	0.100	0.067	0.085	-	0.006	0.087	0.063
		14	0.115	-	0.008	0.098	0.066	0.079	-	0.006	0.081	0.058
		15	0.119	-	0.008	0.098	0.065	0.068	-	0.005	0.062	0.042
		16	0.122	-	0.008	0.102	0.067	0.078	-	0.006	0.077	0.055
		17	0.126	-	0.008	0.102	0.068	0.094	-	0.007	0.100	0.076
		18	0.124	-	0.229	0.095	0.060	0.107	-	0.007	0.105	0.077
		19	0.124	-	0.466	0.095	0.059	0.108	-	1.443	0.107	0.078
		20	0.123	-	0.008	0.101	0.065	0.107	-	0.007	0.109	0.080
		21	0.123	-	0.008	0.105	0.070	0.105	-	0.007	0.111	0.082
		22	-	-	-	-	-	-	-	-	-	-
		23	-	-	-	-	-	-	-	-	-	-
		24	-	-	-	-	-	-	-	-	-	-

D.4 Large Group Host Commercial Solar PV

Table 17. Average Annual Avoided Cost Value for Large Group Host Commercial Solar PV Array Installed in 2024 ($/kWh) (2024$)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Energy	0.070	0.067	0.063	0.045	0.042	0.041	0.042	0.041	0.040	0.041	0.040	0.043
Transmission Charges	0.028	0.030	0.031	0.029	0.031	0.033	0.035	0.037	0.031	0.027	0.029	0.030
Distribution Capacity	0.015	0.015	0.016	0.016	0.016	0.016	0.015	0.015	0.015	0.015	0.014	0.014
Capacity	0.012	0.013	0.013	0.016	0.016	0.016	0.018	0.018	0.018	0.019	0.021	0.018
Distribution Line Losses	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RPS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transmission Line Losses	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Risk Premium	0.010	0.008	0.007	0.006	0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.006
Ancillary Services	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
DRIPE	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.006	0.007
Distribution OPEX	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004	0.004
Utility Admin	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
Environmental Externality	0.059	0.056	0.050	0.046	0.041	0.041	0.038	0.038	0.038	0.039	0.040	0.043
Total – Excluding Environmental	0.152	0.149	0.144	0.124	0.123	0.125	0.128	0.129	0.122	0.120	0.123	0.124
Total – Including Environmental	0.211	0.205	0.194	0.170	0.164	0.165	0.166	0.167	0.160	0.159	0.163	0.166

Table 18. Average Hourly Seasonal Avoided Cost Values for Large Group Host Commercial Solar PV Array Installed in 2024 – Spring ($/kWh) (2024$)

		2024					2035				
Season	Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Spring	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-
	5	0.045	-	0.001	0.108	0.097	0.026	-	0.001	0.037	0.030
	6	0.044	-	0.001	0.095	0.084	0.024	-	0.001	0.029	0.022
	7	0.055	-	0.001	0.086	0.073	0.032	-	0.001	0.048	0.040
	8	0.063	-	0.002	0.065	0.051	0.035	-	0.001	0.042	0.034
	9	0.062	-	0.002	0.062	0.049	0.032	-	0.001	0.035	0.028
	10	0.060	-	0.002	0.057	0.044	0.025	-	0.001	0.023	0.017
	11	0.058	-	0.002	0.050	0.038	0.022	-	0.001	0.019	0.014
	12	0.058	-	0.002	0.053	0.041	0.023	-	0.001	0.023	0.018
	13	0.058	-	0.002	0.052	0.039	0.023	-	0.001	0.024	0.019
	14	0.058	-	0.218	0.054	0.041	0.024	-	0.001	0.024	0.019
	15	0.059	-	0.002	0.056	0.042	0.024	-	0.001	0.022	0.016
	16	0.061	-	0.002	0.064	0.050	0.030	-	0.001	0.032	0.025
	17	0.065	-	0.002	0.078	0.063	0.042	-	0.001	0.065	0.055
	18	0.064	-	0.002	0.078	0.063	0.048	-	0.001	0.083	0.072
	19	0.055	-	0.001	0.060	0.047	0.048	-	0.001	0.093	0.081
	20	-	-	-	-	-	-	-	-	-	-
	21	-	-	-	-	-	-	-	-	-	-
	22	-	-	-	-	-	-	-	-	-	-
	23	-	-	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-	-	-

Table 19. Average Hourly Seasonal Avoided Cost Values for Large Group Host Commercial Solar PV Array Installed in 2024 – Summer ($/kWh) (2024$)

		2024					2035				
Season	Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Summer	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-
	5	0.046	-	0.001	0.107	0.098	0.030	-	0.001	0.048	0.042
	6	0.048	-	0.001	0.119	0.109	0.038	-	0.001	0.076	0.069
	7	0.049	-	0.001	0.096	0.085	0.040	-	0.001	0.074	0.066
	8	0.055	-	0.001	0.082	0.069	0.044	-	0.001	0.064	0.054
	9	0.055	-	0.001	0.077	0.065	0.043	-	0.001	0.063	0.054
	10	0.055	-	0.004	0.075	0.063	0.041	-	0.004	0.057	0.049
	11	0.055	-	0.051	0.073	0.061	0.038	-	0.049	0.052	0.044
	12	0.056	-	0.071	0.074	0.062	0.040	-	0.070	0.054	0.047
	13	0.056	-	0.088	0.073	0.061	0.041	-	0.086	0.057	0.049
	14	0.056	-	0.358	0.075	0.063	0.042	-	0.618	0.061	0.053
	15	0.057	0.458	0.609	0.179	0.064	0.043	0.700	0.163	0.063	0.053
	16	0.058	-	0.130	0.077	0.064	0.047	-	0.127	0.070	0.061
	17	0.059	-	0.121	0.071	0.057	0.055	-	1.095	0.202	0.071
	18	0.060	-	0.101	0.057	0.043	0.065	-	0.099	0.087	0.073
	19	0.060	-	0.058	0.054	0.040	0.069	-	0.057	0.084	0.069
	20	-	-	-	-	-	-	-	-	-	-
	21	-	-	-	-	-	-	-	-	-	-
	22	-	-	-	-	-	-	-	-	-	-
	23	-	-	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-	-	-

Table 20. Average Hourly Seasonal Avoided Cost Values for Large Group Host Commercial Solar PV Array Installed in 2024 – Fall ($/kWh) (2024$)

		2024					2035				
Season	Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Fall	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-
	6	0.044	-	0.001	0.092	0.082	0.036	-	0.001	0.071	0.065
	7	0.045	-	0.001	0.082	0.071	0.041	-	0.001	0.079	0.070
	8	0.058	-	0.002	0.080	0.065	0.049	-	0.001	0.076	0.065
	9	0.059	-	0.002	0.079	0.064	0.049	-	0.001	0.068	0.057
	10	0.058	-	0.002	0.080	0.066	0.042	-	0.001	0.055	0.045
	11	0.059	-	0.002	0.078	0.064	0.043	-	0.001	0.055	0.045
	12	0.058	-	0.002	0.077	0.063	0.043	-	0.001	0.057	0.047
	13	0.059	-	0.002	0.076	0.062	0.046	-	0.001	0.063	0.052
	14	0.059	-	0.002	0.077	0.063	0.047	-	0.001	0.068	0.057
	15	0.058	-	0.002	0.078	0.064	0.046	-	0.001	0.066	0.055
	16	0.059	-	0.002	0.078	0.063	0.051	-	0.001	0.080	0.068
	17	0.053	-	0.456	0.067	0.054	0.051	-	0.001	0.092	0.080
	18	0.053	-	0.001	0.051	0.039	0.051	-	0.001	0.093	0.082
	19	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	-	-	-	-	-	-	-
	21	-	-	-	-	-	-	-	-	-	-
	22	-	-	-	-	-	-	-	-	-	-
	23	-	-	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-	-	-

Table 21. Average Hourly Seasonal Avoided Cost Values for Large Group Host Commercial Solar PV Array Installed in 2024 – Winter ($/kWh) (2024$)

		2024					2035				
Season	Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Winter	1	-	-	-	-	-	-	-	-	-	-
	2	-	-	-	-	-	-	-	-	-	-
	3	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-
	5	-	-	-	-	-	-	-	-	-	-
	6	-	-	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-	-	-
	8	0.123	-	0.003	0.101	0.070	0.085	-	0.002	0.087	0.067
	9	0.121	-	0.003	0.099	0.069	0.085	-	0.002	0.084	0.064
	10	0.119	-	0.003	0.094	0.066	0.070	-	0.002	0.064	0.047
	11	0.118	-	0.003	0.091	0.064	0.066	-	0.002	0.057	0.041
	12	0.117	-	0.003	0.091	0.063	0.066	-	0.002	0.059	0.043
	13	0.117	-	0.003	0.092	0.064	0.065	-	0.002	0.058	0.042
	14	0.118	-	0.003	0.093	0.064	0.067	-	0.002	0.061	0.045
	15	0.118	-	0.003	0.094	0.065	0.071	-	0.002	0.064	0.046
	16	0.121	-	0.003	0.099	0.068	0.083	-	0.002	0.081	0.059
	17	0.126	-	0.003	0.099	0.068	0.094	-	0.003	0.097	0.075
	18	-	-	-	-	-	-	-	-	-	-
	19	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	-	-	-	-	-	-	-
	21	-	-	-	-	-	-	-	-	-	-
	22	-	-	-	-	-	-	-	-	-	-
	23	-	-	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-	-	-

D.5 Micro Hydro

Table 22. Average Annual Avoided Cost Value for Micro Hydro System ($/kWh) (2024$)

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Energy	0.076	0.075	0.072	0.052	0.051	0.051	0.051	0.052	0.052	0.051	0.051	0.053
Transmission Charges	0.042	0.045	0.048	0.051	0.055	0.058	0.062	0.066	0.072	0.077	0.082	0.088
Distribution Capacity	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.007	0.007	0.007
Capacity	0.004	0.004	0.004	0.005	0.005	0.005	0.006	0.006	0.006	0.006	0.007	0.006
Distribution Line Losses	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
RPS	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transmission Line Losses	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Risk Premium	0.010	0.008	0.007	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Ancillary Services	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
DRIPE	0.007	0.007	0.007	0.006	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007
Distribution OPEX	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Utility Admin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Environmental Externality	0.060	0.061	0.060	0.055	0.053	0.054	0.048	0.050	0.052	0.050	0.052	0.053
Total – Excluding Environmental	0.154	0.154	0.152	0.133	0.135	0.139	0.143	0.148	0.154	0.159	0.164	0.171
Total – Including Environmental	0.214	0.215	0.212	0.187	0.188	0.193	0.191	0.198	0.205	0.209	0.216	0.225

Table 23. Average Hourly Seasonal Avoided Cost Values for Micro Hydro System – Spring ($/kWh) (2024$)

		2024					2035				
Season	Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Spring	1	0.055	-	0.001	0.080	0.067	0.032	-	0.001	0.049	0.041
	2	0.053	-	0.001	0.080	0.068	0.032	-	0.001	0.048	0.040
	3	0.053	-	0.001	0.082	0.069	0.029	-	0.001	0.039	0.032
	4	0.052	-	0.001	0.082	0.070	0.029	-	0.001	0.036	0.029
	5	0.054	-	0.001	0.083	0.070	0.027	-	0.001	0.028	0.021
	6	0.055	-	0.001	0.086	0.074	0.028	-	0.001	0.031	0.024
	7	0.058	-	0.002	0.083	0.070	0.034	-	0.001	0.048	0.039
	8	0.063	-	0.002	0.064	0.050	0.034	-	0.001	0.041	0.033
	9	0.062	-	0.002	0.061	0.047	0.031	-	0.001	0.034	0.027
	10	0.058	-	0.002	0.055	0.043	0.025	-	0.001	0.022	0.016
	11	0.056	-	0.001	0.049	0.037	0.022	-	0.001	0.019	0.014
	12	0.056	-	0.001	0.052	0.040	0.023	-	0.001	0.023	0.018
	13	0.056	-	0.001	0.051	0.039	0.023	-	0.001	0.024	0.019
	14	0.056	-	0.220	0.052	0.040	0.023	-	0.001	0.024	0.018
	15	0.058	-	0.002	0.055	0.042	0.024	-	0.001	0.022	0.016
	16	0.060	-	0.002	0.063	0.049	0.029	-	0.001	0.032	0.024
	17	0.065	-	0.002	0.078	0.062	0.041	-	0.001	0.064	0.054
	18	0.068	-	0.002	0.081	0.065	0.050	-	0.001	0.082	0.071
	19	0.069	-	0.222	0.079	0.062	0.056	-	0.002	0.081	0.069
	20	0.069	-	0.002	0.075	0.059	0.057	-	0.441	0.083	0.070
	21	0.068	-	0.255	0.072	0.055	0.057	-	0.949	0.085	0.072
	22	0.067	-	0.002	0.077	0.061	0.053	-	0.001	0.089	0.077
	23	0.066	-	0.002	0.084	0.068	0.048	-	0.001	0.084	0.073
	24	0.057	-	0.002	0.084	0.070	0.041	-	0.001	0.073	0.064

Table 24. Average Hourly Seasonal Avoided Cost Values for Micro Hydro System – Summer ($/kWh) (2024$)

		2024					2035				
Season	Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Summer	1	0.048	-	0.001	0.077	0.067	0.039	-	0.001	0.067	0.060
	2	0.048	-	0.001	0.083	0.074	0.037	-	0.001	0.064	0.057
	3	0.047	-	0.001	0.098	0.088	0.035	-	0.001	0.058	0.052
	4	0.047	-	0.001	0.103	0.093	0.035	-	0.001	0.059	0.053
	5	0.047	-	0.001	0.113	0.103	0.035	-	0.001	0.062	0.055
	6	0.047	-	0.001	0.112	0.102	0.033	-	0.001	0.059	0.053
	7	0.048	-	0.001	0.091	0.081	0.037	-	0.001	0.066	0.058
	8	0.054	-	0.001	0.080	0.068	0.040	-	0.001	0.057	0.049
	9	0.055	-	0.001	0.076	0.064	0.041	-	0.001	0.059	0.051
	10	0.055	-	0.004	0.074	0.062	0.038	-	0.003	0.053	0.046
	11	0.055	-	0.042	0.072	0.061	0.037	-	0.041	0.049	0.042
	12	0.055	-	0.059	0.073	0.061	0.038	-	0.058	0.052	0.045
	13	0.056	-	0.072	0.072	0.061	0.040	-	0.071	0.055	0.048
	14	0.056	-	0.354	0.074	0.062	0.041	-	0.622	0.059	0.052
	15	0.056	0.334	0.590	0.150	0.063	0.041	0.511	0.143	0.060	0.050
	16	0.057	-	0.116	0.076	0.063	0.045	-	0.114	0.068	0.058
	17	0.059	-	0.114	0.071	0.057	0.054	-	1.053	0.175	0.070
	18	0.060	-	0.090	0.058	0.044	0.063	-	0.089	0.086	0.073
	19	0.060	-	0.063	0.055	0.040	0.070	-	0.062	0.085	0.070
	20	0.059	-	0.014	0.060	0.046	0.067	-	0.015	0.087	0.073
	21	0.059	-	0.023	0.060	0.046	0.064	-	0.023	0.088	0.074
	22	0.058	-	0.010	0.071	0.056	0.059	-	0.010	0.090	0.077
	23	0.057	-	0.002	0.080	0.067	0.052	-	0.001	0.089	0.079
	24	0.049	-	0.001	0.079	0.069	0.043	-	0.001	0.080	0.072

Table 25. Average Hourly Seasonal Avoided Cost Values for Micro Hydro System – Fall ($/kWh) (2024$)

		2024					2035				
Season	Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Fall	1	0.060	-	0.002	0.086	0.070	0.054	-	0.001	0.085	0.072
	2	0.058	-	0.002	0.096	0.080	0.053	-	0.001	0.085	0.072
	3	0.059	-	0.002	0.102	0.087	0.053	-	0.001	0.086	0.073
	4	0.058	-	0.002	0.106	0.091	0.052	-	0.001	0.087	0.075
	5	0.058	-	0.002	0.104	0.089	0.051	-	0.001	0.088	0.076
	6	0.056	-	0.002	0.085	0.070	0.050	-	0.001	0.083	0.071
	7	0.057	-	0.002	0.081	0.066	0.052	-	0.001	0.085	0.072
	8	0.064	-	0.002	0.082	0.065	0.056	-	0.002	0.082	0.068
	9	0.063	-	0.002	0.081	0.064	0.053	-	0.001	0.073	0.060
	10	0.062	-	0.002	0.082	0.066	0.047	-	0.001	0.062	0.050
	11	0.062	-	0.002	0.080	0.065	0.047	-	0.001	0.059	0.048
	12	0.062	-	0.002	0.079	0.063	0.047	-	0.001	0.063	0.051
	13	0.062	-	0.002	0.078	0.062	0.049	-	0.001	0.066	0.054
	14	0.063	-	0.002	0.079	0.063	0.051	-	0.001	0.071	0.059
	15	0.063	-	0.002	0.080	0.064	0.051	-	0.001	0.071	0.058
	16	0.062	-	0.002	0.080	0.063	0.055	-	0.002	0.082	0.069
	17	0.063	-	0.178	0.076	0.059	0.060	-	0.002	0.092	0.077
	18	0.065	-	0.302	0.060	0.043	0.062	-	0.002	0.089	0.074
	19	0.065	-	0.002	0.055	0.038	0.063	-	0.636	0.090	0.075
	20	0.064	-	0.239	0.060	0.043	0.062	-	0.858	0.092	0.076
	21	0.065	-	0.002	0.072	0.053	0.062	-	0.002	0.095	0.079
	22	0.066	-	0.002	0.082	0.064	0.062	-	0.002	0.096	0.079
	23	0.066	-	0.002	0.084	0.065	0.061	-	0.002	0.093	0.076
	24	0.060	-	0.002	0.083	0.067	0.056	-	0.002	0.090	0.076

Table 26. Average Hourly Seasonal Avoided Cost Values for Micro Hydro System – Winter ($/kWh) (2024$)

		2024					2035				
Season	Hour	Energy	Capacity	T&D	ROC	Envr.	Energy	Capacity	T&D	ROC	Envr.
Winter	1	0.111	-	0.003	0.095	0.067	0.078	-	0.002	0.083	0.064
	2	0.111	-	0.003	0.096	0.069	0.074	-	0.002	0.077	0.059
	3	0.111	-	0.003	0.097	0.070	0.071	-	0.002	0.072	0.054
	4	0.111	-	0.003	0.098	0.071	0.071	-	0.002	0.071	0.053
	5	0.111	-	0.003	0.098	0.071	0.070	-	0.002	0.068	0.050
	6	0.111	-	0.003	0.093	0.065	0.074	-	0.002	0.077	0.059
	7	0.112	-	0.003	0.092	0.063	0.083	-	0.002	0.089	0.069
	8	0.121	-	0.003	0.100	0.069	0.089	-	0.002	0.091	0.069
	9	0.120	-	0.003	0.098	0.068	0.086	-	0.002	0.086	0.065
	10	0.118	-	0.003	0.094	0.066	0.073	-	0.002	0.067	0.050
	11	0.117	-	0.003	0.092	0.064	0.068	-	0.002	0.060	0.044
	12	0.116	-	0.003	0.091	0.064	0.069	-	0.002	0.062	0.046
	13	0.116	-	0.003	0.092	0.064	0.068	-	0.002	0.061	0.045
	14	0.117	-	0.003	0.093	0.065	0.070	-	0.002	0.066	0.049
	15	0.117	-	0.003	0.094	0.065	0.073	-	0.002	0.067	0.049
	16	0.119	-	0.003	0.098	0.068	0.084	-	0.002	0.083	0.061
	17	0.122	-	0.003	0.097	0.066	0.100	-	0.003	0.101	0.076
	18	0.124	-	0.222	0.091	0.059	0.107	-	0.003	0.102	0.076
	19	0.124	-	0.460	0.091	0.059	0.108	-	1.438	0.104	0.078
	20	0.123	-	0.003	0.097	0.065	0.107	-	0.003	0.106	0.080
	21	0.123	-	0.003	0.101	0.070	0.105	-	0.003	0.108	0.082
	22	0.121	-	0.003	0.102	0.071	0.102	-	0.003	0.105	0.080
	23	0.120	-	0.003	0.102	0.070	0.097	-	0.003	0.101	0.076
	24	0.111	-	0.003	0.093	0.064	0.087	-	0.002	0.094	0.073

E. Stakeholder Questions and Response

E.1 Allocation of Distribution Avoided Costs

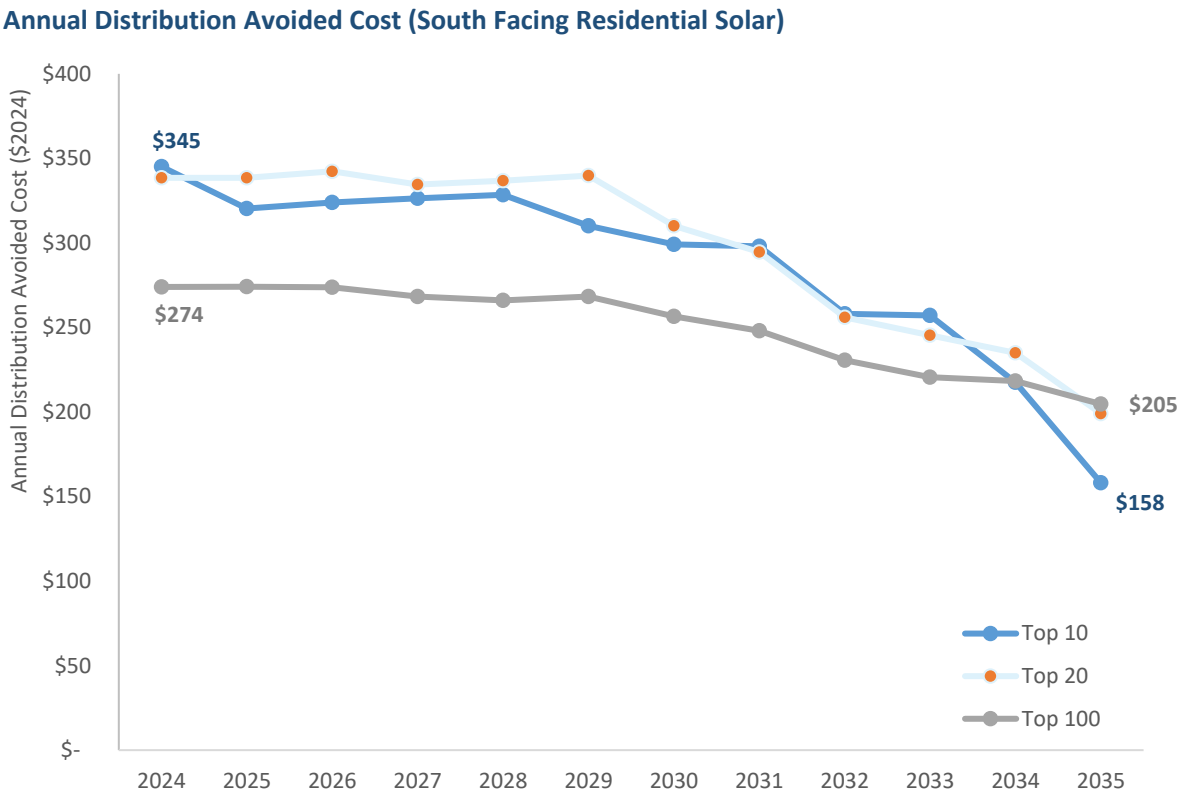
Stakeholder Question: Did Dunsky request hourly substation load data from the IOUs as an alternative to system load data? Dunsky could use a method such as the peak capacity allocation factor (PCAF) approach. This approach was used in The Alliance for Solar Choice (TASC) testimony DE 16-576. See Appendix D, pages D-6 to D-8 of the attached, for the details of that approach.

Dunsky Response:

- Dunsky did not request hourly substation load data from the IOUs as an alternative to system load data. As part of the VDER assessment, we focused on developing system-wide distribution avoided costs rather than substation-specific avoided costs. Distribution substations and circuits can peak at different times than the system, so we leveraged the LVDG study to estimate an average system-wide distribution avoided cost value.
- The approach laid out by TASC focuses on the avoided distribution costs from solar, and our goal was to develop tech-neutral avoided costs. However, we adopted a similar approach to the one described in DE 16-576 (Appendix D), wherein we proportionally allocated the distribution value across the top 100 hours. We recognize that it is challenging to predict the system peak hour; thus, by distributing the avoided distribution costs across the top 100 hours, we can approximate the avoided distribution costs from a DER.

The avoided Dist. Capacity and OPEX Costs ($/kW-year) are based on the LVDG study and utility data. However, the spread of the annual distribution avoided costs across specific hours in a given year will impact the value stack and the value captured by DG systems, as shown in the table below. The selection of the hours is based on the top load hours for the system.

Distribution Approach	Annual Distribution Avoided Cost $/kW-year ($2024)	Distribution Value Over Specific Hours ($/kWh) ($2024)	Key Characteristics
Top 10 Hours	$82 - $84	$8.2 - $8.4	In 2021, these hours occurred in Mid-August (HE 13 –17), and by 2035 the distribution hours could shift later into the evening (HE 14 –21).
Top 20 Hours	$82 - $84	$4.1 - $4.2	July-August (HE 13 –17), by 2035, shift later into the evening (HE 14 –21).
Top 100 Hours	$82 - $84	$0.82 - $0.84	Current Approach, all top 100 load hours occur in Summer.
Summer Top 20 Hours	$82 - $84	$4.1 - $4.2	Similar to the Top 20 hours.
Summer Targeted	$82 - $84	$0.82 - $0.84	Top 100 load hours occur in Summer.
Winter Top 20 Hours	$82 - $84	$4.1 - $4.2	Jan-Dec (HE 18-19), by 2035, shift later into the night (HE 19 – 20).
Winter Targeted	$82 - $84	-	None of the Top 100 load hours occur in Winter



In the VDER study, the distribution avoided costs were spread over the top 100 load hours in the year. Under this valuation method, the annual distribution value that a typical residential PV system can capture is about $234.

Spreading the distribution costs over fewer hours could lead to an increased distribution value for residential solar in the initial part of the study period. For example, reducing the number of distribution hours to 10 approximates a 25% increase in distribution value in 2024.

However, the distribution peak shift into the evening could decrease the distribution value across the study period. In 2035, the distribution value under the top 10 hours is about 23% lower than the current assumption of 100 hours. Therefore, spreading the distribution value over more hours (~100) results in greater certainty of annual distribution avoided cost, albeit at a lower value.

E.2 Treatment of Settlement-Only Generators

Stakeholder Question: Are capacity and energy revenues received by the utilities properly accounted for and deducted for any claimed “costs” of net metering, and was this revenue from small hydro group hosts considered and accounted for in the VDER study?

Dunsky Response:
As a part of the RBI assessment, Dunsky evaluated the incremental impact of customer-sited solar for residential, commercial, and large commercial customers on retail rates. In New Hampshire, customer-sited solar greater than 100 kW could enter the ISO-NE market as settlement-only generators (SOGs) and receive energy and capacity payments for the excess energy (not consumed behind the meter) exported to the grid. As of April, there were 20 net metered SOGs (3 Hydro, 17 Solar) with a maximum capacity of 10.9 MW (1.9 MW Hydro, 9.0 MW Solar).

Energy: When net-metered small-scale solar facilities generate energy, the utility receives wholesale energy revenue for that generation. However, the avoided energy is simply a pass-through component, meaning that it doesn't have any impact on rates. Even though the utility is compensated at the wholesale market, the lost revenue from energy generated by the DG will be equal to the avoided costs. This means that the SOG payment wouldn't affect rates, specifically this portion of it.

Capacity: The utility receives capacity payments for net metered SOGs, but the capacity payments are limited. Only a few net-metered Hydro facilities have Forward Capacity Auction (FCA) obligations and receive monthly payments. Most SOGs without FCA obligations only receive payments under the Pay-For-Performance structure for generation during scarcity events. Avoided capacity is not considered a passthrough component (in line with the Synapse NH RBI Energy Efficiency assessment); thus can impact rates. The current RBI assessment assumes that a utility's fixed cost for generation is the sum of avoided costs from Capacity and DRIPE. If the utility receives capacity payments, the fixed cost for generation should decrease, thereby reducing the upward impact on rates. However, few systems are bid into the ISO-NE as SOGs, so the impact should be minimal.

The RBI assessment assumes that the pre-DG rates include the impact of existing small hydro facilities and that no new facilities come online. Large group host community solar could impact the rates; however, the assessment excluded these assets from the analysis given the challenges associated with developing a robust market adoption of community solar.

This report was prepared by Dunsky Energy + Climate Advisors. It represents our professional judgment based on data and information available at the time the work was conducted. Dunsky makes no warranties or representations, expressed or implied, in relation to the data, information, findings and recommendations from this report or related work products.