

Rhode Island Renewable Energy Growth Program:

**Research, Analysis, & Discussion in Support of
First Draft 2024 Program Year Ceiling Price Recommendations
For Projects Less Than or Equal To 5 MW**

August 24, 2023

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Context Regarding Recent Changes in Rhode Island Distributed Generation Statutes

- On June 24, 2023, the companion bills **2023-S 684/2023-H 5853 – An Act Related to Public Utilities and Carriers – Net Metering** were signed into law
- Implications for REG program:
 - Permits OER and the DG Board to propose schedules of REG ceiling prices and capacity allocations for **no more than three program years in the future**, but allows OER and the Board to make adjustments to said prices
 - **Disqualifies projects sited on a “core forest” parcel** from REG program participation
 - **Creation of resource classes** for projects:
 - 5–9.99 MW
 - 10–14.99 MW
 - 15–38.99 MW, but only if eligible projects are sited on “preferred sites”
 - Allows OER and the Board to consider the **development of adders** for projects “requiring remediation”

Multi-Year Pricing Schedule

- Based on market participants surveyed, it is SEA's understanding that a 2- or 3-year schedule of ceiling prices would be most beneficial to fostering healthy competition within the REG program
 - Note that statute allows for revisions to be made to such a pricing schedule after its initial approval if there are changes in law or policy that have a major impact on the rate of return for REG-eligible projects
- As such, SEA's first draft ceiling prices contain proposed prices for program year's 2024-2026, but **no decision has been made at this time as to the length of the filing**
- For first-draft pricing, the 2025-2026 ceiling prices assume YoY reductions in installed costs and changes in debt assumptions, but (for now) no other inputs are assumed to change beyond those revised for PY 2024
- **SEA intends to further survey market to understand what other inputs are expected to vary for program year 2025 and 2026**

Schedule for Analysis/Stakeholder Engagement Process Ahead of (Likely) Multi-Year Filing

- **Meeting #1: 1st Draft of Ceiling Prices for ≤ 5 MW Renewable Energy Classes**
 - **Thursday, August 24, 2023** (9:00–11:00 am Eastern Time (ET))
 - **Purpose of the Meeting:** Share analysis/discuss with stakeholders first draft of Ceiling Prices for the Renewable Energy Classes **less than or equal to 5 MW** (read: the pre-new law categories) and all years of the program prior to that.
 - [Click here](#) to register.
- **Meeting #2: 1st Draft of Greater than 5 MW Class Prices & All Incentive-Rate Adders**
 - **Friday, September 22, 2023** (9:00–11:00 am ET)
 - **Purpose of the Meeting:** Share analysis/discuss with stakeholders first draft of Ceiling Prices for the Renewable Energy Classes **for Solar projects greater than 5 MW and potential incentive-rate adders (from recently-enacted law).**
 - [Click here](#) to register.
- **Meeting #3: 2nd Draft of All Proposed Prices and All Incentive-Rate Adders**
 - **Friday, October 20, 2023** (9:00–11:00 am ET)
 - **Purpose of the Meeting:** Share (and discuss with stakeholders) second draft of **all REG ceiling prices and incentive-rate adders under consideration.**
 - [Click here](#) to register.



Draft 2024–26 Ceiling Prices, Categories and Modeling Parameters



Purpose

- To present stakeholder data responses, survey results, and supplemental research
- To *begin* the discussion that supports the development of Ceiling Price inputs and recommendations for the 2024 Renewable Energy Growth (REG) Program (and possibly up to two (2) Program Years thereafter); and
- To develop Ceiling Price recommendations through an iterative, public process.

Potential 2024-2026 PY Ceiling Price Categories For Projects ≤ 5 MW

REG Program: Proposed Technology, Size & Tariff Length Parameters			
Eligible Technology	System Size for CP Development (DC)	Eligible System Size Range (DC)	Tariff Length
Small Solar I	5.8 kW	≤ 15 kW	15 Years
Small Solar II	25 kW	>15 to 25 kW	20 Years
Medium Solar	250 kW	>25 to 250 kW	20 Years
Commercial Solar I	500 kW	>250 to 500 kW	20 Years
Commercial Solar I – Community Remote DG (CRDG)	500 kW	>250 to 500 kW	20 Years
Commercial Solar II	1 MW	>500 kW to 1 MW	20 Years
Commercial Solar II – Community Remote DG (CRDG)	1 MW	>500 kW to 1 MW	20 Years
Large Solar	5 MW	>1 to 5 MW	20 Years
Large Solar - CRDG	5 MW	>1 to 5 MW	20 Years
Wind	3 MW	≤ 5 MW	20 Years
Anaerobic Digestion	750 kW	≤ 5 MW	20 Years
Hydropower	500 kW	≤ 5 MW	20 Years

Summary Results, Potential 2024-2026 Solar Classes (¢/kWh)

NOTE: The 2024-2026 prices shown below are indicative only. As of the drafting of this presentation, no decision has yet been made regarding the length of a potential multi-year pricing schedule.

Technology	Tariff Term	Size Range kW (Modeled Size kW)	2023 Approved CP	2024 1 st Draft Potential CP	2025 1 st Draft Potential CP	2026 1 st Draft Potential CP	% Change (2023→2024)	% Change (2023→2025)	% Change (2023→2026)
Small Solar I	15	0-15 (5.8)	27.75	33.55	31.25	29.15	21%	13%	5%
Small Solar II	20	>15-25 (25)	26.15	32.25	30.45	28.75	23%	16%	10%
Medium Solar	20	>25-250 (250)	25.65	33.45	32.35	31.45	30%	26%	23%
Commercial I	20	>250-500 (500)	22.05	29.85	28.65	27.75	35%	30%	26%
Commercial I CRDG	20	>250-500 (500)	25.15	32.65	31.55	30.65	30%	25%	22%
Commercial II	20	>500-1,000 (1,000)	19.05	23.85	22.85	22.05	25%	20%	16%
Commercial II CRDG	20	>500-1,000 (1,000)	21.91*	26.65	25.65	24.85	22%	17%	13%
Large Solar	20	>1,000-5,000 (5,000)	14.35	17.35	16.55	16.05	21%	15%	12%
Large Solar-CRDG	20	>1,000-5,000 (5,000)	16.50*	19.95	19.03	18.46	21%	15%	12%

*This is the maximum CRDG Ceiling Price allowed by law. The calculated 2023 values are 22.95 for Commercial CRDG 251-500, 19.95 for Commercial CRDG 500-999 and 15.15 for Large CRDG. Note, however, that this CP would allow cost-competitive projects (bidding below the CP) access to > a 15% premium compared to actual project costs.

Summary Results, Potential 2024-2026 Non-Solar Classes (¢/kWh)

Technology	Tariff Term (Years)	Size Range kW (Modeled Size kW)	2023 Approved CP	2024 1 st Draft Potential CP	2025 1 st Draft Potential CP	2026 1 st Draft Potential CP	% Change (2023 → 2024)	% Change (2023 → 2025)	% Change (2023 → 2026)
Wind	20	<=5,000 (3,000)	19.15	19.55	19.25	19.35	2%	1%	1%
Wind - CRDG	20	<=5,000 (3,000)	21.15	21.35	21.15	21.15	1%	0%	0%
Hydroelectric	20	<=5,000 (500)	31.95	31.55	31.05	31.05	-1%	-3%	-3%
Anaerobic Digestion (AD)	20	<=5,000 (750)	19.05	\$18.65	\$19.65	\$18.25	-2%	3%	-4%

*Average of (1) 60-20% bonus depreciation and (2) no bonus depreciation

NOTE: The 2024-2026 prices shown below are indicative only. As of the drafting of this presentation, no decision has yet been made regarding the length of a potential multi-year pricing schedule.

Overview of Key Stakeholder Feedback and Modeling Implications



Summary of Data/Survey Response

Ceiling Price Category	# of Data Points Received (Data Request or Survey)
Solar	8
Non-Solar	1
Both Solar and Non-Solar	1
TOTAL	10

Cost & Performance Assumptions



Installed & Interconnection Cost Assumptions & Methodology (1)

- Robust data available from RI and other Northeast states for small solar, but data more limited for Medium, Commercial, and Large Solar classes
 - More large MA SMART projects beginning to come online → incorporate cost data into large + small solar estimates (reflects CapEx of *completed* projects)
 - CT RRES program now more fully under way → data utilized for Small Solar
 - **NOTE: Since initial publishing of 1st Draft of Ceiling Prices, SEA recently discovered recent installed cost data from selected CT Non-Residential Renewable Energy Solutions (NRES) projects**
- **Open Enrollment results continue to suggest prices remain unaligned with costs**, particularly in Commercial and Large Solar segments
 - Only one Large Solar bid in the 1st Open Enrollment of 2023 PY, only one accepted bid in 2022 PY;
 - No Commercial Solar bids in 1st Open Enrollment of 2023 PY
 - Medium Solar bid values appear tightly connected to ceiling price, suggesting ongoing unhealthy competition in that segment

Installed & Interconnection Cost Assumptions & Methodology (2)

- Unfortunately (and as in prior years) REG Open Enrollment results contained some values for total project costs that do not align with bid prices
 - As a result, in certain cases, **these values had to be excluded from this analysis in lieu of values for projects that were bid in but not selected**
- **Modeling Implication (M.I.):**
 - **Small Solar I and II to utilize the median installed cost data from NY and MA programs, Energy Sage quotes, REF quotes, REG enrollments, and Lawrence Berkeley National Laboratory (LBNL) regional data (rather than average of median and 25th percentile values)**
 - **Medium, Commercial, and Large solar set based upon average of median and 75th percentile costs for NY data, MA SMART, REG Open Enrollment Data, and regional data from LBNL**
- **Anticipated M.I. and Next Steps for 2nd Round \leq 5 MW Prices:**
 - **Incorporate newly-discovered Small, Medium and Large Zero-Emission project installed cost data from Connecticut NRES**
 - **SEA is open to further consultations with the DPUC, Rhode Island Energy and stakeholders to form consensus on the issue of how to receive more accurate cost quotes from REG bidders**

Year-on-Year Cost Decline Assumptions (Solar)

- During the 2023 PY Ceiling Price development process, SEA computed year-on-year (YoY) cost decline assumptions derived from the National Renewable Energy Laboratory's (NREL's) Annual Technology Baseline (ATB), to capture fundamental cost declines for solar
- With the exception of certain financing assumptions, YoY cost declines applicable to installed capital cost are one of few inputs SEA is varying annually for the purposes of computing 2025 and 2026 PY ceiling prices
- As discussed later in this presentation, SEA plans to determine which other inputs to vary based on program year, and will survey market participants to better understand which cost components (both CapEx and OpEx) are expected to change going forward
- **M.I.: SEA will continue to use [NREL ATB 2023](#) "conservative" case values for 1st Draft shown below, but will also continue to conduct further desktop research to substantiate or revise inputs**

Renewable Energy Class	'23 → '24 % ↓	'23 → '25 % ↓	'23 → '26 % ↓
<i>Small Solar I & II</i>	1.9%	3.8%	5.7%
<i>Medium/Comm'l Solar</i>	1.4%	2.9%	4.3%
<i>Large Solar</i>	1.6%	3.1%	4.6%

Interconnection Cost Changes for Projects >25 kW (1)

- SEA assessed average interconnection costs for each resource class for illustrative purposes
 - IRA provisions allowing for inclusion of interconnection costs in the basis for ITC benefits → no need for differential treatment of IC costs vs total CapEx
 - Updated RIE interconnection data suggest large solar projects *completing the interconnection process in 2022/2023* averaged **~\$230/kW**
- However, market participant-supplied information and SEA's understanding of regional trends in interconnection costs for DG-saturated markets (incl. MA, ME and RI) have suggested that projects over 1 MW currently under development are likely to be assessed system modification costs that are much higher than historic norms
 - **Large volume of projects currently under study means that relying on IC costs for already connected projects may dramatically understate costs for future projects**

Interconnection Cost Changes for Projects >25 kW (2)

- Based on developer quotes, SEA understands interconnection costs in the range of \$300–600/kW are expected absent revisions to cost allocation procedures
- **M.I.: For present draft, assume \$500/kW interconnection costs in CapEx estimates for Solar and Non-Solar projects >1 MW → Apply additional \$270/kW to installed cost inputs (model assumes \$270/kW on top of \$230/kW estimate from RIE dataset)**
 - **For future drafts, continue to collect Rhode Island and regional data associated with interconnection cost estimates for projects currently under study**

Other Solar >25 kW Capital Cost Assumptions (1)

- **CapEx Impact of Meeting Prevailing Wage Requirements**
 - Recently-enacted RI legislation requires projects greater than 1 MW to pay prevailing wage, along with IRA provisions requiring the same for >1 MW
 - SEA previously estimated, based on market participant data, that the impact of such requirements was \$57.50/kW_{DC}
 - Installed cost data draws from 2022/2023 CODs → assume sample data from 2023 complied with prevailing wage requirements
 - **Exception:** Given that the MA SMART data reflects completed projects (as opposed to cost estimates at the time of program qualification), we assume that such costs do not include prevailing wage
 - Majority of data points come from 2022 and/or SMART program → Apply 83% of cost adder
 - **M.I.: Add \$47.92/kW_{DC} to previously-estimated installed cost values for Large Solar, Large Solar CRDG**
 - **Wind and Wind CRDG continue to receive full \$57.50/kW_{DC} given underlying cost data has not been updated**

Other Solar >25 kW Capital Cost Assumptions (2)

- **Meter Reconfiguration Costs**

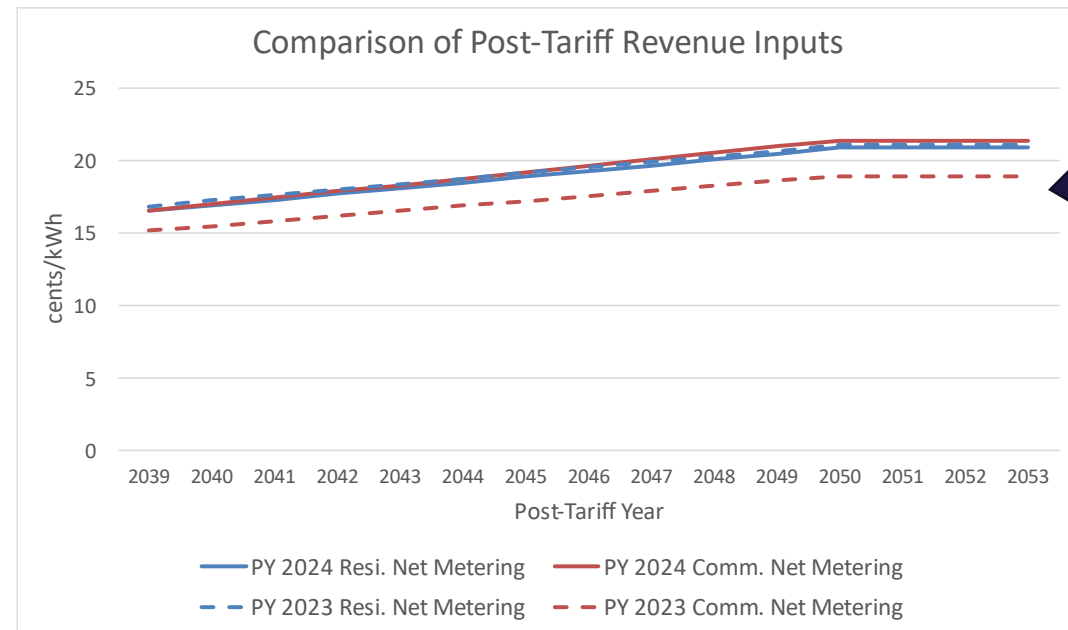
- It is SEA's understanding that Rhode Island Energy's [Electric System Bulletin](#) now contains requirements that customers upgrading their service must re-locate their meter outside of the building in question at the customer's expense
- → significant costs on building-mounted projects to which the requirements might apply given service upgrades triggered by solar installation
- Market participants surveyed have provided a significant range of costs → reflects site-specific nature of costs
- **M.I.: Apply \$30,000 additional upfront costs to Medium and Commercial I Solar representing the low-end of stakeholder estimates, but continue to conduct further research to understand typical costs and consider revision of inputs**

- **Other Cost Drivers**

- SEA has heard from market participants that there are other cost drivers impacting projects such as inflated labor costs, and 2021 International Building Code requirements for roof mounted projects to include optimizers
- Currently SEA assumes that such costs should be reflected in the 2022/2023 installed cost data utilized to derive CapEx inputs
- **M.I.: No change, but SEA will continue to conduct further research to understand if any of these costs are not reflected in the sample data utilized**

Post-Tariff Project Revenue Assumptions

- Per R.I.G.L. [§ 39-26.6-23](#), REG facilities are eligible to participate in net metering post tariff
- During the 2023 PY CP development process, SEA provided the PUC with two sets of ceiling prices with/without net metering post-tariff revenue included, given uncertainty regarding if REG facilities could qualify for net metering without a system reconfiguration
 - The PUC selected the CPs with post tariff revenue → SEA will continue to assume discounted net metering revenue post-tariff
- To forecast net metering rates, SEA utilized an internal forecast of Rhode Island Energy's C-06 and A-16 rates, developed for its recent benefit cost analysis of RI DG programs
- Recent change in law provides for virtual net metering credits at 80% of the full net metering rate
- **M.I.: SEA continues to assume that post-tariff energy revenue for all technologies will be based on forecasted virtual net metering rates (or a comparable successor policy) as opposed to wholesale rates, with a 40% discount applied EXCEPT for Medium Solar (given goal of not subsidizing post-tariff loss)**



2024 values
Includes
40%
discount
+ 20%
haircut
for VNM



Solar >25 kW Operating Expense Assumptions (1)

• Land Lease (\$/year)

- **An Act Related to Public Utilities and Carriers – Net Metering** bans development on core forests unless a project is sited on a “preferred site”
- Market participants surveyed indicate that a majority of prior development, especially for Large Solar, occurred on core forest → law requires shift to alternatives (e.g., C&I zoned land)
- Additional opportunity cost for leasing land and greater competition from alternate uses → increased lease costs
- SEA surveyed five market participants and conducted research on lease costs public databases
 - Information suggests that 1) C&I-zoned ground mounted project leases are typically ~70% higher vs typical greenfield and 2) values for smaller C&I roof-mounted projects are around \$20k-\$30k/acre/year, but typically no greater than \$45k/MW/year
- **M.I.: Increase modeled annual lease costs by 70% for Commercial and Large, and adopt midpoint of smaller C&I estimate, but continue to conduct further outreach to market participants to receive (where possible) documented quotes to substantiate or revise inputs**

	2023 Adopted	2024-2026 Potential
Large	\$94,530	\$160,701
Comm'l II	\$32,458	\$55,178
Comm'l I	\$24,500	\$41,650
Medium	\$18,090	\$28,000

Solar >25 kW Operating Expense Assumptions (2)

- **Insurance**

- A market participant suggested that Medium Solar is experiencing insurances costs comparable to larger facilities (~0.56% of total costs vs current assumption of 0.34%)
- **M.I.: No change for now, given limited data, but SEA will engage with market participant to better understand scope of services and documentation regarding insurance costs**

Non-Solar Operating Expense Assumptions

- **Insurance**

- A market participant suggested that insurance rates for hydro facilities are typically as high as 10% of total project costs
- **M.I.: No change for now. Given dramatic increase suggested (vs current assumptions) SEA plans to engage the participant to better understand assumptions and procure documentation of costs**

- **Operating Costs**

- A market participant suggested that O&M costs are 10% higher relative to previous assumptions for hydro facilities
- **M.I.: No change for now. Given dramatic increase suggested (vs current assumptions) SEA plans to engage the participant to better understand assumptions and procure documentation of costs**

Interest Rates on Term Debt (1)

- **Current Interest Rates on Term Debt:**
 - Market participants surveyed suggest that debt costs have risen relative to the 2023 PY
 - However, publicly available quotes regarding typical interest rates offered for renewable energy development are representative of the largest lenders and project scale → not representative of typical rates experienced by DG. SEA has not yet received recent term sheets from market participants to understand DG/region specific rates in RI
 - **M.I.: No change in financing inputs for now given lack of recent region-specific term sheets, but continue to collect information to substantiate or revise inputs**

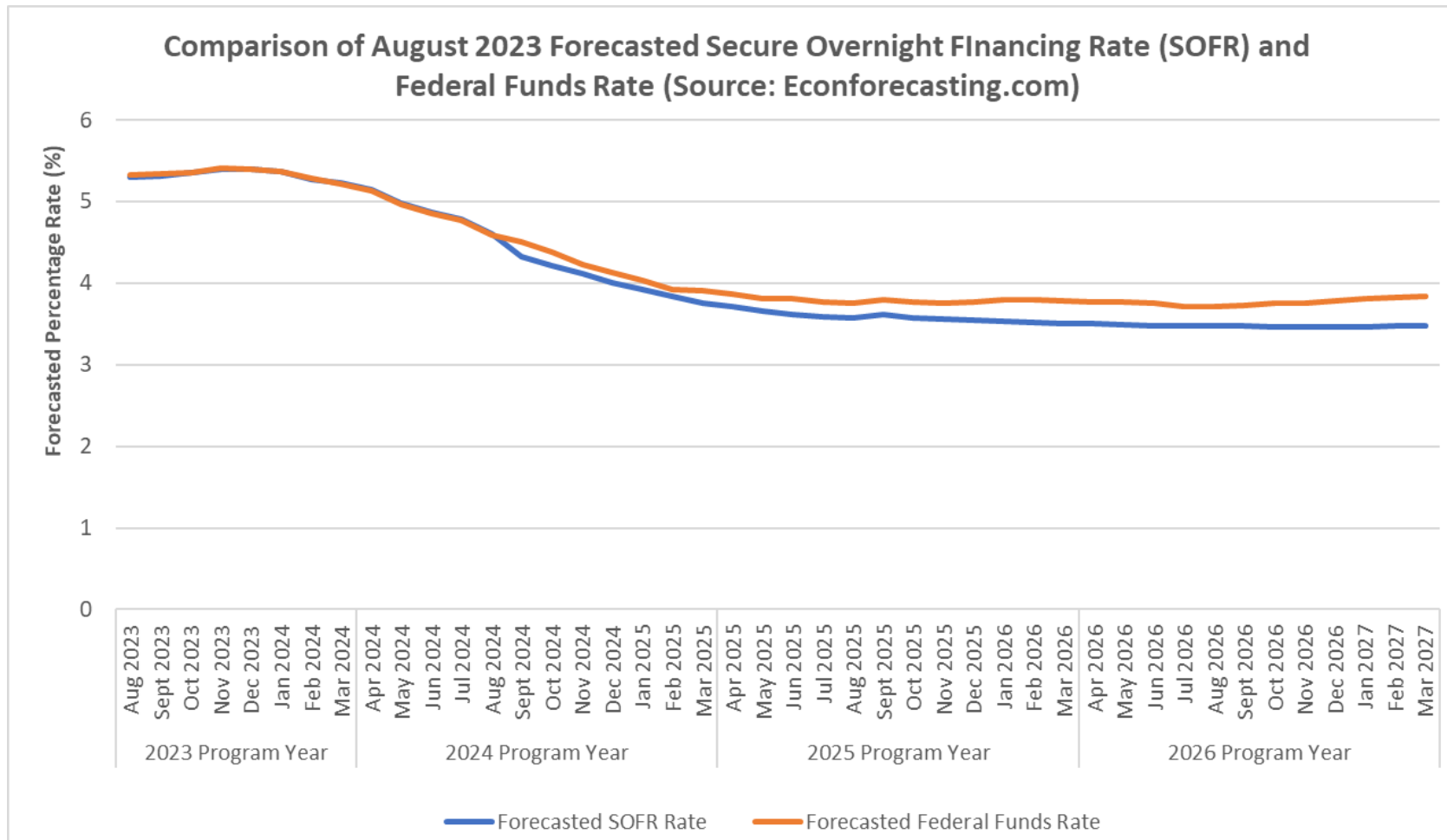
Interest Rates on Term Debt (2)

- **Outlook for Interest Rates on Term Debt:**
 - Given that a multi-year REG plan is under consideration, it is necessary to forecast expected debt costs over up to a three (3) year horizon
 - In general, the foundation of interest rates (and thus the cost of debt) for project finance purposes is the Secured Overnight Financing Rate (SOFR), which is used as the “risk free rate” plus the specific risk premium associated with the investment
 - The general risk profile of solar PV, as well as borrowers involved, are unlikely to change over a 2-3 year period
 - However, SOFR rates tend to track closely with overall monetary policy, represented by the federal funds rate, set by the Federal Open Market Committee (FOMC) of the Federal Reserve Bank of the United States
 - Overall, the FOMC has communicated its interest (via a survey of its members in July) in lowering interest rates during the latter half of 2024 and thereafter, returning to a long-term average in late 2025-2026

Interest Rates on Term Debt (3)

- **Outlook for Interest Rates on Term Debt (Cont'd):**

- As shown on the next slide, publicly-available forecasts of SOFR and federal funds rate show that the two rates are very closely linked (and thus driven by policy)



Interest Rates on Term Debt (4)

- **Outlook for Interest Rates on Term Debt (Cont'd):**

- **M.I.: Reduce current assumed interest rates on term debt value based on trajectory of SOFR rates, resulting in the following interest rates between 2024 and 2026**
Program Year
 - **Adjust debt percentages upward by no more than 50 basis points between 2025–2026 (see Appendix A for more detail) to account for lower values**
 - **However, continue to collect data on 2023 PY basis for rate, and update SOFR forecast**

Resource Class	2023 PY (Approved)	2024 PY	2025 PY	2026 PY
Small I	6.30%	5.47%	4.67%	4.56%
Small II	7.00%	6.17%	5.37%	5.26%
Medium	7.29%	6.46%	5.66%	5.55%
Commercial I	7.29%	6.46%	5.66%	5.55%
Commercial II	7.29%	6.46%	5.66%	5.55%
Large Solar	7.29%	6.46%	5.66%	5.55%
Wind	7.59%	6.76%	5.96%	5.85%
Hydro	7.59%	6.76%	5.96%	5.85%
Anaerobic Digestion	7.34%	6.51%	5.71%	5.60%

Bonus Depreciation and Tax Credit Transferability Provisions

- Despite the availability of bonus depreciation, market participants indicate **most tax equity investors continue to not utilize bonus depreciation**, to preserve their tax capital to invest in a higher volume of projects
 - SEA assumes that investors continue to utilize the five-year schedule of the Modified Accelerated Cost Recovery System (MACRS) for depreciation
- During the 2023 PY CP development process, the DPUC suggests that new tax credit transferability provisions should allow project owners to claim bonus depreciation
 - In SEA's view, even if a developer can utilize transfer provisions, it is not reasonable to assume project's tax liability is sufficient to utilize bonus depreciation
- **M.I.: No change. SEA believes that in assuming bonus depreciation may unduly limit market participation at the expense of healthy competition**
 - **If a market participant can utilize bonus depreciation, such benefits will enable participants to submit bids under the ceiling prices at the benefit of ratepayers**

Characterization of Frequency of Change in CREST Model Inputs



CREST Model Input Review for Frequency of Change

- Given the potential multi-year nature of the forthcoming REG filing, it is important to note the various cost inputs that may be subject to change over a 2- or 3- year period
 - In general, while some inputs change frequently year to year based on a variety of market and policy-related dynamics, others are slower to change, or do not change at all
 - Next 5 slides include:
 - A review of the major cost, performance and finance inputs in the Cost of Renewable Energy Spreadsheet Tool (CREST) model; and
 - The degree to which the inputs vary based on renewable energy class/bin
 - The frequency with which the inputs vary (and SEA's view of roughly how often they should be changed)
- Green cells** = change recommended annually, **Yellow cells** = no change currently recommended, and **Red cells** = no change appears feasible absent a change in law or policy

Performance and Capital Cost Input Characterization

Performance/Capital Cost Input	Units	Utilized in REG Ceiling Price Analysis?	Does Input Value Vary by Renewable Energy Class?	Does Input Tend to Change Year on Year?
<i>Generator Nameplate Capacity</i>	kW	Yes	Varies by size bin	RI PUC has requested that ceiling prices should be modeled with projects at maximum end of size bin, and thus will not be subject to significant annual change
<i>Net Capacity Factor, Yr 1</i>	%	Yes	Total production tends to increase by size bin	Typical production for proxy projects tends to increase in small increments over time, and thus will not change significantly on an annual basis
<i>Annual Production Degradation</i>	%	Yes	Level of degradation tends to increase from the largest to the smallest size bins	Industry-wide understanding of typical degradation rates tend to change over longer periods of time, and is not likely to change on an annual basis
<i>Project Useful Life</i>	Years	Yes	Length of lives tends to increase by size bin	Useful lives tend to change over longer periods of time, and is not likely to change on an annual basis
<i>Installed Capital Cost</i>	\$/kW	Yes	Tends to decline on a unit basis with each size bin	Can change dramatically year to year, and sector by sector

Operating Expense Input Characterization (1)

OpEx Cost Input	Units	Utilized in REG Ceiling Price Analysis?	Input Value Vary by Class?	Does Input Tend to Change Year on Year?
<i>Fixed O&M Expense, Yr 1</i>	<i>\$/kW-yr</i>	Yes	Yes, the value tends to decline on a unit basis with system size.	Value tends to change (typically in a downward direction) annually
<i>Variable O&M Expense, Yr 1</i>	<i>¢/kWh</i>	No	N/A	N/A
<i>O&M Cost Inflation, initial period</i>	<i>%</i>	Yes, for all eligible projects	No	Values have not tended to change substantially from one year to the next
<i>Initial O&M Contract Period</i>	<i>year</i>	Yes	No	Values have not tended to change substantially from one year to the next
<i>O&M Cost Inflation, thereafter</i>	<i>%</i>	Yes	Same as initial period Inflation values	See above row
<i>Non-O&M OpEx Escalation Factor</i>	<i>%</i>	Yes, for all eligible projects	No	Values have not tended to change substantially from one year to the next
<i>Insurance, Yr 1 (% of Total Cost)</i>	<i>%</i>	Yes	Yes, Small Solar assumed not to require insurance beyond existing host property insurance), while the amounts for projects less than or equal to 250 kW	Values have not tended to change substantially from one year to the next.

Operating Expense Input Characterization (2)

OpEx Cost Input	Units	Utilized in REG Ceiling Price Analysis?	Input Value Vary by Class?	Does Input Tend to Change Year on Year?
<i>Project Management Yr 1</i>	<i>\$/yr</i>	Yes	Yes, generally the annual amount increases with the scale of the project	Values have tended to increase every 1-2 years, depending on the project size
<i>Property Tax or PILOT</i>	<i>\$/kW</i>	Yes	No, the value is a flat statewide value of \$5/kW for all projects	Value is set by law, and other recent state laws have banned the reassessment of the value of underlying land for RE projects.
<i>Annual Property Tax/ PILOT Adjustment Factor</i>	%	No (statewide value is flat, unchanging value)	See cells at left	See cells at left
<i>Land Lease</i>	<i>\$/yr</i>	Yes	Yes, values vary based on size and based upon \$/acre estimates of various projects	Value tends to change annually, but unclear what change will be over 2- or 3-year period.
<i>Land Lease Escalation Factor</i>	%	Yes	No	Values have not tended to change substantially from one year to the next.
<i>Decommissioning Cost</i>	<i>\$/kW</i>	Yes	Yes, values differ slightly for Solar and Non-Solar projects greater than 25 kW.	Values have not tended to change substantially from one year to the next.
<i>Bond Expense for Decommissioning (% of Decomm. Cost)</i>	%	Yes	No	Values have not tended to change substantially from one year to the next

Financing Input Characterization (1)

Financing Inputs	Units	Input Utilized in REG Ceiling Price Analysis?	Does Input Value Vary by Renewable Energy Class?	Does Input Tend to Change Year on Year?
<i>Investment Tax Credit (ITC)/Clean Energy Investment Credit (CEIC) Value</i>	%	Yes	No	Unchanged for small solar, but for larger projects, value will be available for 4 years for projects that "begin construction" in 2024, and for projects after that, is assumed to be the value for projects placed in service after 2024
<i>% of Bonus Depreciation applied in Year 1</i>	%	Yes	Varies based on whether project can monetize bonus depreciation	Currently, value will phase out for projects placed in service by end of 2026 (therefore, without extension, depreciation will likely only be available for Wind projects qualified in 2024 PY)
<i>% Debt (% of hard costs)</i>	%	Yes	Yes, varies based on maximum viable debt to meet coverage ratios at different project scale levels	Likely to change (though very slightly) on annual basis as interest rates change
<i>Debt Term/"Tenor"</i>	Years	Yes	Yes, varies based on typical financing terms per size bin	Values tend to shift with the tenor of the purchased power agreement/tariff duration and risk of borrower in question, therefore unlikely to change annually
<i>Interest Rate on Term Debt</i>	%	Yes	Yes, varies based on length of debt term/tenor	Likely to change on annual basis as monetary policy/overnight financing rates change
<i>Lender's Fee (% of total borrowing)</i>	%	Yes	Yes, increases for larger projects and for projects receiving consumer "solar loans"	Lender fees have not been known to change dramatically over time, so not expected to change annually

Financing Input Characterization (2)

Financing Inputs	Units	Input Utilized in REG Ceiling Price Analysis?	Does Input Value Vary by Renewable Energy Class?	Does Input Tend to Change Year on Year?
<i>Required Minimum Annual Debt Service Coverage Ratio (DSCR)</i>	#	Yes, as a required minimum metric	Varies based on inherent variability of "fuel"/production (e.g. insolation is more predictable than wind).	Coverage ratios tend to evolve with lenders' perception of risk, which don't tend to change substantially year-to-year
<i>Required Average DSCR</i>	#	See above row	See above row	See above row
<i>Sponsor Equity, as % of total equity</i>	%	Yes, as a contributor to total equity	No	Value shifts proportionally to value of ITC, and thus not expected to change absent a change in the law
<i>Sponsor Equity after tax IRR</i>	%	Yes, as a contributor to total target after-tax IRR	Varies slightly based on whether owner is third party or host customer	Values tend to shift with host customer investment return expectations, which tend to not shift dramatically year to year
<i>Tax Equity, as % of total equity</i>	%	Yes, as a contributor to total equity	No	Value shifts proportionally to value of ITC, and thus not expected to change absent a change in the law
<i>Tax Equity after tax IRR</i>	%	Yes, as a contributor to total target after-tax IRR	No	Values tend to shift with changes in demand for tax equity, which may tend to change with a broader rollout of the IRA and of transferability allowances, but changes are often not evident annually
<i>Total Share of Capital Stack Comprised of Tax Equity</i>	%	Yes, as a required minimum metric for Solar projects	Maximum tax equity values only assumed for Solar projects (based on market intelligence)	Unlikely to dramatically change over time, our market intelligence suggests these values currently assumed have not changed substantially with time
<i>Target After-Tax Equity IRR</i>	%	Yes	Varies based on shares of tax/sponsor equity and associated target IRRs by size bin	Unlikely to dramatically change over time, given components do not change dramatically over time

Request for Comments and Other Next Steps



Supplemental Data Request and Survey/Request for Written Comments Related to this Meeting

- SEA will be developing a specific comment prompt related to the 1st Draft of Ceiling Prices and CREST Model input categories subject to annual change
- The comment prompt will be released **no later than the close of business tomorrow (Friday, August 25, 2023)**
- Please submit any written comments regarding subjects discussed at this workshop **no later than September 15, 2023 at 11:59 pm Eastern Time (ET)**
- Please send written comments **in a PDF attachment** (preferably on organizational letterhead if applicable) to Cal Brown (cbrown@seadvantage.com), copying me (jkennerly@seadvantage.com) and Karen Bradbury (karen.bradbury@energy.ri.gov)
- In addition, SEA will be developing a supplemental Data Request and Survey request related to the topics discussed today and will likely release that Data Request and Survey **likely by the first week of September**
- SEA is currently contacting a number of market participants for assistance with the >5 MW and incentive rate adders analysis – **please write back to Mondre and schedule interviews ASAP!**



Appendix A: Detailed Cost, Performance and Financing Assumptions



Summary: Solar ≤25 kW Financing Assumptions

	Small I (1-15 kW)		Small II (15-25 kW)	
	<i>2023 Final</i>	<i>2024 1st Draft</i>	<i>2023 Final</i>	<i>2024 1st Draft</i>
Federal Investment Tax Credit (%)	30%	30%	30%	30%
% Debt	52.5%	52.0%	45%	45%
Debt Term (years)	13	13	10	10
Interest Rate on Term Debt	6.3%	5.47%	7.0%	6.17%
Lender's Fee (% of total borrowing)	4.25%	4.25%	2.3%	2.3%
Target After-Tax Equity IRR	7%	7%	12.5%	12.5%

Summary: Solar Cost & Production Assumptions

	Small I	Small II	Medium	Comm'l I	Comm'l I (CRDG)	Comm'l II	Comm'l II (CRDG)	Large	Large CRDG
Nameplate Capacity (kW)	5.8	25	250	500	500	1,000	1,000	5,000	5,000
Capacity Factor	13.4%	13.4%	14.5%	14.6%	14.6%	14.6%	14.6%	15.10%	15.10%
Annual Degradation	1.0%	1.0%	0.8%	0.8%	0.8%	0.8%	0.8%	0.5%	0.5%
Useful Life (Years)	25	25	25	25	25	25	25	30	30
Total Capital Cost ^ (\$/kW)	\$4,449 [\$3,566]	\$3,946 [\$3,058]	\$3,111 [\$2,485]	\$3,051 [\$2,352]	\$3,151 [\$2,452]	\$2,673 [\$2,218]	\$2,773 [\$2,318]	\$2,309 [\$1,964]	\$2,409 [\$2,064]
Fixed O&M (\$/kW-yr)	\$29	\$24	\$14.57	\$12.03	\$34.03	\$12.03	\$34.03	\$11.00	\$33.00
O&M Escalation Factor	2.0%	2.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Non-O&M Escalation %	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Insurance (% of Cost)	0.0%	0.0%	0.34%	0.57%	0.57%	0.57%	0.57%	0.57%	0.57%
Project Management (\$/yr)	\$0	\$0	\$3,000	\$4,000	\$4,000	\$4,000	\$4,000	\$20,000	\$20,000
Site Lease (\$/yr)	\$0	\$0	\$30,753 [\$18,090]	\$41,650 [\$24,500]	\$41,650 [\$24,500]	\$55,178 [\$32,458]	\$55,178 [\$32,458]	\$160,701 [\$94,530]	\$160,701 [\$94,530]

Values in [Purple Brackets] represent 2023 ceiling price inputs

* Reflects installed cost of non-CRDG project from same category, plus estimated cost of customer acquisition (\$100/kW)

^ Total cost includes interconnection cost

Summary: Non-Solar Cost & Production Assumptions

	Wind	Wind - CRDG	Hydroelectric	Anaerobic Digestion
Nameplate Capacity (kW)	3,000	3,000	500	725
Capacity Factor	21.00%	21.00%	55.00%	92% ¹
Annual Degradation	0.5%	0.5%	0.0%	0.0%
Total Cost (\$/kW)	\$3,558 [\$3,288]	\$3,658 [\$3,388]	\$12,189 [\$11,918]	\$11,408
Fixed O&M (\$/kW-yr)	\$26.50	\$48.50	\$245	\$600
O&M Inflation	2.0%	2.0%	0%	2.0%
Insurance (% of Cost)	0.29%	0.29%	3.19%	1.5%
Project Management (\$/yr)	\$18,000	\$18,000	\$24,000	\$75,000
Property Tax (\$/kW)	\$5	\$5	\$5	\$5
Site Lease (\$/yr)	\$162,000	\$162,000	\$8,750	\$35,000

1. Note: For Anaerobic Digestion we use an Availability Factor
2. Values in [Purple Brackets] represent 2023 ceiling price inputs



Summary: Solar >25 kW Financing Assumptions

Assumption Set	Medium (>25-250 kW)		Comm'l & Comm'l CRDG (>250-1 MW)		Large & Large CRDG (>1 MW-5 MW)	
	2023 Final	2024-2026 1 st Draft	2023 Final	2024-2026 1 st Draft	2023 Final	2024-2026 1 st Draft
Federal Investment Tax Credit (%)	30%	30%	30%	30%	30%	30%
% Debt	50%	See Slide "Multi-Year Debt % Assumptions"	48%	See Slide "Multi-Year Debt % Assumptions"	45%	See Slide "Multi-Year Debt % Assumptions"
Debt Term (years)	13	13	13	13	15	15
Interest Rate on Term Debt	7.29%	See Slide "Interest Rate on Term Debt"	7.29%	See Slide "Interest Rate on Term Debt"	7.34%	See Slide "Interest Rate on Term Debt"
Lender's Fee (% of total borrowing)	1.0%	1.0%	1.0%	1.0%	2.0%	2.0%
% Equity Share of Sponsor Equity	30%	32%	33.3%	32%	35%	35%
Target After-Tax Equity IRR (Sponsor Equity, Levered Return)	12.5%	12.5%	12.0%	12.0%	11.0%	11.0%
% Equity Share of Tax Equity	70%	68%	66.7%	68%	65%	65%
Target After-Tax Equity IRR (Tax Equity, Levered Return)	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%
Depreciation Approach	5-Year MACRS	5-Year MACRS	5-Year MACRS	5-Year MACRS	5-Year MACRS	5-Year MACRS

Summary: Non-Solar Financing Assumptions

	Wind & Wind CRDG		Hydroelectric		Anaerobic Digestion	
<i>Assumption Set</i>	<i>2023 Final</i>	<i>2024 1st Draft</i>	<i>2023 Final</i>	<i>2024 1st Draft</i>	<i>2023 Final</i>	<i>2024 1st Draft</i>
Federal Investment Tax Credit	30%	30%	30%	30%	30%	30%
% Debt	44%	See Slide “Multi-Year Debt % Assumptions”	48%	See Slide “Multi-Year Debt % Assumptions”	42%	See Slide “Multi-Year Debt % Assumptions”
Debt Term (years)	15	15	20	20	15	15
Interest Rate on Term Debt	7.59%	See Slide “Interest Rate on Term Debt”	7.59%	See Slide “Interest Rate on Term Debt”	7.34%	See Slide “Interest Rate on Term Debt”
Lender's Fee (% of total borrowing)	1.0%	1.0%	1.88%	1.88%	1.5%	1.5%
% Equity Share of Sponsor Equity	25%	25%	25%	25%	25%	25%
Target After-Tax Equity IRR (Sponsor Equity, Levered Return)	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
% Equity Share of Tax Equity	75%	75%	75%	75%	75%	75%
Target After-Tax Equity IRR (Tax Equity, Levered Return)	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%
Depreciation	5-Year MACRS	5-Year MACRS	5-year MACRS	5-year MACRS	5-year MACRS	5-year MACRS

Multi-Year Installed Cost Inputs (\$/kW)

Resource Class	2023 Costs (baseline)	2024	2025	2026
Small I	\$4,535	\$4,449	\$4,278	\$4,032
Small II	\$4,022	\$3,946	\$3,794	\$3,577
Medium	\$3,105	\$3,060	\$2,973	\$2,844
Commercial I	\$2,908	\$2,866	\$2,784	\$2,664
Commercial II	\$2,712	\$2,673	\$2,596	\$2,485
Large	\$2,297	\$2,261	\$2,191	\$2,090

Multi Year Debt % Assumptions

Resource Class	2024	2025	2026
Small I	52%	52%	52%
Small II	45%	45%	45%
Medium	48%	49%	49%
Commercial I	48%	49%	49%
Commercial II	47%	48%	48%
Large Solar	45%	46%	46%
Wind	44%	44%	44%
Hydro	48%	48%	48%
Anaerobic Digestion	42%	42%	42%

Interest Rate on Term Debt : Multi-Year Assumptions

Resource Class	2023 Approved	2024	2025	2026
Small I	6.30%	5.47%	4.67%	4.56%
Small II	7.00%	6.17%	5.37%	5.26%
Medium	7.29%	6.46%	5.66%	5.55%
Commercial I	7.29%	6.46%	5.66%	5.55%
Commercial II	7.29%	6.46%	5.66%	5.55%
Large Solar	7.29%	6.46%	5.66%	5.55%
Wind	7.59%	6.76%	5.96%	5.85%
Hydro	7.59%	6.76%	5.96%	5.85%
Anaerobic Digestion	7.34%	6.51%	5.71%	5.60%

Appendix B: Detailed Capital Cost Data for Solar Projects



Small Solar I Installed Cost Summary Statistics

Small Solar I, Installed Costs											
1-15 kW											
Time Period		2022 (Full Year)						2023 (6 Months)			
Dataset	Sample Size	Average (\$/kW)	Median (\$/kW)	25th Percentile (\$/kW)	75th Percentile (\$/kW)	N	Average (\$/kW)	Median (\$/kW)	25th Percentile (\$/kW)	75th Percentile (\$/kW)	
NY - NYSEDA Solar Electric Programs	14,658	\$4,480	\$4,212	\$3,250	\$5,344	6,511	\$4,521	\$4,266	\$3,280	\$5,318	
MA SMART (Qualified & Operational)	639	\$5,772	\$5,446	\$4,350	\$6,908	1,299	\$5,194	\$4,997	\$4,322	\$5,888	
CT Residential Renewable Energy Solutions	632	\$3,932	\$3,889	\$3,146	\$4,432	1	\$4,593	\$4,593	One Project - No Percentile		
State Database Averages		\$4,728	\$4,516	\$3,582	\$5,561		\$4,769	\$4,619	\$3,801	\$5,603	
Energy Sage - RI Accepted	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	
EnergySage - MA Accepted Bids*	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	
EnergySage - NY Accepted*	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	
EnergySage - CT Accepted*	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	
EnergySage - ME Accepted*	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	
Energy Sage Accepted Averages	N/A	\$3,328	\$3,311	\$3,125	\$3,531	N/A	\$3,364	\$3,448	\$3,269	\$3,635	
Rhode Island REF Data	292	\$4,391	\$4,006	\$3,500	\$4,977	113	\$4,435	\$4,167	\$3,793	\$5,000	
Small Scale REG enrollments	871	\$5,931	\$6,100	\$5,350	\$6,707	13	\$5,012	\$5,050	\$4,344	\$5,456	
LBNL Tracking the Sun Advance Dataset RI	1,652	\$5,751	\$5,731	\$4,786	\$6,647	N/A	no data	no data	no data	no data	
LBNL TTS - All NE States	24,657	\$4,495	\$4,331	\$3,400	\$5,311	N/A	no data	no data	no data	no data	

*NOTE: SEA has withheld the state-specific summary statistics, since these values represent the output of non-public datasets that are normally provided for a fee that were generously provided to SEA by EnergySage specifically for this analysis.

Small Solar II Installed Cost Summary Statistics

Small Solar II, Installed Costs										
15-25 kW										
Time Period	2022 (Full Year)					2023 (6 Months)				
Dataset	Sample Size	Average (\$/kW)	Median (\$/kW)	25th Percentile (\$/kW)	75th Percentile (\$/kW)	Sample Size	Average (\$/kW)	Median (\$/kW)	25th Percentile (\$/kW)	75th Percentile (\$/kW)
NY - NYSEDA Solar Electric Programs	1,504	\$3,656	\$3,418	\$2,882	\$4,464	567	\$3,711	\$3,380	\$3,000	\$4,204
MA SMART (Qualified & Operational)	10	\$5,668	\$5,734	\$4,933	\$6,419	28	\$4,624	\$4,186	\$3,602	\$5,624
CT Residential Renewable Energy Solutions	64	\$3,915	\$3,655	\$3,080	\$4,596	No Data	No Data	No Data	No Data	No Data
State Database Averages		\$4,413	\$4,269	\$3,632	\$5,160		\$4,168	\$3,783	\$3,301	\$4,914
Energy Sage - RI Accepted*	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>
Energy Sage - MA Accepted*	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>
Energy Sage - NY Accepted*	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>
Energy Sage - CT Accepted*	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>
Energy Sage - ME Accepted*	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	N/A	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>	<i>Withheld</i>
Energy Sage Accepted Averages	N/A	\$3,204	\$3,219	\$3,078	\$3,476	N/A	\$3,221	\$3,342	\$3,222	\$3,471
Rhode Island REF Data	17	\$3,429	\$3,210	\$2,947	\$3,705	7	\$4,504	\$3,914	\$3,480	\$4,840
Small Scale Rhode Island REG enrollments	40	\$5,268	\$5,530	\$4,427	\$6,140	-	No data	No data	No data	No data
LBNL TTS – Rhode Island	72	\$4,819	\$5,131	\$3,586	\$5,702	no data	no data	no data	no data	no data
LBNL TTS - All NE States	2,696	\$3,676	\$3,550	\$2,888	\$4,381	no data	no data	no data	no data	no data

*NOTE: SEA has withheld the state-specific summary statistics, since these values represent the output of non-public datasets that are normally provided for a fee that were generously provided to SEA by EnergySage specifically for this analysis.

Medium Solar Installed Cost Summary Statistics

Medium Solar, Installed Costs

>25-250 kW

Time Period		2022 (Full Year)					2023 (6 Months)			
Dataset	Sample Size	Average (\$/kW)	Median (\$/kW)	25th Percentile (\$/kW)	75th Percentile (\$/kW)	Sample Size	Average (\$/kW)	Median (\$/kW)	25th Percentile (\$/kW)	75th Percentile (\$/kW)
NY - NYSERDA Solar Electric Programs	516	\$3,362	\$3,200	\$2,420	\$3,793	172	\$3,443	\$3,231	\$2,645	\$3,851
MA SMART Qualified And Operational	158	\$2,871	\$2,743	\$2,411	\$3,078	35	\$3,159	\$3,065	\$2,570	\$3,527
RI REG Bids	21	\$2,844	\$2,766	\$2,369	\$3,312	5	\$2,568	\$2,575	\$2,330	\$2,670
LBNL TTS - RI only	11	\$3,159	\$3,179	\$2,536	\$3,373	no data	no data	no data	no data	no data
LBNL - all NE states	768	\$2,637	\$2,395	\$2,000	\$2,917	no data	no data	no data	no data	no data

Commercial Solar Installed Cost Summary Statistics

Commercial Solar, Installed Costs										
>250-1 MW										
Time Period	2022 (Full Year)					2023 (6 Months)				
Dataset	Sample Size	Average (\$/kW)	Median (\$/kW)	25th Percentile (\$/kW)	75th Percentile (\$/kW)	Sample Size	Average (\$/kW)	Median (\$/kW)	25th Percentile (\$/kW)	75th Percentile (\$/kW)
NY - NYSERDA Solar Electric Programs	61	\$2,139	\$2,120	\$1,715	\$2,381	23	\$2,862	\$2,767	\$1,770	\$3,532
MA SMART Qualified And Operational	39	\$3,014	\$2,814	\$2,188	\$3,379	13	\$3,681	\$3,574	\$2,943	\$4,310
RI REG Bids	8	\$2,256	\$2,146	\$2,019	\$2,503	0	no data	no data	no data	no data
LBNL - RI only	2	\$1,935	\$1,935	\$1,917	\$1,953	no data	no data	no data	no data	no data
LBNL - all NE states	292	\$2,215	\$2,069	\$1,692	\$2,485	no data	no data	no data	no data	no data

Large Solar Installed Cost Summary Statistics

Large Solar, Installed Costs

1000-5000+ kW

Time Period	2022 (Full Year)					2023 (6 Months)				
Dataset	Sample Size	Average (\$/kW)	Median (\$/kW)	25th Percentile (\$/kW)	75th Percentile (\$/kW)	Sample Size	Average (\$/kW)	Median (\$/kW)	25th Percentile (\$/kW)	75th Percentile (\$/kW)
NY - NYSERDA Solar Electric Programs	242	\$1,319	\$1,328	\$1,115	\$1,482	56	\$1,379	\$1,335	\$1,122	\$1,562
SMART Qualified And Operational	33	\$2,363	\$2,395	\$1,915	\$2,722	7	\$2,912	\$2,643	\$2,521	\$3,518
RI REG Bids	2	\$1,689	\$1,689	\$1,613	\$1,766	no data	no data	no data	no data	no data
LBNL - all NE states	111	\$1,848	\$1,678	\$1,332	\$2,200	no data	no data	no data	no data	no data

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