



# **Rhode Island Renewable Energy Growth Program:**

**Research, Analysis, & Discussion in Support of  
First Draft 2024 Program Year Ceiling Price Recommendations  
For Projects Greater than 5 MW and All Incentive-Rate Adders**

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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”

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

- **Meeting #1: 1st Draft of Ceiling Prices for  $\leq 5$  MW Renewable Energy Classes**
  - **Thursday, August 24, 2023**
  - **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.
  - A copy of the presentation delivered at the meeting can be found [here](#)
- **Meeting #2: 1<sup>st</sup> 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: 2<sup>nd</sup> 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 For Projects >5 MW**

# Purpose

- To present stakeholder data responses, survey results, and supplemental research
- To *begin* the discussion that supports the development of
  - Ceiling Price inputs for resources over 5 MW for the 2024 Renewable Energy Growth (REG) Program (and possibly up to two (2) Program Years thereafter); and
  - Adders for projects “requiring remediation”
- To refine results presented today in an iterative, public process based on stakeholder feedback

# 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
Large Solar II	9.99 MW	5 to <10 MW	20 Years
Large Solar III	14.99 MW	10 to <15 MW	20 Years
Large Solar IV	20 MW	15 to <39 MW	20 Years

- Historically, SEA has typically modeled the proxy project at the largest allowable capacity for a given resource class
  - Follows guidance provided by RI PUC and reflects developers' tendency to size projects to maximum to minimize costs on a per-unit basis
- However, given that Large Solar IV is required to be located on "preferred sites," SEA is proposing to model this resource class as a 20 MW project to reflect a more typical parcel size for such preferred sites
  - SEA's recommendation is based on an analysis of Synapse Energy Economics' [Solar Siting Opportunities for Rhode Island](#) Report results, which suggests that a majority preferred site parcels that can support solar development over 15 MW have roughly 20 MW of technical potential
  - Specifically, the results demonstrate that only a single brownfield could support a project sized at greater than 20 MW, suggesting sizing beyond this point would exclude a majority of brownfield potential

# 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)	2024 1 <sup>st</sup> Draft Potential CP	2025 1 <sup>st</sup> Draft Potential CP	2026 1 <sup>st</sup> Draft Potential CP
Large Solar II	20	5,000-<10,000 (9,999)	15.25	14.75	14.65
Large Solar III	20	10,000-<15,000 (14,999)	14.15	13.65	13.55
Large Solar IV	20	15,000-<39,000 (20,000)	17.05*	16.65*	16.55*

\*As required by [Chapter 300 – An Act Relating to Public Utilities and Carriers – Net Metering](#), the Ceiling Prices for Large Solar IV include incremental costs associated with development on a preferred site, equal to the maximum adder value for projects sited on land requiring remediation. These values are equivalent to SEA’s estimated levelized cost of developing a 20 MW project on a capped landfill, and are the sum of the value for a project sited on a C&I-zoned parcel of land (read: not sited on a landfill) (estimated at **13.45 ¢/kWh** in 2024, **13.05 ¢/kWh** in 2025 and **12.95 ¢/kWh** in 2026) plus a 3.6 ¢/kWh landfill adder value.

# Overview of Key Stakeholder Feedback and Modeling Implications for





# Installed & Interconnection Cost Assumptions & Methodology (1)

- As described in SEA's first stakeholder presentation, CapEx assumptions for projects under 5 MW are derived based on an analysis of regional installed cost databases
- Given the limited volume of development in the Northeast over 5 MW with available cost data, this "top-down" approach is not workable for larger resource classes given very limited sample sizes
- **Solution:** Conduct bottom-up CapEx analysis to derive proposed inputs for stakeholder feedback

# Installed & Interconnection Cost Assumptions & Methodology (2)

- **Method:** SEA utilized NREL's new "Detailed Cost Analysis Model (DCAM)" to derive proposed inputs for each resource class
  - DCAM allows users to produce customized component-level CapEx outputs based on the inputs utilized in NREL's [2022 Q1 Cost Benchmark Analysis](#)
  - SEA's analysis of labor costs assumed in NREL's inputs confirm they are consistent with Inflation Reduction Act (IRA) prevailing wage requirements → no additional adjustments necessary
  - Given Rhode Islands [solar sales tax exclusion](#), SEA removed the sales tax cost component
  - SEA replaced Interconnection cost components with region-specific numbers as follows
    - *Large II (5-<10 MW):* \$500/kW – The assumed IC costs for distribution-connected facilities
    - *Large III (10-<15 MW):* \$320/kW – A blend of Large II and Large IV, assuming 2/3 of projects will be TX IC
    - *Large IV (15-<39 MW):* \$260/kW – The assumed IC costs for transmission-connected facilities (based on an analysis of NY TX IC costs)

# Installed & Interconnection Cost Assumptions & Methodology (3)

- SEA vetted NREL component-level cost estimates with industry participants, who provided feedback to the consulting team
- **M.I.: Adopt following cost inputs representing NREL input categories with adjustments based on participant feedback, but continue to engage participants for additional data**
  - **SEA specifically intends to engage certain participants who provided feedback on new categories of cost component not included in DCAM to better understand if such costs are accounted for elsewhere**

CapEx Inputs (All Units \$.kW)	Large	Large III	Large IV
EPC/Developer Net Profit	\$195 [\$90]	\$192 [\$85]	\$186 [\$72]
Contingency	\$50 [\$0]	\$50 [\$0]	\$50 [\$0]
Developer Overhead	\$66	\$51	\$29
Transmission Line	\$10 [\$0]	\$10 [\$2]	\$10
Permitting Fee	\$50 [\$21]	\$40 [\$14]	\$30 [\$5]
Interconnection Fee	\$500 [\$750]	\$340 [\$423]	\$260
EPC Overhead	\$81	\$80	\$76
Installation Labor & Equipment	\$250 [\$130]	\$250 [\$129]	\$250 [\$122]
Electrical BOS	\$200 [\$122]	\$200 [\$115]	\$200 [\$99]
Structural BOS	\$300 [\$149]	[\$300 \$147]	\$300 [\$140]
Inverter	\$26	\$26	\$26
Module	\$353	\$353	\$353
<b>Total CapEx (\$/kW)</b>	<b>\$2,082</b>	<b>\$1,893</b>	<b>\$1,770</b>

Values in [blue brackets] represent initial SEA-proposed values that were revised in response to stakeholder feedback

# Year-on-Year Cost Decline Assumptions

- Consistent with the approach utilized for resource classes under 5 MW, SEA intends to utilize National Renewable Energy Laboratory (NREL) projections for installed cost declines to compute expected CapEx for future program years
- **M.I.: SEA will continue to use [NREL ATB 2023](#) “conservative” case values for 1<sup>st</sup> Draft shown below, but will also continue to conduct further desktop research to substantiate or revise inputs**

	'23 → '24 % ↓	'23 → '25 % ↓	'23 → '26 % ↓
<i>Large Solar</i>	1.6%	3.1%	4.6%

# Solar >5 MW Operating Expense Assumptions (1)

- **Operation and Maintenance (O&M) costs**

- Based on an analysis of NREL studies assessing utility-scale O&M costs, SEA proposed to adopt an O&M expense of \$9/kW-yr for all resource classes over 5 MW
- No stakeholder provided feedback in opposition to this value
- **M.I.: Adopt \$9/kW-yr O&M cost input for Large Solar II, III, IV**

- **Land Lease (\$/yr)**

- As discussed in the first stakeholder presentation, **An Act Related to Public Utilities and Carriers – Net Metering** bans development on core forests unless a project is sited on a “preferred site” → Expected to increase lease costs
- Stakeholders surveyed indicated that land lease inputs adopted for Large Solar in SEA’s first draft modeling for resources under 5 MW would be applicable to larger classes on a per-MW Basis
- **M.I.: Adopt following land lease inputs:**

	Modeled Size (kW <sub>DC</sub> )	2023 Adopted	2024-2026 Potential
Large	5,000	\$94,530	\$160,701
Large II	9,999	N/A	\$321,370
Large III	14,999	N/A	\$482,071
Large IV	20,000	N/A	\$642,804

# Solar >5 MW Operating Expense Assumptions (2)

- **Transmission O&M Costs**

- Given that larger resources are more likely to be transmission-interconnected, SEA intends to incorporate transmission O&M costs into the OPEX of Large Solar II/III/IV
- However, data collection regarding typical costs for such projects is ongoing
- **M.I.: No change for now, but SEA will continue to collect data from public resources and market participants for second draft pricing**

- **Other Operating Expense Assumptions**

- SEA **currently** assumes that all other operating expense inputs for Large Solar II, III, and IV would be identical to Large Solar I on a unit basis (\$/kW), as discussed in SEA's first stakeholder presentation
- **M.I.: Provisionally adopt identical cost escalation, decommissioning, project management, and insurance cost inputs, but continue to survey market participants to understand if such costs are expected to vary by size**

# **Draft Adder Values for >1 MW Projects Sited on Land Requiring Remediation**



# Case Definitions and Research Approach (1)

- As discussed above, **2023-S 684/2023-H 5853 – An Act Related to Public Utilities and Carriers – Net Metering** Allows OER and the Board to consider the **development of adders** for projects sited on parcels “requiring remediation”
  - SEA interprets “requiring remediation” to focus on parcels that involve environmental cleanup to be suitable for development → focus on brownfields and landfills
    - However, SEA does not assume that remediation would include the initial capping of landfills, as such activity is a cost the landfill owner would inevitably incur in the regular course of business
  - Synapse Energy Economics' [Solar Siting Opportunities for Rhode Island](#) Report confirms there is significant technical potential for either category of development



# Case Definitions and Research Approach (2)

- To derive an appropriate adder for such projects, SEA relied on regional data collected through prior engagements to derive initial proposed input values
  - Such inputs were then provided to a (roughly) representative sample of market participant via targeted outreach from the consultant team to solicit additional feedback specific to Rhode Island
  - Overall, market participant feedback was in line with SEA's initial proposed inputs, suggesting that proposed inputs are robust
  - However, SEA intends to continue to collect information from participants to further substantiate inputs
- Given that most development on parcels requiring remediation is likely to be over 1 MW, SEA's modeling focused on Large Solar Classes
  - This modeling decision does not necessarily preclude smaller resource classes from qualifying for an adder, if such an adder is ultimately adopted

# Incremental Cost Assumptions

- M.I.: Adopt SEA's proposed inputs, adjusted to account for initial market participant feedback, provided below:**

Input	Unit	Landfill		Brownfield	
		Stakeholder Input Range	Adopted Input	Stakeholder Input Range	Adopted Input
Upfront Capital Cost	Inc. \$/kW vs. Greenfield	\$350-500	\$392 [ <b>\$350</b> ]	\$350-450	\$365 [ <b>\$330</b> ]
Upfront Permitting Costs (incremental to above \$/kW input)	Inc. \$ vs. Greenfield	\$175,000-\$1,000,000*	\$230,000 [ <b>\$175,000</b> ]	\$100,000-\$475,000	\$240,000 [ <b>\$0</b> ]
Year 1 DC CF	% Change vs. Greenfield	-2.5% - -10%	-5.0%	-2.5% - -5%	-2.5% [ <b>0%</b> ]
O&M	"	15%	15%	15%-16%	16%
Project Mgmt.	"	10%	10%	7%-10%	7%
Insurance	"	10%	10%	15%-20%	15%
Land/Site Lease	"	0%	0%	0%	0%

Values in **[blue brackets]** represent initial SEA-proposed values that were revised in response to stakeholder feedback

\*The upper range of this estimate assumed the developer was covering expenses associated with capping a landfill, which is not typical to include in the incremental costs of landfill solar development

# Financing Assumptions

- **ITC Bonus Assumption for Brownfield Projects**

- Although some brownfield projects will be able to qualify for a 10% ITC bonus as an “energy community” under the IRA, the ability to do so will be limited to certain brownfields meeting federal criteria, rather than the full class of brownfields
- Thus, assuming ITC bonus in the calculation of an applicable brownfield adder is likely to render the adder unworkable for projects unable to qualify for ITC bonus
- **M.I.: Do not assume ITC bonus for brownfield projects**

# Summary of Resulting Adder Values

- A summary of the resulting adders, by resource class and parcel type, is provided below
  - **Results are in line with adders in Massachusetts for landfills/brownfields, which are approximately 3-4 cents/kWh**

Resource Class	Landfill Adder (cents/kWh)	Brownfield Adder (cents/kWh)
Non-Large Solar (<1 MW)	4.20	3.50
Large Solar (1-<5 MW)	4.20	3.50
Large Solar II (5-<10 MW)	3.80	3.20
Large Solar III (10-<15 MW)	3.70	3.10
Large Solar IV (15-<39 MW)	3.60*	3.00*

SEA proposes to set the adder value for resources under 1 MW equal to the Large Solar Adder Value. Stakeholder feedback is requested on this approach.

\*Given that Large Solar IV is required to be located on a “preferred site”, the maximum adder value derived here (3.6 cents/kWh) is applied to the base ceiling price presented above to reflect the assumption that incremental costs relating to preferred siting will be incurred by default. As such, it is SEA’s expectation that this resource class would not be eligible for additional compensation via an adder and that the results presented here are illustrative only.

# **Request for Comments and Other Next Steps**



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

- SEA will send a specific comment prompt related to the 1<sup>st</sup> Draft of Ceiling Prices for resources over 5 MW and Adders following the presentation
- Comments on the ceiling prices contained in this presentation, and the forthcoming comment prompt, will be due no later than 11:59 am ET on September 29, 2023.
- Please send written comments **in a PDF attachment** (preferably on organizational letterhead if applicable) to Cal Brown ([cbrown@seadvantage.com](mailto:cbrown@seadvantage.com)), copying Jim Kennerly ([jkennerly@seadvantage.com](mailto:jkennerly@seadvantage.com)), Toby Armstrong ([tarmstrong@seadvantage.com](mailto:tarmstrong@seadvantage.com)), Shauna Beland ([shauna.beland@energy.ri.gov](mailto:shauna.beland@energy.ri.gov)), and Karen Bradbury ([karen.bradbury@energy.ri.gov](mailto:karen.bradbury@energy.ri.gov))

# **Appendix A: Detailed Cost, Performance and Financing Assumptions**

# Summary: Solar Cost & Production Assumptions

	Large II			Large III				Large IV	
<i>Siting Type/ Use Case</i>	<i>Greenfield/ C&amp;I-Zoned</i>	<i>Brownfield</i>	<i>Landfill</i>	<i>Greenfield/ C&amp;I-Zoned</i>	<i>Brownfield</i>	<i>Landfill</i>	<i>Greenfield/ C&amp;I-Zoned</i>	<i>Brownfield</i>	<i>Landfill</i>
<b>Nameplate Capacity (kW<sub>DC</sub>)</b>	9,999	9,999	9,999	14,999	14,999	14,999	20,000	20,000	20,000
<b>Capacity Factor</b>	15.10%	14.72%	14.37%	15.10%	14.72%	14.37%	15.10%	14.72%	14.37%
<b>Annual Degradation</b>	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
<b>Useful Life (Years)</b>	30	30	30	30	30	30	30	30	30
<b>Total Capital Cost ^ (\$/kW<sub>DC</sub>)</b>	\$ 2,049	\$2,438	\$2,464	\$1,863	\$2,244	\$2,271	\$1,743	\$2,120	\$2,146
<b>Fixed O&amp;M (\$/kW<sub>DC</sub>-yr)</b>	\$9.00	\$10.35	\$10.44	\$9.00	\$10.35	\$10.44	\$9.00	\$10.35	\$10.44
<b>O&amp;M Escalation Factor</b>	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
<b>Non-O&amp;M Escalation %</b>	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
<b>Insurance (% of Cost)</b>	0.57%	0.66%	0.63%	0.57%	0.66%	0.63%	0.57%	0.66%	0.63%
<b>Project Management (\$/yr)</b>	\$20,000	\$21,400	\$22,000	\$20,000	\$21,400	\$22,000	\$20,000	\$21,400	\$22,000
<b>Site Lease (\$/yr)</b>	\$321,370	\$321,370	\$321,370	\$321,370	\$321,370	\$321,370	\$642,804	\$642,804	\$642,804

^ Total cost includes interconnection cost



# Summary: Solar >25 kW Financing Assumptions

	Large II	Large II	Large IV
<b>Federal Investment Tax Credit (%)</b>	30%	30%	30%
<b>% Debt</b>	See Slide “Multi-Year Debt % Assumptions”	See Slide “Multi-Year Debt % Assumptions”	See Slide “Multi-Year Debt % Assumptions”
<b>Debt Term (years)</b>	15	15	15
<b>Interest Rate on Term Debt</b>	See Slide “Interest Rate on Term Debt”	See Slide “Interest Rate on Term Debt”	See Slide “Interest Rate on Term Debt”
<b>Lender's Fee (% of total borrowing)</b>	2.0%	2.0%	2.0%
<b>% Equity Share of Sponsor Equity</b>	35%	35%	35%
<b>Target After-Tax Equity IRR (Sponsor Equity, Levered Return)</b>	11.0%	11.0%	11.0%
<b>% Equity Share of Tax Equity</b>	65%	65%	65%
<b>Target After-Tax Equity IRR (Tax Equity, Levered Return)</b>	9.5%	9.5%	9.5%
<b>Depreciation Approach</b>	5-Year MACRS	5-Year MACRS	5-Year MACRS

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

Resource Class	2023 Costs (baseline)	2024	2025	2026
Large II	2,082	2,049	2,017	1,986
Large III	1,893	1,863	1,834	1,806
Large IV	1,770	1,743	1,715	1,689

# Multi Year Debt % Assumptions

Resource Class	Adder	2024	2025	2026
Large II	None	44%	45%	45%
Large III	None	44%	45%	45%
Large IV	None	43%	44%	44%
Large II	Brownfield	45%	45%	45%
Large III	Brownfield	45%	45%	45%
Large IV	Brownfield	44%	44%	44%
Large II	Landfill	45%	45%	45%
Large III	Landfill	45%	45%	45%
Large IV	Landfill	44%	44%	44%

# Interest Rate on Term Debt : Multi-Year Assumptions

Resource Class	2024	2025	2026
Large II	6.46%	5.66%	5.55%
Large III	6.46%	5.66%	5.55%
Large IV	6.46%	5.66%	5.55%

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