Rhode Island
Renewable Energy Growth Program:

Research, Analysis, & Discussion in Support of First Draft 2021 Ceiling Price Recommendations

July 28, 2020

Sustainable Energy Advantage, LLC
Mondre Energy, Inc.

Sustainable Energy Advantage, LLC

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 2021 Renewable Energy Growth (REG) Program.
- To develop Ceiling Price recommendations through an iterative, public process.

Copyright © Sustainable Energy Advantage, LLC.

Draft 2021 Ceiling Prices, Categories and Modeling Parameters

Sustainable Energy Advantage, LLC

Proposed Ceiling Price Categories

2021 REG Program: Proposed Technology, Size & Tariff Length Parameters			
The DG Board and OER seek comment on the following Ceiling Price technology, system size and tariff length parameters.			
Eligible Technology	**System Size for CP Development**	**Eligible System Size Range**	**Tariff Length**
Small Solar I	5 kW	≤ 15 kW	15 Years
Small Solar II	25 kW	15 to 25 kW	20 Years
Medium Solar	250 kW	26 to 250 kW	20 Years
Commercial Solar	500 kW	251 to 999 kW	20 Years
Commercial Solar – Community Remote DG (CRDG)	500 kW	251 to 999 kW	20 Years
Large Solar	4,500 kW	1 to 5 MW	20 Years
Large Solar - CRDG	4,500 kW	1 to 5 MW	20 Years
Wind	3,000 kW	0 to 5 MW	20 Years
Anaerobic Digestion	750 kW	≤ 5 MW	20 Years
Hydropower	500 kW	≤ 5 MW	20 Years

Copyright © Sustainable Energy Advantage, LLC.

Summary Results (1): Solar (cents/kWh)

Technology	Size Range kW (Modeled Size kW)	2020 Approved CP	2021 1st Draft Proposed CP (incl. Statutory 22% ITC)	2021 1st Draft CP at 2020 ITC Value (26%)
Small Solar I (15 year tariff)	1-15 (5)	29.65	**29.95 (1%)**	*28.75 (-3%)*
Small Solar II	15.01-25 (25)	23.45	**26.15 (12%)**	*24.65 (5%)*
Medium Solar	26-250 (250)	21.15	**20.95 (-1%)**	*20.05 (-5%)*
Commercial Solar	251-999 (500)	18.25	**16.05 (-12%)**	*15.35 (-16%)*
Commercial Solar-CRDG	251-999 (500)	20.99	**18.46* (-12%)**	*17.65 (-16%)*
Large Solar	1,000-5,000 (4,500)	13.65	**11.25 (-18%)**	*10.75 (-21%)*
Large Solar-CRDG	1,000-5,000 (4,500)	15.70	**12.94* (-18%)**	*12.36 (-21%)*

Proposed 2021 CP increase for Small Solar I driven by reduction in ITC value; increase in Small Solar II by reduction in ITC value and change in financing assumptions. Proposed CPs for all other solar categories decreased despite the reduction of the ITC, driven by lower installed cost data and other inputs (see Appendix).

*This is the maximum CRDG Ceiling Price allowed by law. The calculated 2021 values are 19.45 for Commercial CRDG and 14.65 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.

Copyright © Sustainable Energy Advantage, LLC.

Summary Results (2): Wind, Hydro & AD (cents/kWh)

Technology	Size Range kW (Modeled Size kW)	2020 Approved CP 20 year Tariff Duration	2021 Proposed CP 20 year Tariff Duration
Wind	0-5,000 (3,000)	18.85	**19.85 / (5%)**
Large Wind - CRDG	0-5,000 (3,000)	21.05	**22.15 / (7%)**
Hydroelectric	1-5,000 (500)	21.45	**24.55 / (14%)**
Anaerobic Digestion	1-5,000 (750)	15.35	**21.05 / (37%)**

Increases in Ceiling Prices for non-Solar technologies driven by the expiration of the PTC and resulting changes in financing assumptions.

Copyright © Sustainable Energy Advantage, LLC.

Overview of Key Stakeholder Feedback and Modeling Implications

Sustainable Energy Advantage, LLC

Summary of Data/Survey Response

Ceiling Price Category	# of Data Points Received (Data Request or Survey)
Solar	21
Non-Solar	3
Both Solar and Non-Solar	2
TOTAL	26

Copyright © Sustainable Energy Advantage, LLC.

Installed & Interconnection Cost Assumptions & Methodology

- Installed Cost Data Availability
  - MA SMART program does not make total cost available until projects are complete → cost data only available for small solar
  - NJ solar costs from SREC Registration Program were available last year but have not been updated for the public
  - Data for residential projects available from CT residential incentive program and EnergySage average pricing data from quotes accepted by Northeast customers
  - RI Renewable Energy Fund and REG Open Enrollment Results
    - REG Open Enrollment results contained some values for total project costs that did not align with price bids; Small Solar reported costs significantly higher than other sources
  - Therefore, robust data from RI and other Northeast states available for small solar, but for Medium, Commercial, and Large Solar classes, data is very limited
  - **Modeling Implication (M.I.):**
    - **Small Solar I and II use similar approach to previous years, based upon NY, MA, CT data from incentive programs and Energy Sage quotes, plus REF data**
    - **Medium, commercial, large solar rely upon NY data, REG Open Enrollment Data, and SEA survey of Northeast developers conducted last fall. For large solar, use 75th percentile of NY data to reflect lower costs in upstate NY regions.**

Copyright © Sustainable Energy Advantage, LLC.

Installed Cost Assumptions & Methodology (Cont'd)

- Assumption of Year-on-Year Cost Declines
  - **Stakeholder feedback:** Some stakeholders commented that assuming cost declines as in past years is unnecessary given uncertainties in the market
  - **Consulting Team Response:** There is not sufficient data to assess how cost declines will be impacted by COVID and other market conditions. Consulting team conducted a time series analysis of the Northeast state databases to understand cost changes from Q1 2019 to present → results do not form a consistent trend in part due to few 2020 data points available
  - Some indications that prices could increase due to COVID, but other indications prices could decrease (e.g. supply chain interruptions resulting in oversupply of modules and inverters)
  - **M.I.: No current change in approach; continue to utilize the YoY cost declines from last year: 3.5% reduction factor for Small Solar I and II, and 4.5% for all other Solar categories based on SEA analysis of Wood Mackenzie estimates**
  - **Will subject cost declines to further scrutiny in next drafts**

Copyright © Sustainable Energy Advantage, LLC.

Installed Cost Assumptions & Methodology (Cont'd)

- Cost Reductions from 2017 state permitting law
  - Previous years assumed an additional 10% decrease in permitting costs (assumed to be 3% of total installed costs) from gathered installed cost data to account for changes in state permitting law; at this point cost reductions should be reflected in data itself
  - **M.I.: No longer reducing installed costs further for permitting impacts**
- NEC 2017 code compliance cost
  - In 2020 Ceiling Price analysis, added an estimate of these compliance costs, assuming they were not present in installed data because the code had not gone into effect yet. Now that code is in effect, costs should be present in total installed cost data.
  - **M.I.: No longer adding in additional compliance costs for NEC 2017 code**

Copyright © Sustainable Energy Advantage, LLC.

Increases in Interconnection (IC) Cost

- RI 2020 Data Limited
  - Smaller number of YTD projects than in past, possibly due to COVID impacts
  - Therefore, use data from 2019-2020 YTD
  - In comparison to 2019 YTD costs as analyzed for 2020 CPs, large increases in costs of medium solar
- Treatment of Interconnection Costs
  - Federal Investment Tax Credit (ITC) for solar excludes interconnection equipment & upgrades from ITC eligibility
  - However, state cost databases and 1st Open Enrollment data assumed to include IC costs
- **M.I.: 2019-2020 RI average interconnection costs assumed deducted from basis for 26% ITC**

RI Average IC Cost per kW_{DC}	2020 CP Input ($/kW)	Proposed 2021 Input ($/kW)
Large Solar (1-5 MW)	$134	**$147**
Commercial Solar (250 kW - 1 MW)	$151	**$133**
Medium Solar (25-250 kW)	$49	**$118**

Copyright © Sustainable Energy Advantage, LLC.

Small Solar I and II

- Changing Small Solar I to 1-15 kW and Small Solar II to 15-25 kW
  - **Stakeholder Feedback:** was neutral or supportive, none disagreed
  - Respondents noted that 90-99% of systems sized 10-15 kW are residential
  - M.I.: Continue to treat Small Solar I as residential and Small Solar II as commercial, keep modeled system sizes as 5 kW and 25 kW, respectively
- Financing Assumptions
  - **Stakeholder Feedback f**or Small Solar I: Indicate similar shares of market for solar loans, home equity loans/lines of credit, and cash as last year's assumptions, and small increase in interest rate. Responses indicated lower lender's fees than modeled in the past
  - M.I.: Reduce share of debt by 6%, increase interest rate 0.7%, decrease fees to average of responses (4.25%)
  - For Small Solar II, feedback indicates increase in the market share of debt, mostly CPACE or standard bank/business loans, the latter having shorter terms; inconclusive feedback on typical fees
  - M.I.: Increase share of debt to 60% of project costs, decrease debt term to 10 years, decrease fees to 2.3% (average of responses and in line with debt for other categories)

Copyright © Sustainable Energy Advantage, LLC.

Solar Project Operating Cost and Performance Assumptions

- Year 1 Capacity Factor (%)
  - Based on stakeholder survey, four respondents expressed agreement with current capacity factors (14% for Small, Medium and Commercial and 15.3% for Large), 5 were neutral, while two were opposed
  - One stakeholder provided a dataset of modeled 1st year capacity factors for projects in Rhode Island, suggesting ground-mounted Medium, Commercial and Large Solar projects had different capacity factors from rooftop and canopy capacity factors
    - **Multiple M.I.s:**
      - **Given exploration of adders for non-greenfield projects, make explicit that Ceiling Prices assume a greenfield ground-mounted project (which requires ground-mounted capacity factors)**
      - **Adjust capacity factors for Medium Solar to 14.7% (from 14%), for Commercial Solar to 15.2% (from 14%) and Large Solar to 15% (from 15.3%)**
      - **Develop robust capacity factor assumptions in Public Policy Adder process, in which SEA & National Grid will examine differences in capacity factors for different types of projects, and how such production estimates could factor into adders for those types of projects.**
- Production Degradation (%/yr)
  - Previous NREL research has produced an industry rule of thumb of 0.5%/year
  - However, others have suggested that this figure may be misleading as a single annual figure, and a solar stakeholder provided initial documentary evidence suggesting that Year 1 production degradation is much steeper, followed by less severe degradation in following years
  - It appears NREL is studying this exact question as part of the Photovoltaic Lifetime Project
    - **M.I.: No changes for 1st draft, However, SEA plans to reach out to NREL and its regional test centers to get more information regarding the current state of independent, high-quality research**

Copyright © Sustainable Energy Advantage, LLC.

Solar Project Operating Cost and Performance Assumptions (Cont'd)

- Proxy System Sizes (kW_{DC})
  - Some stakeholders suggested changing proxy system size for Medium Solar from 250 kW to a smaller average value
    - **M.I.: Maintain 250 kW proxy size (given 250 kW remains the mode of Medium Solar projects in several prior enrollments)**
  - However, most Large projects are being proposed closer to 5 MW, and non-REG survey research conducted by SEA found that projects between 4-5 MW have the best development economics (as well as most optimized costs for ratepayers)
    - **M.I.: Change Large Solar proxy system size from 2,000 kW_{DC} (2 MW_{DC}) to 4,500 kW_{DC} (4.5 MW_{DC}) to reflect greater profusion of projects closer to max eligible size (Impact should be minimal, but will ensure calculations based on project capacity are not being undercounted by the assumed system size)**
- Land/Site Lease ($/yr)
  - A Medium Solar market participant provided documentary evidence of lease prices in that category ranging from approximately $11,000-$12,000/yr
    - **M.I.: Set Medium Solar land/site lease input at $12,000/yr (up from $10,000/yr) and request follow-up information on site lease values for other categories in subsequent survey**

Copyright © Sustainable Energy Advantage, LLC.

Solar Project Operating Cost and Performance Assumptions (Cont'd)

- O&M Cost (kW-yr)
  - A Solar participant provided an O&M quote from a (name redacted) Top 3 O&M provider across Medium, Commercial and Large categories that includes one "basic" level option, and one premium "guarantee" option
  - However, quote did not include a specific value for a Large project at (or near) the new proxy system size of 4,500 kW (4.5 MW_{DC})
    - **M.I.: Adopted values from "Basic" package included in quote, but SEA plans to request more information about typical adoption of premium/"performance guarantee" packages in a follow-up survey**
- O&M and Non-O&M OpEx Escalation (%)
  - Currently, SEA utilizes a single escalation factor for OpEx (2%)
  - However, a Solar participant provided data across Medium, Commercial and Large categories suggesting the O&M escalation rate for Top 3 O&M provider is now 3%, rather than 2%
    - **M.I.: Prices now assume 3% annual escalator for O&M costs, but keep 2% escalator for other OpEx**
- Insurance (% of Project Cost/yr)
  - One Medium Solar participant provided a quote for approximately 7x the current input for insurance cost, while another cited the current input (0.27% of total project cost/year) as being sufficient
    - **M.I.: No change 1st draft, but SEA will request more information on insurance costs in a follow-up survey**

Copyright © Sustainable Energy Advantage, LLC.

Solar Project Operating Cost and Performance Assumptions (Cont'd)

- Project Management – Monitoring ($/yr)
  - A stakeholder suggested that the Ceiling Price assumptions do not appropriately account for the cost of monitoring a project, and can be a substantial added cost relative to SEA's current assumption
    - **M.I.: No change for now, but will follow up in supplemental survey to determine cost of monitoring (and whether that should be considered "project management" or rolled into O&M)'**
- Non-Solar Cost and Performance Assumptions
  - No significant changes (at least with documentation) proposed, and limited competitive activity observed in any segments (Wind/Hydro/AD)
    - **M.I.: Keep same costs and financial structuring as last year consistent with loss of ITC in lieu of PTC treatment for Wind/Hydro/AD (given expected expiration of PTC) until Non-Solar participants can provide documented evidence of changes to inputs**

Copyright © Sustainable Energy Advantage, LLC.

Financing Assumptions for >25 kW (ITC, Debt Term and Share, Equity Share)

- ITC/ILoPTC Value
  - **Solar (ITC):** ITC value will decline to 22% per current law, while ability to "safe harbor" at 26% value still not assumed to be available to all market participants
    - **M.I.: Assume 22% ITC value for Solar [See Slide 5 for impact of drop in ITC value]**
  - **Wind/Hydro/AD (ITC in Lieu of the PTC (ILoPTC)):** PTC set to expire under current law at end of 2020
    - **M.I.: Assume no federal tax credits available to Wind/Hydro/AD (with subsequent ramifications for debt/equity shares)**
- Debt (% of Hard Costs)
  - SEA continues to assume (based on market trends) that third party investors/developers and host owners will aim to maximize the amount of leverage in the project (especially when offered a fixed revenue stream) in order to make up for declining ITC benefits
    - **M.I.: Increase debt share by 5% (on an absolute basis) for all classes**
- Depreciation
  - **Solar M.I.: Still assumed to be MACRS in most cases, but 2021 tax year likely to be the last year Solar assumed not to elect 100% bonus depreciation, given the scheduled ITC reversion to 10% in 2022, and the subsequent need to reduce financing cost**
  - **Wind/Hydro/AD M.I.: Wind assumed to be a 50/50 split of MACRS and 100% bonus depreciation. Hydro and AD assumed unable to elect 100% bonus depreciation due to long duration of construction**

Copyright © Sustainable Energy Advantage, LLC.

Financing Assumptions for >25 kW (ITC, Debt Term and Share, Equity Share)

- Debt Term (Years)
  - While some market participants can get longer than 15 years (for Solar) and 20 years (Hydro) from their lenders, it is unlikely that this will be the norm, even in a fixed-price tariff program such as REG
    - **M.I.: Maintain 15-year debt term for Solar and 20-year for Hydro**
- % Equity Share of Sponsor & Tax Equity
  - **Solar:** Project sponsors/developers will continue to seek as much tax equity as possible given the lower relative cost of tax equity, despite contractions in the supply of tax equity due to COVID-19
    - **M.I.: Share of tax equity in equity stack to remain at 75% for solar projects**
  - **Wind, Hydro & AD:** Participants not assumed to be able to access tax equity (given expected expiration of PTC & ILoPTC)
    - **M.I. Sponsor equity increased to 100%**

Copyright © Sustainable Energy Advantage, LLC.

Financing Assumptions for >25 kW (Interest Rates on Term Debt)

- Indicators of Reduced Cost of Debt:
  - Since 2020 CPs Recommended to PUC, Federal Reserve has returned to policy of massive monetary stimulus/quantitative easing in response to COVID-19 pandemic (and pre-COVID concerns regarding turbulence in US-China trade relations)
  - Target fed funds rate declined from 2% to 0.25% (**-175 bps**)
  - LIBOR 3-month rate declined 2% to 0.3% (as of 7/3, **-170 bps**)
- Swap Value
  - Lenders typically "swap" LIBOR to lock in its value over the life of a substantial loan
  - 10-year swap value +**66 bps** on 7/3
  - Based on this, tentative assumption of **+100 bps** for a 15-year swap
- Net decline = ~**75 bps**
- Potential Risk Premium Associated with COVID-19:
  - Large DG financier: Credit committees currently pricing in 30-60 bps for new debt during pandemic
  - However, unclear how long additional risk will continue to be priced in (i.e. how long the pandemic will last in 2021)
  - **M.I.: Assume 75 basis point reduction in interest rates, but determine extent of potential credit premia likely to exist for projects applicable in 2021 in financier survey**

Copyright © Sustainable Energy Advantage, LLC.

Financing Assumptions for >25 kW (Sponsor and Tax Equity Returns)

- Target After-Tax IRR (Sponsor Equity, Levered)
  - **Solar:** Given COVID-19 market impacts, we assume third-party sponsor capital (which tends to back Large Solar projects) will be unlikely to seek alternative investments (relative to Commercial and Large Solar)
  - However (based on stakeholder feedback/experience in other markets), host owners of Medium and Commercial projects undergoing their own business disruptions are likely to demand higher returns to compensate for enhanced COVID-19 investment risk (this is consistent with what SEA has heard as well)
    - **M.I.: Adjust Sponsor equity IRR +200 basis points (bps, equivalent to 2%) for Medium (which we assume are nearly all host-owned), +100 bps (+1%) for Commercial (reduced to account for mix of host and third party ownership), but leave unchanged for Large**
  - **Wind, Hydro & AD:** We assume third-party sponsor capital unlikely to seek alternatives or demand higher premium
    - **M.I.: Assumed unchanged (given lack of alternatives for third-party sponsor capital)**
- Target After-Tax IRR (Tax Equity, Levered)
  - **Solar:** We assume (based on stakeholder feedback and discussions with participants in other markets) that the supply of tax equity likely to contract in 2020 and early 2021 as a result of decreased economic activity on the part of largest tax equity providers (typically large corporations) in response to COVID-19. However, this will be offset to a degree by rules allowing carrying back of non-operating losses for 2018, 2019 and 2020 tax years.
    - **M.I.: Adjust target tax equity IRR +50 bps (+0.5%)**
  - **Wind, Hydro & AD:** No tax equity assumed in capital stack (given expected sunset of ILoPTC provisions)

Copyright © Sustainable Energy Advantage, LLC.

Modeling Inputs for Initial Proposed Prices

Sustainable Energy Advantage, LLC

Summary: Cost & Production Assumptions (Solar)

	Small I	Small II	Medium	Commercial	Commercial CRDG	Large	Large CRDG
Nameplate Capacity (kW)	5	25	250	500	500	2,000	2,000
Capacity Factor	14.00%	14.00%	14.70% [14.00%]	15.20% [14.00%]	15.20% [14.00%]	15.00% [15.30%]	15.00% [15.30%]
Annual Degradation	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Total Cost^ ($/kW)	$3,129 [$3,279]	$2,899 [$2,979]	$2,288 [$2,360]	$1,897 [$1,988]	$2,047* [$2,138*]	$1,384 [$1,602]	$1,534* [$1,752*]
Fixed O&M ($/kW-yr)	$35	$35	$12.38 [$14]	$10.06 [$14]	$35.06 [$37]	$14.50	$39.50 [$37]
O&M Inflation	2.0%	2.0%	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]
Insurance (% of Cost)	0.0%	0.0%	0.27%	0.27%	0.45%	0.45%	0.45%
Project Management ($/yr)	$0	$0	$2,375	$2,375	$2,375	$12,000	$12,000
Site Lease ($/yr)	$0	$0	$12,000 [$10,000]	$20,000	$20,000 [$12,500]	$50,000	$50,000

Values in [Brackets] represent 2020 ceiling price inputs

* Reflects installed cost of non-CRDG project from same category, plus estimated cost of customer acquisition ($150/kW).

Copyright © Sustainable Energy Advantage, LLC.

Summary: Financing Assumptions (Small Solar)

	Small I (1-15 kW)		Small II (15-25 kW)	
	2020 Final	***2021 Proposed***	***2020 Final***	***2021 Proposed***
Federal Investment Tax Credit (%)	26%	22%	26%	22%
% Debt	77%	71%	40%	60%
Debt Term (years)	13	13	15	10
Interest Rate on Term Debt	5.6%	6.3%	6.7%	7.0%
Lender's Fee (% of total borrowing)	8.5%	4.25%	3.5%	2.3%
Target After-Tax Equity IRR	5.0%	5.2%	9.5%	13.0%

Copyright © Sustainable Energy Advantage, LLC.

Summary: Final 2020 vs. 1st Draft 2021 Financing Assumptions (Solar >25 kW)

	Medium (25-250 kW)		Commercial (251-999 kW)		Commercial CRDG (251-999 kW)		Large (1 MW-5 MW)		Large CRDG	
Assumption Set	***2020 Final***	***2021 Proposed***	***2020 Final***	***2021 Proposed***	***2020 Final***	***2021 Proposed***	***2020 Final***	***2021 Proposed***	***2020 Final***	***2021 Proposed***
Federal Investment Tax Credit (%)	26%	22%	26%	22%	26%	22%	26%	22%	26%	22%
% Debt	55%	60%	60%	65%	60%	65%	60%	65%	60%	65%
Debt Term (years)	15	15	15	15	15	15	15	15	15	15
Interest Rate on Term Debt	6.0%	5.25%	6.0%	5.25%	6.0%	5.25%	6.0%	5.25%	6.0%	5.25%
Lender's Fee (% of total borrowing)	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	2.0%	2.0%	2.0%	2.0%
% Equity Share of Sponsor Equity	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Target After-Tax Equity IRR (Sponsor Equity, Levered Return)	11.0%	13%	11.0%	12%	11.0%	12%	11.0%	11%	11.0%	11%
% Equity Share of Tax Equity	75%	75%	75%	75%	75%	75%	75%	75%	75%	25%
Target After-Tax Equity IRR (Tax Equity, Levered Return)	9.0%	9.5%	9.0%	9.5%	9.0%	9.5%	9.0%	9.5%	9.0%	9.5%
Depreciation Approach	5-Year MACRS	5-Year MACRS	5-Year MACRS	5-Year MACRS	5-Year MACRS	5-Year MACRS	5-Year MACRS	5-Year MACRS	5-Year MACRS	5-Year MACRS

Copyright © Sustainable Energy Advantage, LLC.

Summary: Cost & Production Assumptions
Wind, Hydro, and AD

	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)	$2,820	$2,970	$10,431 [$8,750]	$10,502
Fixed O&M ($/kW-yr)	$26.50	$51.50	$2.00	$600
O&M Inflation	2.0%	2.0%	2.0%	2.0%
Insurance (% of Cost)	0.20%	0.20%	2.0%	1.0%
Project Management ($/yr)	$18,000	$18,000	$3,000	$75,000
Site Lease ($/yr)	$162,000	$162,000	$8,750	$35,000

1. *Note: For Anaerobic Digestion we use an Availability Factor*
2. *Note: Includes $150 per kW for interconnection costs*

Copyright © Sustainable Energy Advantage, LLC.

Summary: Final 2020 vs. 1st Draft 2021 Financing Assumptions (Wind, Hydro & AD)

	Wind		Wind - CRDG		Hydroelectric		Anaerobic Digestion	
Assumption Set	***2020 Final***	***2021 Proposed***	***2020 Final***	***2021 Proposed***	***2020 Final***	***2021 Proposed***	***2020 Final***	***2021 Proposed***
Federal Investment Tax Credit	18%	None (Expiring 1/1/2021)	18%	None (Expiring 1/1/2021)	30%	None (Expiring 1/1/2021)	30%	None (Expiring 1/1/2021)
% Debt	65%	70%	65%	70%	65%	70%	60%	65%
Debt Term (years)	15	15	15	15	20	20	15	15
Interest Rate on Term Debt	6.5%	5.75%	6.5%	5.75%	7.0%	6.25%	7.0%	6.25%
Lender's Fee (% of total borrowing)	1.0%	1.0%	1.0%	1.0%	1.88%	1.88%	1.5%	1.5%
% Equity Share of Sponsor Equity	25%	100%	25%	100%	20%	100%	20%	100%
Target After-Tax Equity IRR (Sponsor Equity, Levered Return)	12%	12%	12.0%	12%	12%	12%	12%	12%
% Equity Share of Tax Equity	75%	0%	75%	0%	80%	0%	80%	0%
Target After-Tax Equity IRR (Tax Equity, Levered Return)	9.0%	N/A	9.0%	N/A	9.0%	N/A	9.0%	N/A
Depreciation	Average of 100% bonus and MACRS	Average of 100% bonus and MACRS	Average of 100% bonus and MACRS	Average of 100% bonus and MACRS	7-year MACRS	7-year MACRS	5-year MACRS	5-year MACRS

Copyright © Sustainable Energy Advantage, LLC.

Further Stakeholder Input Sought

- Financing Assumptions for >25
  - Additional survey to be distributed to stakeholders
- Capacity Factors
  - Consulting team welcomes submission of verified and documented capacity factors
- O&M Costs
  - How often do project sponsors utilize a performance guarantee O&M package, and what are the typical costs of such a package
- Typical insurance costs
- Monitoring
  - What is the typical cost of monitoring and is that included in O&M costs
- Decommissioning
  - What percent of municipalities require an upfront decommissioning bonds?
  - What are typical costs of decommissioning, including salvage value?
- Year on Year cost declines
  - What is reasonable to expect for changes in capital equipment costs from 2020 to 2021, and what is the basis and evidence for that expectation?

Copyright © Sustainable Energy Advantage, LLC.

Appendix: Bid Data, Regional Benchmarking, and Additional Assumptions

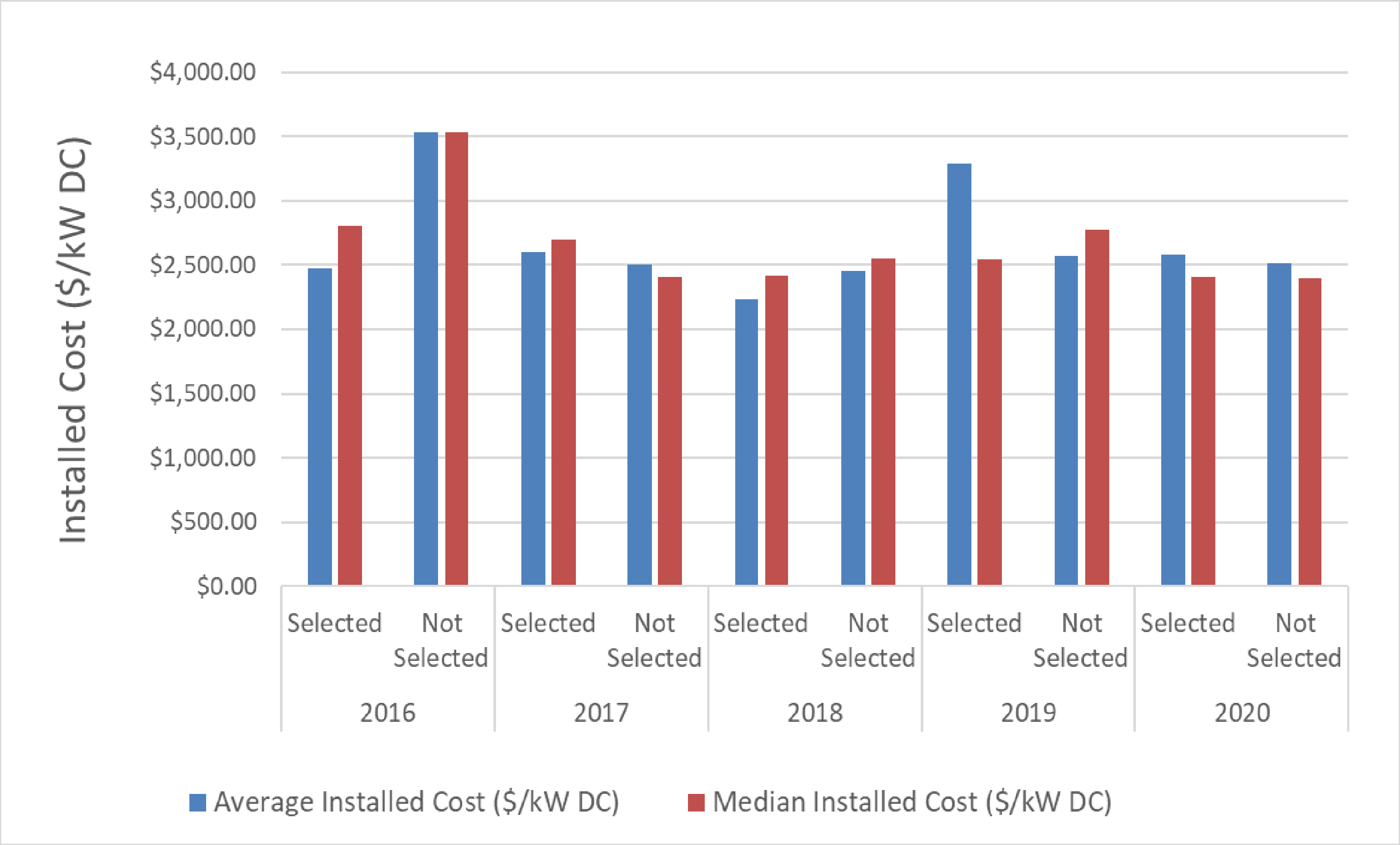
Sustainable Energy Advantage, LLC

Overview of Research to Inform CP Inputs

- Direct stakeholder input
  - Through *Data Request <u>and</u> Survey*
- Supplemental research
  - Interviews
  - Program data (bids, executed contracts)
  - Additional data from National Grid (Interconnection costs, production data)
  - Northeast regional cost databases
  - Revealed pricing data for <=25 kW system from EnergySage
  - Northeast data from national reports (LBNL *Tracking the Sun,* which will be analyzed for the 2nd round of prices)
  - Technology-specific, competitively bid long-term contract pricing data (VT, which will be analyzed for the 2nd round of prices)
- DG Standard Contracts bid data (2011 – 2014)
- REG bid data (2015-2019 Open Enrollments and 1st Open Enrollment of 2020)

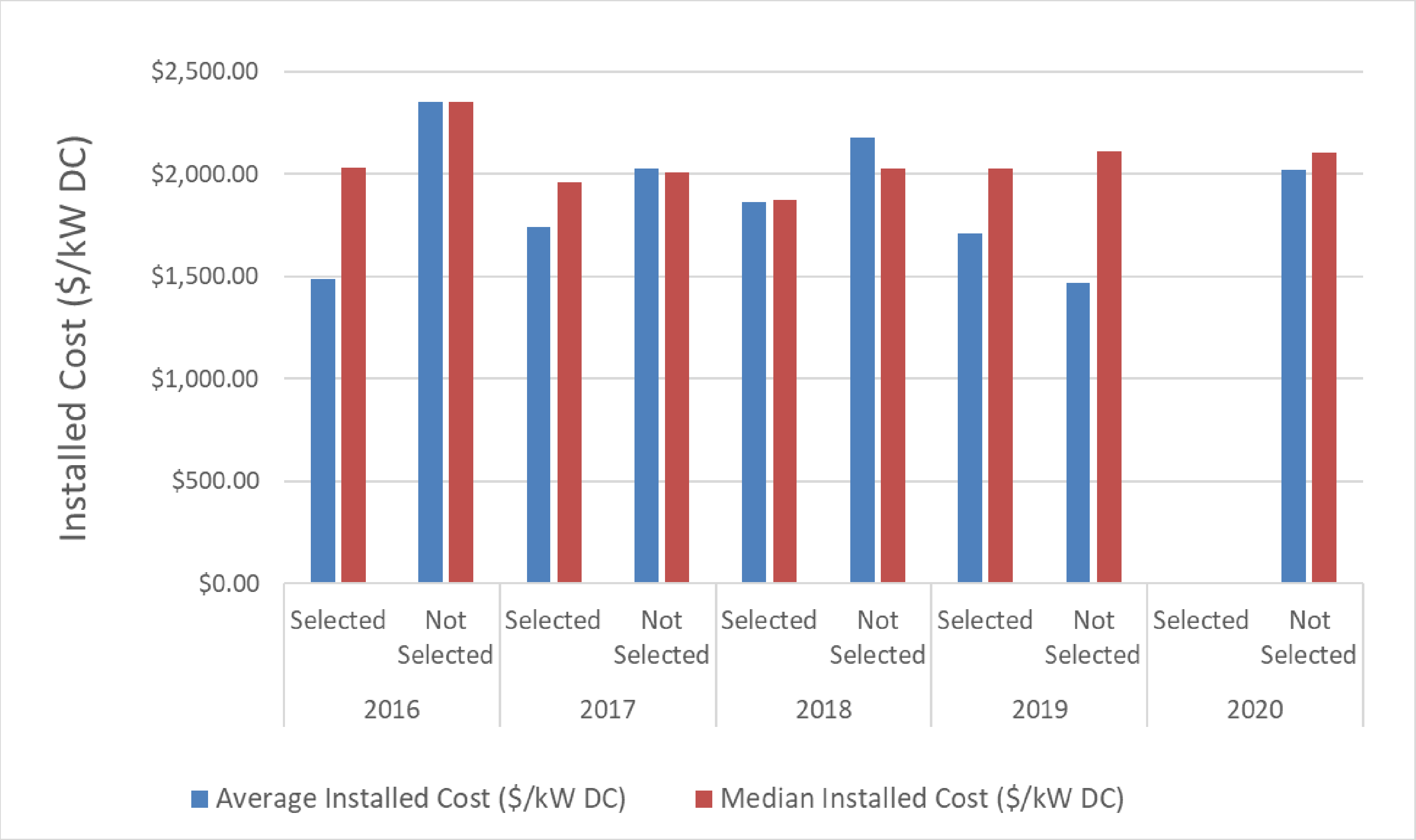
Copyright © Sustainable Energy Advantage, LLC.

REG Bid Data – Average & Median Installed Cost for Medium Solar Bids Under Different Tariff Years



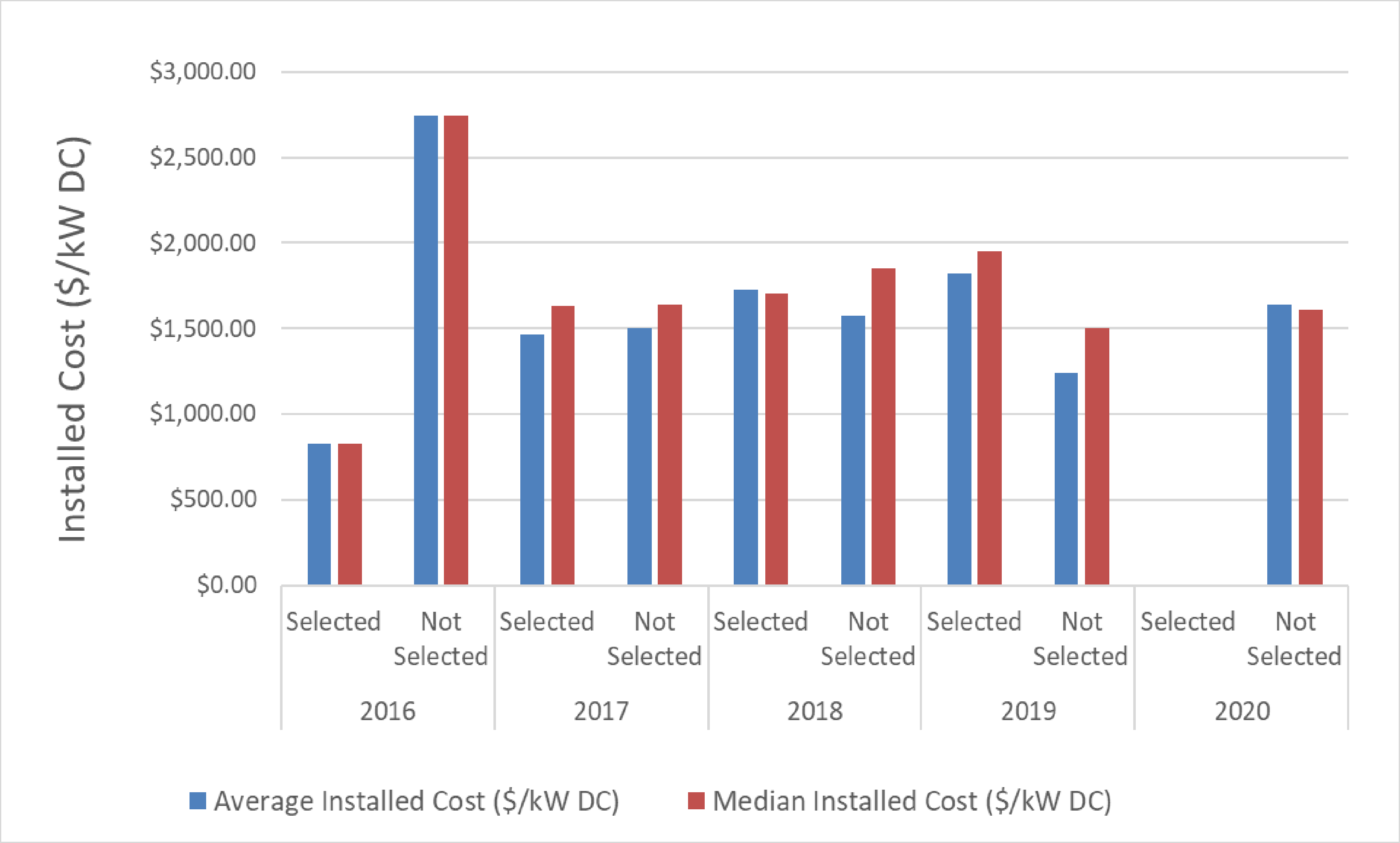
Note: Only 1 project was not selected under the 2016 tariff

REG Bid Data – Average & Median Installed Cost for Commercial Solar Bids Under Different Tariff Years



Note: Only 1 project was not selected under the 2016 tariff. Projects under the 2020 tariff are pending PUC review.

REG Bid Data – Average & Median Installed Cost for Large Solar Bids Under Different Tariff Years

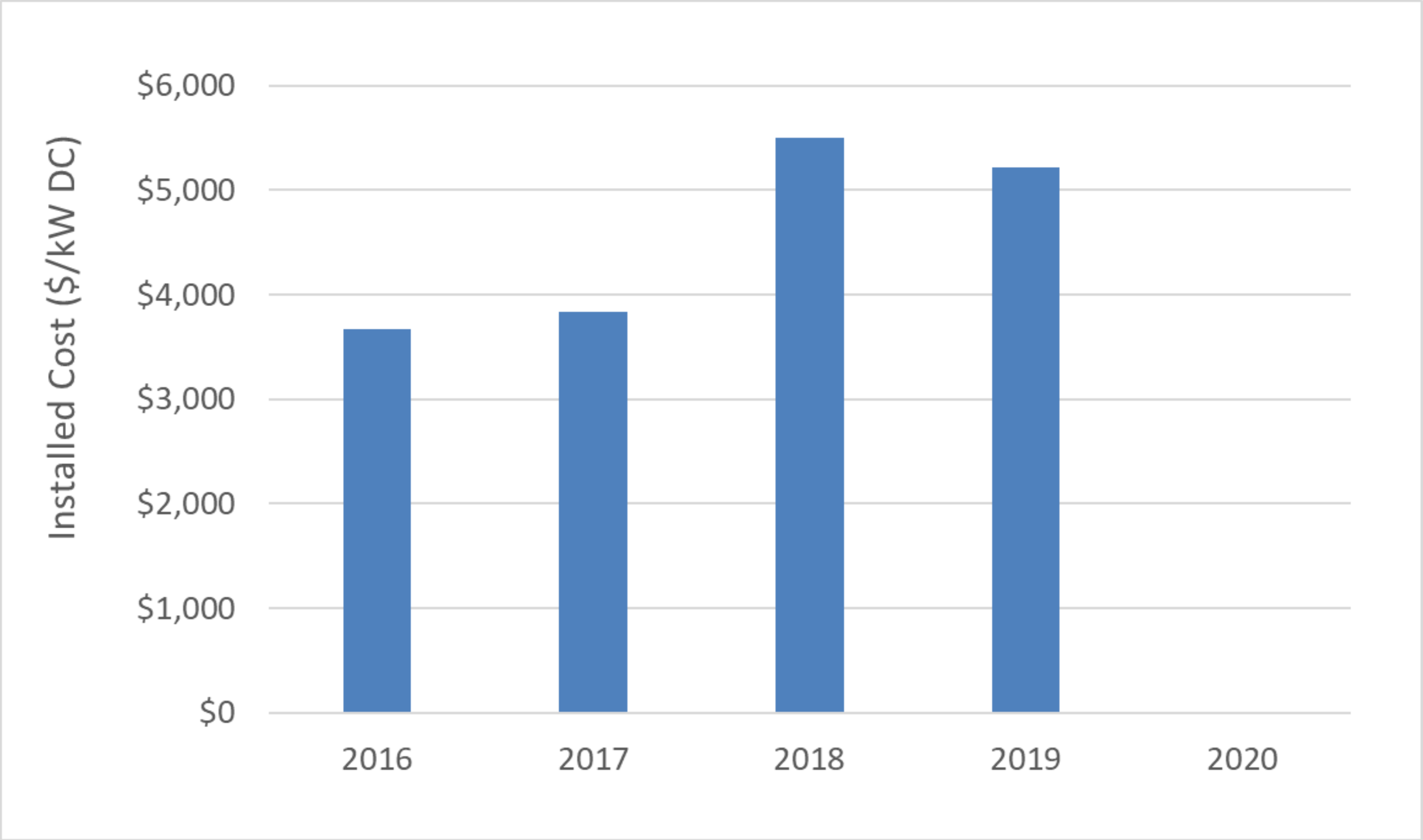


Note: Only one cost data point was available for projects selected under the 2016 tariff. Two projects under the 2019 tariff are excluded from analysis due to implausibly high costs ($66 million +), which suggest data entry errors.

Projects under the 2020 tariff are pending PUC review.

Copyright © Sustainable Energy Advantage, LLC.

REG Bid Data – Average Installed Costs for Wind Bids Under Different Tariff Years



Note: Only 2 projects were bid in years 2016-2018 (all were accepted). Only one project bid in 2019. No projects were bid in 2020.

Copyright © Sustainable Energy Advantage, LLC.

Small Solar I, Installed Costs

Small Solar I, Installed Costs								
1-15 kW								
	2019				2020			
Dataset	Average ($/kW)	Median ($/kW)	25th Percentile ($/kW)	75th Percentile ($/kW)	Average ($/kW)	Median ($/kW)	25th Percentile ($/kW)	75th Percentile ($/kW)
NY - NYSERDA Solar Electric Programs	$4,146	$3,940	$3,398	$4,594	$4,105	$3,840	$3,191	$4,646
MA Smart (Qualified & Operational)	$4,395	$4,418	$3,807	$5,043	$4,493	$4,512	$3,927	$5,072
CT Residential Solar Investment Program	$3,585	$3,575	$3,164	$4,007	N/A	N/A	N/A	N/A
State Database Averages	$4,042	$3,978	$3,457	$4,548	$4,299	$4,176	$3,559	$4,859
Energy Sage - RI Accepted	$3,292				$2,975			
Energy Sage - MA Accepted	$3,139				$3,183			
Energy Sage - NY Accepted	$3,148				$3,387			
Energy Sage - CT Accepted	$3,009				$2,993			
Energy Sage - RI All (inc. non-selected)	$3,385				$3,223			
Energy Sage Accepted Averages	$3,147				$3,134			
REF Data	$3,501	$3,500	$3,220	$4,000	$3,601	$3,450	$2,936	$3,930
Small Scale REG enrollments	$4,421	$4,300	$3,884	$4,884	$6,020	$4,509	$4,171	$4,792

Datasets: NY (NYSERDA Solar Programs 2019-2020 data), CT (Residential Solar Investment Program), MA SMART data, Energy Sage revealed pricing data for past four quarters (Q2 2019-Q1 2020), RI Renewable Energy Fund

Copyright © Sustainable Energy Advantage, LLC.

Small Solar II, Installed Costs

Small Solar II, Installed Costs								
15-25 kW								
	2019				2020			
Dataset	Average ($/kW)	Median ($/kW)	25th Percentile ($/kW)	75th Percentile ($/kW)	Average ($/kW)	Median ($/kW)	25th Percentile ($/kW)	75th Percentile ($/kW)
NY - NYSERDA Solar Electric Programs	$3,223	$3,051	$2,644	$3,611	$3,306	$3,203	$2,655	$3,665
MA Smart (Qualified & Operational)	$3,813	$3,687	$3,386	$4,489	$3,948	$3,926	$3,328	$4,612
CT Residential Solar Investment Program	$3,408	$3,400	$3,118	$3,716	No Data	No Data	No Data	No Data
State Database Averages	$3,482	$3,379	$3,050	$3,939	$3,627	$3,565	$2,991	$4,138
Energy Sage - RI Accepted	$3,226				$2,980			
Energy Sage - MA Accepted	$2,992				$3,039			
Energy Sage - NY Accepted	$2,947				$3,004			
Energy Sage - CT Accepted	$2,944				$2,756			
Energy Sage - RI All (inc. non-selected)	$3,225				$3,033			
Energy Sage Accepted Averages	$3,027				$2,945			
REF Data	$3,403	$3,500	$3,023	$3,841	$3,069	$3,026	$2,988	$3,129
Small Scale REG enrollments	$3,649	$3,326	$3,066	$3,963	No data	No data	No data	No data

Datasets: NY (NYSERDA Solar Programs 2019-2020 data), CT (Residential Solar Investment Program), MA SMART data, Energy Sage revealed pricing data for past four quarters (Q2 2019-Q1 2020), RI Renewable Energy Fund

Copyright © Sustainable Energy Advantage, LLC.

Medium, Commercial, and Large Solar Installed Costs

Medium--Scale Solar (26--250 kW DC)								
25-250 kW								
	2019				2020			
Dataset	Average ($/kW)	Median ($/kW)	25th Percentile ($/kW)	75th Percentile ($/kW)	Average ($/kW)	Median ($/kW)	25th Percentile ($/kW)	75th Percentile ($/kW)
NY - NYSERDA Solar Electric Programs	$2,972	$2,617	$2,390	$3,243	$3,612	$3,500	$2,592	$4,558
RI REG Bids	$2,581	$2,600	$2,394	$2,800	$2,311	$2,397	$2,209	$2,405

Commercial--Scale Solar (251-999 kW DC)								
250-1000 kW								
	2019				2020			
Dataset	Average ($/kW)	Median ($/kW)	25th Percentile ($/kW)	75th Percentile ($/kW)	Average ($/kW)	Median ($/kW)	25th Percentile ($/kW)	75th Percentile ($/kW)
NY - NYSERDA Solar Electric Programs	$2,218	$2,187	$1,664	$2,480	$2,339	$2,388	$2,149	$2,600
RI REG Bids	$2,144	$2,202	$2,029	$2,323	$2,168	$2,208	$2,109	$2,302
SEA Industry Survey	$2,146	$1,980						

Large-Scale Solar (1,000--5,000 kW DC)								
1000-5000+ kW								
	2019				2020			
Dataset	Average ($/kW)	Median ($/kW)	25th Percentile ($/kW)	75th Percentile ($/kW)	Average ($/kW)	Median ($/kW)	25th Percentile ($/kW)	75th Percentile ($/kW)
NY - NYSERDA Solar Electric Programs	$1,346	$1,320	$1,133	$1,468	$1,426	$1,255	$1,164	$1,470
RI REG Bids	$1,803	$1,873	$1,500	$2,027	$1,303	$1,212	$1,206	$1,309
VS Survey	$1,720	$1,600						

Datasets: NY (NYSERDA Solar Programs), RI Renewable Energy Growth bids for 2019-2020 enrollments, SEA survey of industry from November 2019

Copyright © Sustainable Energy Advantage, LLC.

Average & Median Installed Cost/kW for RI REF Data (2019-2020)

Installed Cost Analysis of Renewable Energy Fund (REF) Systems 1-25 kW, 2019-2020										
	2019					2020				
	Average cost ($/kW)	Median cost ($/kW)	1st Quartile	3rd Quartile	N	Average cost ($/kW)	Median cost ($/kW)	1st Quartile	3rd Quartile	N
1-15 kW	$3,501	$3,500	$3,220	$4,000	414	$3,601	$3,450	$2,936	$3,930	110
15-25 kW	$3,403	$3,500	$3,023	$3,841	19	$3,069	$3,026	$2,988	$3,129	3

Note: Data from RI Renewable Energy Fund (CommerceRI).

Copyright © Sustainable Energy Advantage, LLC.

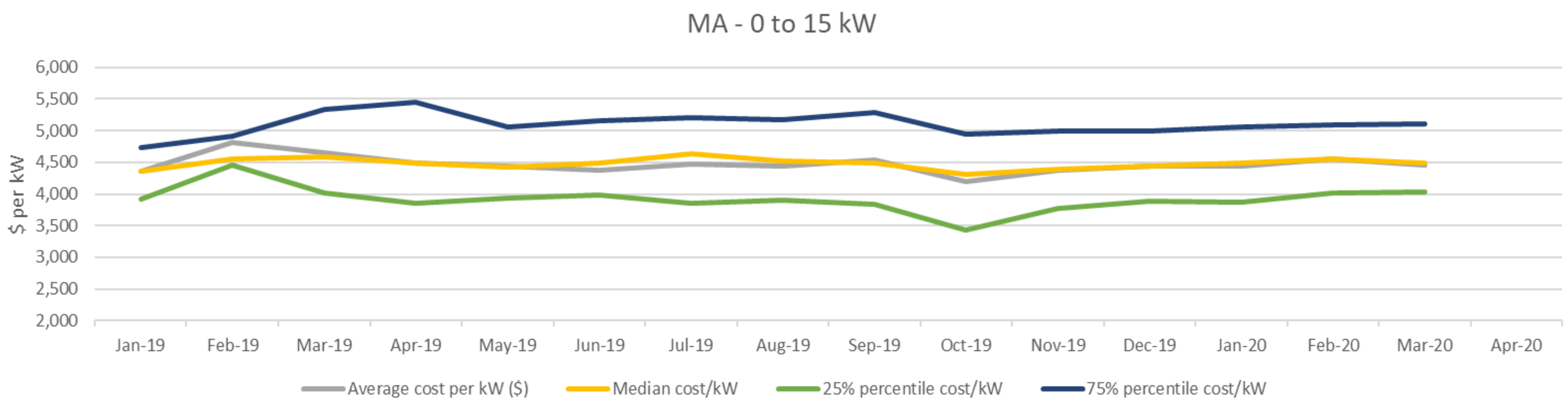
Interconnection Cost Analysis

	Rhode Island 2019-2020 Projects		
	Number of Projects with Cost Data	Median Cost ($/kW DC)	Average Cost ($/kW DC)
Solar (<25 kW)	15	$0.00	$59.53
Solar (25-250 kW)	13	$22.10	$49.37
Solar (250-1000 kW)	1	$1.89	$1.89
Solar (1000-5000 kW)	5	$155.13	$134.18
Small Wind (<=999 kW)	0	N/A	N/A
Large Wind (1000-5000 kW)	6	$291.95	$301.06

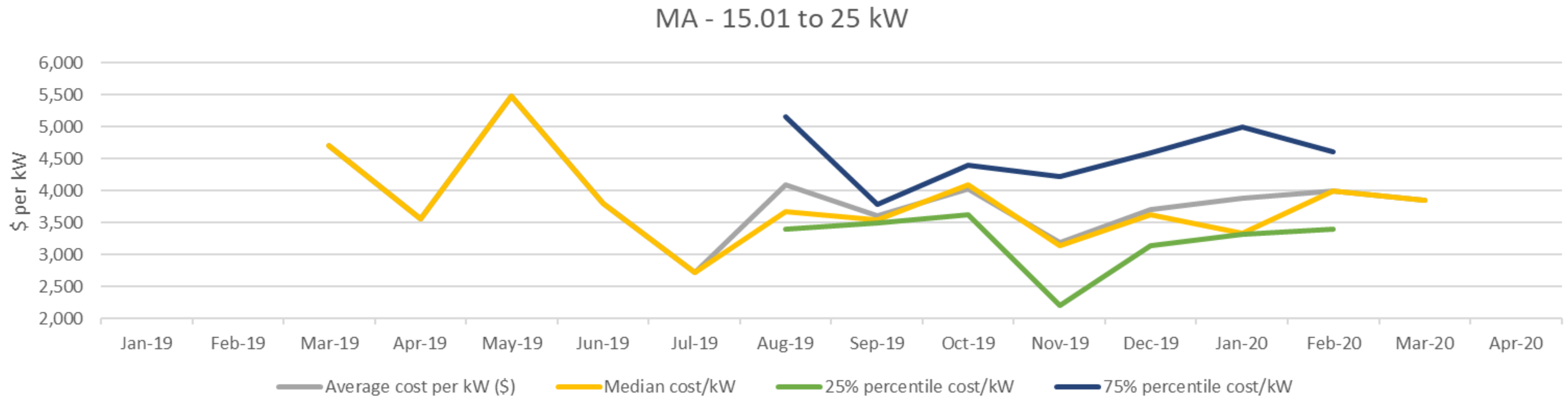
Note: Based on National Grid Data. Dataset includes additional projects that do not have cost data available.

Copyright © Sustainable Energy Advantage, LLC.

Small Solar Installed Costs, Jan 2019-Present - MA



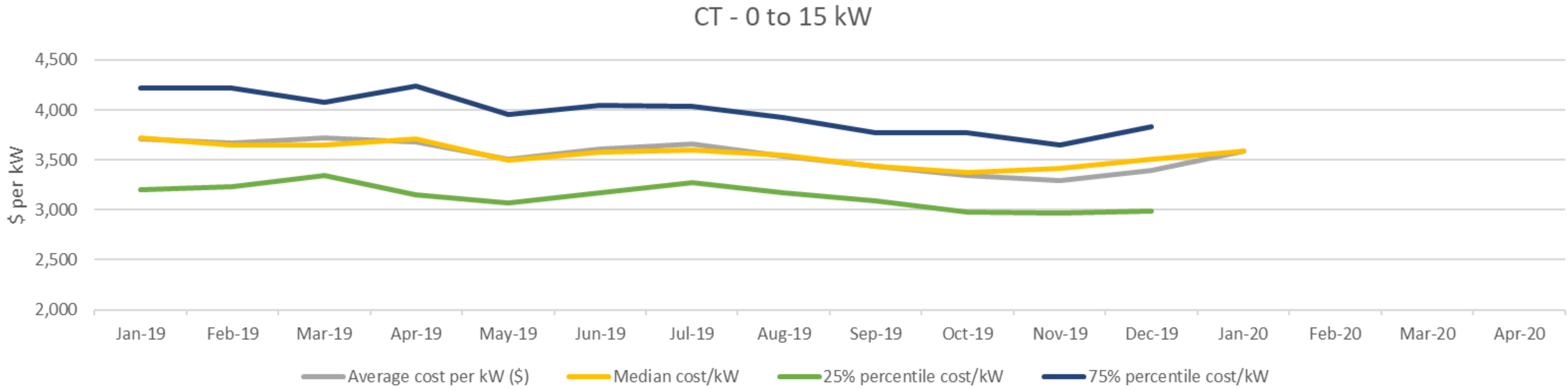
<u>Ave. Monthly Change:</u>
Average: 0.2%
Median: 0.2%



<u>Ave. Monthly Change:</u>
Average: 1.7%
Median: 1.5%

Copyright © Sustainable Energy Advantage, LLC.

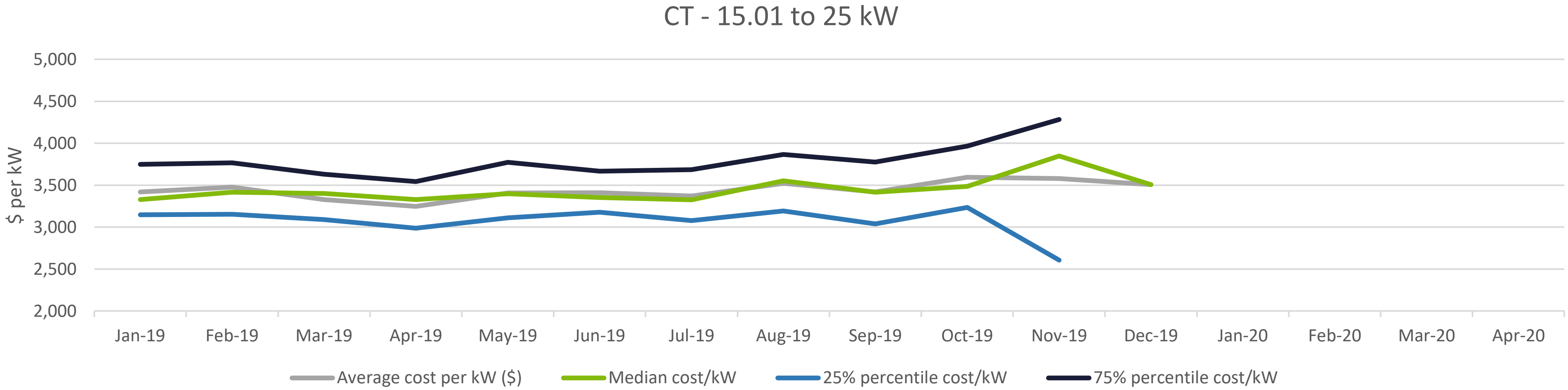
Small Solar Installed Costs, Jan 2019-Present - CT



<u>Ave. Monthly Change:</u>

Average: -0.25%

Median: -0.28%



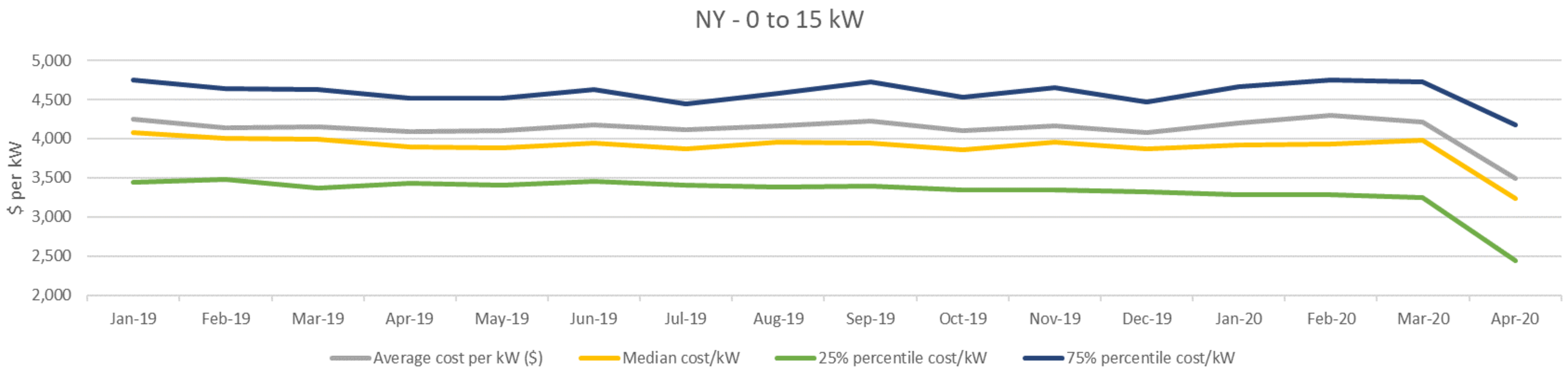
<u>Ave. Monthly Change:</u>

Average: 0.28%

Median: 0.59%

Copyright © Sustainable Energy Advantage, LLC.

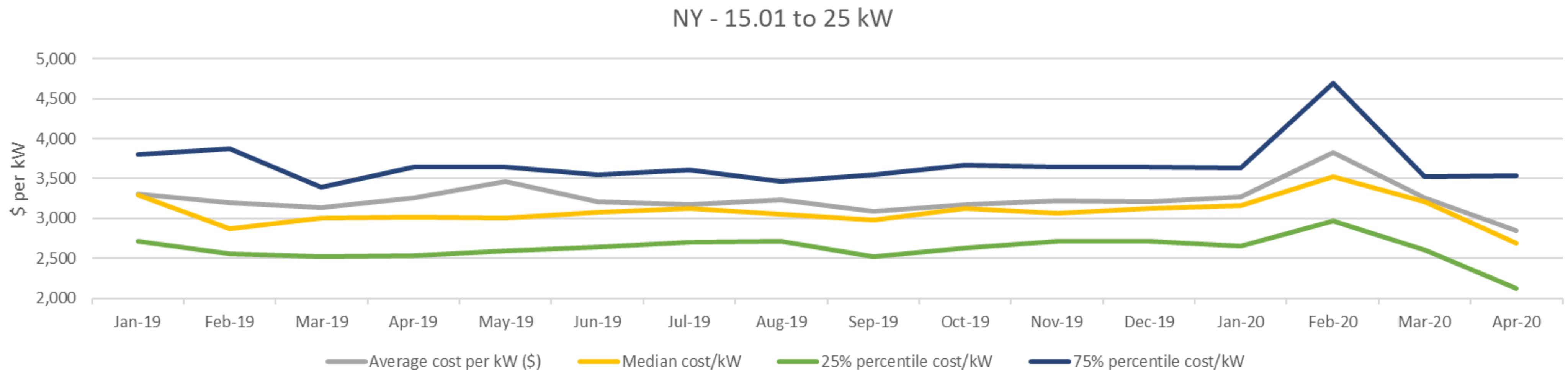
Small Solar Installed Costs, Jan 2019-Present - NY



<u>Ave. Monthly Change:</u>

Average: -1.19%

Median: -1.40%



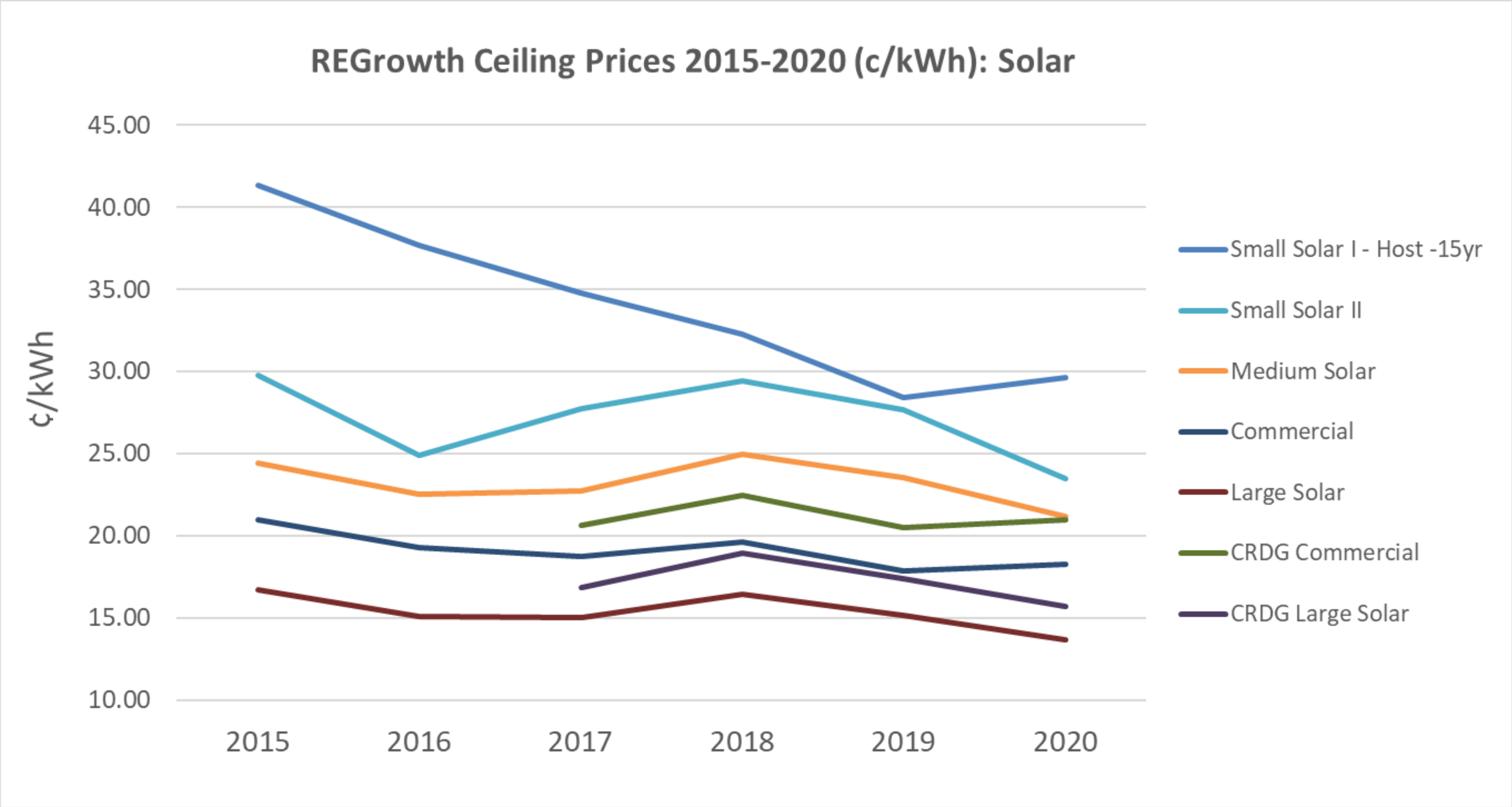
<u>Ave. Monthly Change:</u>

Average: -0.73%

Median: -1.11%

Copyright © Sustainable Energy Advantage, LLC.

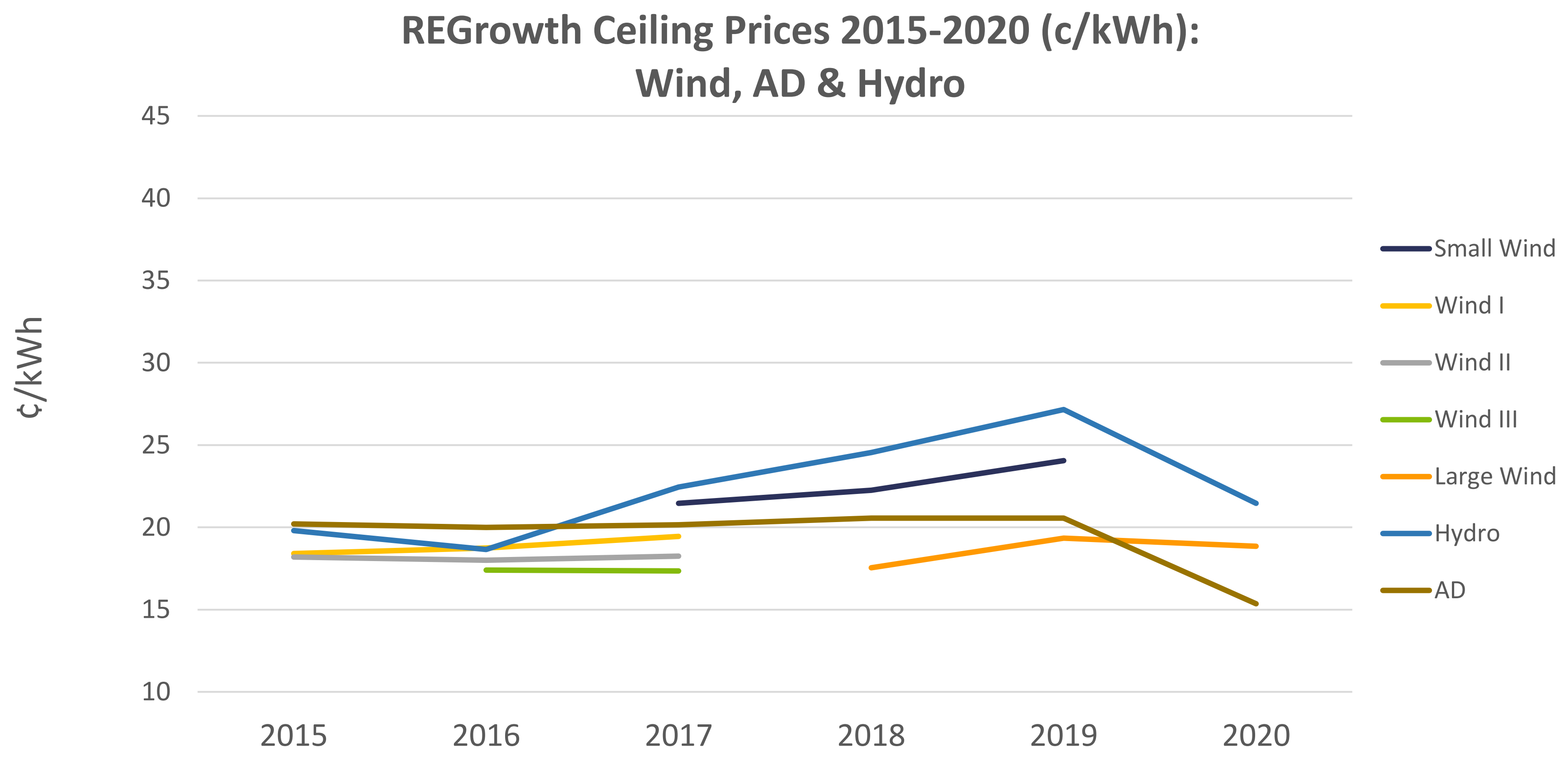
Summary of Ceiling Prices: 2015 – 2020 (Solar)



Note: Graph for Demonstration Purposes only. Ceiling Price Classes have changed over time, making cross-comparison across enrollments tenuous.

Copyright © Sustainable Energy Advantage, LLC.

Summary of Ceiling Prices: 2015 – 2020 (Non-Solar)



Note: Graph for Demonstration Purposes only. Ceiling Price Classes have changed over time, making cross-comparison across enrollments tenuous.

Copyright © Sustainable Energy Advantage, LLC.

Post-Tariff Market Value of Production

- Applied after tariff expires, for remainder of modeled useful life, if applicable.
  - Solar (years 21 through 25)
  - Hydro (years 21 through 30)
  - Does not apply to wind and AD, modeled as 20-year useful life
- Purpose = to take full useful life and market revenues into account when recommending ceiling price
- Methodology
  - Wholesale energy and capacity revenue +
    - Production-weighted for solar
    - All-hours for hydro
  - (Nominal) REC revenue (assumed to be $5/MWh)

Copyright © Sustainable Energy Advantage, LLC.

Post-Tariff Market Value of Production (2021 CPs)

Project Year	Calendar Year	Market Value of Production (incl. energy, capacity & RECs) (cents/kWh)	
		Solar	Hydroelectric
16	2036	4.45	5.69
17	2037	4.62	5.83
18	2038	4.73	5.97
19	2039	4.85	6.11
20	2040	5.00	6.26
21	2041	5.15	6.41
22	2042	5.27	6.56
23	2043	5.39	6.71
24	2044	5.52	6.86
25	2045	5.65	7.02
26	2046	5.78	7.18
27	2047	5.92	7.34
28	2048	6.06	7.51
29	2049	6.21	7.68
30	2050	6.37	7.85

Copyright © Sustainable Energy Advantage, LLC.

Post-Tariff Market Value of Production (2020 CPs)

Project Year	Calendar Year	Market Value of Production (incl. energy, capacity & RECs) (cents/kWh)	
		Solar	Hydroelectric
16	2035	5.46	7.36
17	2036	5.65	7.61
18	2037	5.84	7.87
19	2038	5.98	8.15
20	2039	6.16	8.44
21	2040	6.38	8.75
22	2041	6.61	9.07
23	2042	6.86	9.41
24	2043	7.11	9.76
25	2044	7.37	10.12
26	2045	7.65	10.49
27	2046	7.93	10.88
28	2047	8.22	11.28
29	2048	8.53	11.70
30	2049	8.84	12.13

Copyright © Sustainable Energy Advantage, LLC.

Sustainable Energy Advantage, LLC
161 Worcester Road, Suite 503
Framingham, MA 01701
http://www.seadvantage.com

Contacts:

Jim Kennerly
☎ 508-665-5862
✉ jkennerly@seadvantage.com

Kate Daniel
☎ 508-665-5863
✉ kdaniel@seadvantage.com

Jason Gifford
☎ 508-665-5856
✉ jgifford@seadvantage.com

Rhode Island
Renewable Energy Growth Program:

Analysis & Discussion in Support of 2nd Draft 2021 Ceiling Price Recommendations

September 8, 2020

Sustainable Energy Advantage, LLC
Mondre Energy, Inc.

Sustainable Energy Advantage, LLC

Changes in Cost/Performance Assumptions to Incorporate Stakeholder Feedback (from 1st Draft)

Sustainable Energy Advantage, LLC

Installed Costs

- **Incorporating data from New York:** One stakeholder commented that using NY data is inappropriate because it does not capture costs required in RI.
  - **M.I.: No change. § 39-26.6-5(d) of the Renewable Energy Growth Act permits the DG Board to consider not only build costs in Rhode Island, but also those in the "ISO-NE Control Area" as well as the "Northeast Corridor" (of which NY is a part).**
    - **However, in reviewing the data, consulting team discovered the large solar data previously included projects up to 10 MW, which has now been adjusted to a max of 5 MW**
- **LBNL Data:** Received data from Lawrence Berkeley National Laboratory (LBNL) collected as part of forthcoming annual Tracking the Sun report
  - **M.I.: Incorporate 25th percentile upfront capital cost data from RI and other Northeastern states**
- **Updated Greenfield Estimates:** SEA conducted a survey to estimate incremental costs for potential Public Policy Adder categories, which provided updated estimates for greenfield projects as well
  - **M.I.: Incorporate the greenfield estimates for Medium, Commercial, and Large Solar into installed cost inputs**

Copyright © Sustainable Energy Advantage, LLC.

Capacity Factors for Solar and Non-Solar Projects

- Most (77%) survey respondents found the proposed Solar capacity factors reasonable. The few responses that indicated they were not reasonable did not provide alternative capacity factors or documentation.
- Only one response to non-solar capacity factors was received, and that stakeholder indicated support of those assumptions.
- **M.I.: No change to assumed capacity factors. Additional work regarding capacity will be pursued as part of the Public Policy Adders process.**

Copyright © Sustainable Energy Advantage, LLC.

Solar Operations & Maintenance Costs

- RE: performance guarantees, developers in the commercial and large sectors indicated that such guarantees are standard practice.
- Small Solar (<=25 kW) developers indicated that while not typically required by investors, they usually back their projects with performance guarantees. Developers in the medium category were mixed in whether this is required or not commonly encountered.
- Other than one documented quote for O&M packages received in the first round of comments, SEA did not receive additional cost estimates for O&M – either for standard or premium packages. Most (62.5%) of survey responses indicated that our O&M cost inputs were reasonable.
- **M.I.: Use a blend of the basic and premium O&M quotes provided in the first round for Medium and Commercial categories. No change to Large Solar.**

Copyright © Sustainable Energy Advantage, LLC.

Project Monitoring

- More responses indicated monitoring costs would be accounted for under project management than O&M
  - M.I.: Account for monitoring costs under project management
- Stakeholders provided estimates of monitoring costs ranging from $1,200 a year to $3,000 a year per project, or $4.6-$8/kW
- The consulting team did not receive quantified data on the other aspects of project management
- **M.I.: The estimates of monitoring costs support raising project management costs, which also include staff time related to managing the project's PPAs, grid integration, and periodic reporting, for medium and commercial categories.**
  - **Assume monitoring ~1/2 project management costs; monitoring = $1,500 for medium and $2,000 for commercial costs → total project management = $3,000 for medium and $4,000 for commercial.**
  - **No change to large category project management, as it is sufficiently higher than monitoring estimate.**

Copyright © Sustainable Energy Advantage, LLC.

Year-on-Year Cost Declines

- Few stakeholders responded to the question of what appropriate assumptions are for annual cost declines from 2020 to 2021. Of those that did, around 75% agreed with our assumptions, while those who stated that they disagreed did not provide another quantified estimate.
- Comments from developers note great uncertainty around COVID, and argue that costs could rise.
- NREL Annual Technology Baseline (ATB) 2020 values indicate nominal decline rate from 2020 to 2021 of 3.6%-8%
- **M.I.: Current estimates (3.5% for Solar <=25 kW and 4.5% for Solar >25 kW) are in line with NREL ATB range, therefore no change. However, consulting team reserves the right to adjust these factors in response to the COVID-19 pandemic and its impact on costs and markets.**

Copyright © Sustainable Energy Advantage, LLC.

Interconnection Costs and Delays (1)

- One stakeholder commented that we should not utilize REG bid data because projects do not have final interconnection costs at the time of submitting applications.
- **M.I.: No change for current round, but consulting team will investigate with National Grid the extent to which interconnection costs change from initial estimate to final costs**
- Another stakeholder raised that our interconnection cost basis is historical, and interconnection costs have been increasing.
- **M.I.: No change for current round, but consulting team agrees that distribution interconnection costs are rising, and will investigate degree of year-over-year interconnection cost trends for final recommended prices**

Copyright © Sustainable Energy Advantage, LLC.

Interconnection Costs and Delays (2)

- Yet another stakeholder suggested the REG Ceiling Prices should include consideration of transmission upgrades required as a result of Affected System Operator (ASO) analyses undertaken at the behest of ISO-NE.
- **M.I.s:**
  - **Consulting team plans to incorporate the precise costs of ASO studies into final round of prices (given the paucity of substations to which interconnection would not require a transmission system impact study)**
  - **However, we decline to incorporate the capital and/or operating costs associated with transmission upgrade costs in the Ceiling Prices for the following reasons:**
    1. **The current ISO-NE "cost causation" approach (and the wide variance in potential transmission upgrade costs) makes assessing an "average" value for all projects impossible**
    2. **The Ceiling Prices are not intended as a means of attempting to make broader public policy changes that are outside the scope of OER and the Board's mandate (and which should be made in the context of either the National Grid interconnection tariff, or via changes to the Section I.3.9 process in the ISO-NE tariff)**

Copyright © Sustainable Energy Advantage, LLC.

Other Cost/Performance Issues

- Degradation (%/yr)
  - Initial regional analysis (from internal SEA research) has suggested degradation can reach up to 1%/year. However, impact of this change could be significant, and given large number of changes currently under consideration (including development of Public Policy Adders),
  - **M.I.: No change, and consulting team recommends further (and more conclusive) investigation as part of 2022 Ceiling Price process**
- Insurance (% of Total Cost)
  - No additional information received regarding insurance quotes during most recent round of analysis
  - **M.I.: No change for this round, but consulting team will seek further information and documentation of insurance costs from stakeholders ahead of development of final recommended CPs.**

Copyright © Sustainable Energy Advantage, LLC.

Changes in Financing Assumptions to Incorporate Stakeholder Feedback (from 1st Draft)

Sustainable Energy Advantage, LLC

Debt % and Debt Term

- % Debt (All Projects):
  - Several participants have pushed back on the debt quantity being increased 5%, arguing that a reduction in income does not allow for meeting debt service payments
  - Follow-up market research (from Norton Rose) indicated a coverage ratio of 1.25 for solar was appropriate (we had assumed it was closer to 1.15)
  - Re-set this coverage ratio, and found that maintaining the debt percentage at 2020 levels was a better fit for this ratio
  - **M.I.: Adjust debt/equity ratios back to 2020 levels, except for Medium Solar (since initial 60% debt fraction allows for appropriate coverage, given other consulting team assumptions)**
- Debt Term (Years):
  - Nearly all participants agreed with assumption of 15 years of term debt
  - Others suggested longer terms were possible (despite agreeing that 15 years was a good proxy for the market as a whole).
  - Suggestion was backed up by a redacted term sheet
  - **M.I.: No change in debt term (consulting team believes 15 years remains a good proxy)**

Copyright © Sustainable Energy Advantage, LLC.

Interest on Term Debt

- Solar projects
  - Some have suggested (with documented evidence) that Medium solar is typically between 6.0%-6.5%
  - Others have suggested debt prices are closer to 6% (the 2020 value)
  - Yet others argued prices are lower than 5.25% (closer to 4.5%)
  - **M.I.: Set value at 6.0% for Medium Solar, but leave unchanged for others**
- Non-Solar (Wind) projects
  - Documented evidence that wind interest on term debt (from term sheet) is 6.5%
  - **M.I.: Set Wind debt interest to 6.0%, with option to revise based on further documented evidence from Wind participants**
- COVID-related Risk Premium (Solar and Non-Solar)
  - Consensus amongst financiers and developers suggested the premium was already baked in at the 5.25% value, but that if the economy worsened (or lacked further stimulus) credit would likely dry up
  - **M.I.: No immediate change, but consulting team will consider increasing debt premiums at least an additional 25 to 50 bps for final round of prices in October 2020 if economic growth stalls (or substantial further stimulus is not forthcoming)**

Copyright © Sustainable Energy Advantage, LLC.

Equity (Sponsor and Tax)

- Interconnection/Permitting Delay-Related Risk
  - Numerous stakeholders have noted a concern for longer-term permitting and interconnection delays associated with COVID-19 pandemic (and the associated carrying cost for project sponsors)
  - **M.I.: Increase sponsor equity returns for all projects by 50 basis points to account for longer-term permitting/interconnection delays created by COVID-19 pandemic impacts**
- Tax Equity % of Capital Stack
  - A financier indicated that most tax equity advance rates corresponded to a 60% share of tax equity within the share of total equity (rather than 75%)
  - **M.I.: Adjusted the amount of tax equity to 60% (thereby increasing share of sponsor equity, for projects explicitly financed with tax equity)**
- CRDG Risk/Return
  - A Solar developer stakeholder suggested a 200-basis point AT IRR increase should be applied to all CRDG projects to account for risks of shorter customer agreement terms, as well as perceived financier risk
  - However, the REG statute limits the CRDG Ceiling Price premium to 15%
  - **M.I.: No change (since Solar CRDG prices already assume maximum allowable premium)**

Copyright © Sustainable Energy Advantage, LLC.

Tax Credit Approach/Impact

- Solar Investment Tax Credit (%)
  - Two stakeholders suggested that the consulting team assume a 10% Investment Tax Credit (ITC) value (consistent with the current law values for 2022 and thereafter), given current permitting and interconnection delays
  - Under current law, the Investment Tax Credit (ITC) value for Solar projects in calendar year 2021 is 22%
  - **M.I.: No change. The Internal Revenue Service (IRS) allows for generous "safe harbor" provisions (under which project developers and/or owners can spend as little as 5% of the project cost prior to the end of 2021) to qualify, rendering changes to the assumed Solar ITC value unnecessary.**
- Hydro ILoPTC Treatment Fix
  - Upon further review of the CREST model, the consulting team discovered that hydroelectric projects were inadvertently still assumed to be receiving the ITC in lieu of the PTC (ILoPTC) despite its expiration 1/1/2021
  - **M.I.: ILoPTC treatment removed (resulting in ITC value of 0%)**

Copyright © Sustainable Energy Advantage, LLC.

OER/Board Proposal in Response to PUC Request for Options to Address Commercial & Large Solar Pricing Discrepancy

Sustainable Energy Advantage, LLC

Splitting Commercial Class Pricing (at PUC Request)

- On August 13, 2020, PUC held technical session regarding several topics, including issues regarding the 2021 Ceiling Price development process
- PUC Chair Gerwatowski expressed concern at the size of the dropoff between the Commercial and Large Solar classes (e.g., that a project could receive up to 4-5 cents more by simply sizing a project at 999 kW_{DC} (rather than 1 MW_{DC})
- While Chair Gerwatowski did not specifically order OER and the Board to revise the design of the Commercial ceiling price, the Chairman requested that OER and the Board develop “options” for addressing his concern
- **<u>OER and the Board wish to vet these options with stakeholders prior to proposing these options with the PUC when filing the 2021 recommended CPs.</u>**

Copyright © Sustainable Energy Advantage, LLC.

OER/Board Proposed Commercial Class Pricing Options for Stakeholder Consideration (Ahead of PUC Consideration)

- Option A: (Effectively) Status Quo
  - **M.I. for Full 251-999 kW Range:**
    - **Single 251-999 kW class with 500 kW proxy system size**
    - **No change to upfront capital and operating costs, or financing assumptions (capital costs based on 25th percentile of all bid and state databases)**
- Option B: Splitting Commercial Class
  - Maintain single Commercial class with single capacity allocation for both CRDG and non-CRDG, but apply different Ceiling Prices to 251-750 kW and 751-999 kW projects
    - Challenge: limited dataset of state database projects between 751-999 kW in 2020
  - **M.I. for 251-750 kW**
    - **Set 500 kW proxy size, and set upfront capital cost assumption for 251-750 kW based on median value for 251-999 kW range (vs. 25th percentile for 251-999 kW, as in Option A)**
    - **Maintain Option A OpEx and financing assumptions**
    - **Assume same additional CRDG spending (capped at 15% by law)**
  - **M.I. for 751-999 kW**
    - **Set 900 kW proxy size, and set upfront capital cost assumption for 751-999 kW based 25th percentile for 251-999 kW range**
    - **Maintain Option A OpEx and financing assumptions**
    - **Assume same additional CRDG spending (capped at 15% by law)**

Copyright © Sustainable Energy Advantage, LLC.

2nd Draft 2021 Ceiling Prices

Sustainable Energy Advantage, LLC

Summary Results for Solar (Option A, ¢/kWh)

Technology	**Size Range kW** (Modeled Size kW)	**2020 Approved CP**	**2021 1st Draft CP** (% Change from 2020 Approved)	**2021 2nd Draft CP (%** Change from 2020 Approved, 22% ITC Statutory Value)	**2021 2nd Draft CP (%** Change from 2020 Approved, Hypothetical 26% ITC)[1]
Small Solar I (15 year tariff)	1-10 (5)	29.65	*29.95 (1%)*	**30.05 (1%)**	***28.85 (-3%)***
Small Solar II	11-25 (25)	23.45	*26.15 (11%)*	**26.05 (11%)**	***24.55 (5%)***
Medium Solar	26-250 (250)	21.15	*20.95 (-1%)*	**22.35 (6%)**	***21.45 (1%)***
Commercial Solar (251-999 kW)	251-999 (500)	18.25	*16.05 (-12%)*	**17.25 (-5%)**	***16.55 (-9%)***
Comm. Solar-CRDG (251-999 kW)	251-999 (500)	20.99	*18.46 (-12%)*[2]	**19.84 (-5%)**[2]	***19.03 (-9%)***
Large Solar	1,000-5,000 (4,500)	13.65	*11.25 (-18%)*	**12.25 (-10%)**	***11.75 (-14%)***
Large Solar-CRDG	1,000-5,000 (4,500)	15.70	*12.94 (-18%)*[2]	**14.09 (-10%)**[2]	***13.51 (-14%)***

Proposed 2021 CP increases for Small Solar I and Medium Solar driven mostly by reduction in ITC value; increase in Small Solar II by reduction in ITC value and change in financing assumptions.

1. The values in this column are shown to illustrate the change from the 2020 Approved CP, which also assumes a 26% statutory ITC value (the statutory value for calendar year 2020). The proposed prices, which reflect a 22% statutory ITC value for calendar year 2021, are in the column to the immediate left.
2. This is the maximum CRDG Ceiling Price allowed by law. The calculated 2020 values are 20.75 for Comm. Solar-CRDG (251-999) and 15.85 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.

Copyright © Sustainable Energy Advantage, LLC.

Summary Results for Solar (Option B, ¢/kWh)

Technology	Size Range kW (Modeled Size kW)	2020 Approved CP	2021 1st Draft CP (% Change from 2020 Approved)	2021 2nd Draft CP (% Change from 2020 Approved, 22% ITC Statutory Value)	2021 2nd Draft CP (% Change from 2020 Approved @ Hypothetical 26% ITC)[1]
Small Solar I (15 year tariff)	1-10 (5)	29.65	*29.95 (1%)*	**30.05 (1%)**	***28.85 (-3%)***
Small Solar II	11-25 (25)	23.45	*26.15 (11%)*	**26.05 (11%)**	***24.55 (5%)***
Medium Solar	26-250 (250)	21.15	*20.95 (-1%)*	**22.35 (6%)**	***21.35 (1%)***
Commercial Solar (251-750 kW)[2]	251-750 (500)	18.25	*16.05 (-12%)*	**18.55 (2%)**	***17.75 (-3%)***
Comm. Solar-CRDG (251-750 kW)[2]	251-750 (500)	20.99	*18.46 (-12%)[3]*	**21.33 (2%)[3]**	***20.41 (-3%)***
Commercial Solar (751-999 kW)[2]	751-999 (900)	18.25	*16.05 (-12%)*	**15.25 (-16%)**	***14.55 (-20%)***
Comm. Solar-CRDG (751-999 kW)[2]	751-999 (900)	20.99	*18.46 (-12%)[3]*	**17.54 (-16%)[3]**	***16.73 (-20%)***
Large Solar	1,000-5,000 (4,500)	13.65	*11.25 (-18%)*	**12.25 (-10%)**	***11.75 (-14%)***
Large Solar-CRDG	1,000-5,000 (4,500)	15.70	*12.94 (-18%)[3]*	**14.09 (-10%)[3]**	***13.51 (-14%)***

Proposed 2021 CP increases for Small Solar I and Medium Solar driven mostly by reduction in ITC value; increase in Small Solar II by reduction in ITC value and change in financing assumptions.

1. The values in this column are shown to illustrate the change from the 2020 Approved CP, which also assumes a 26% statutory ITC value, which is in effect during calendar year 2020. The proposed prices, which reflect a 22% statutory ITC value in effect during calendar year 2021, are in the column to the immediate left.
2. The 2020 Approved CP in this category represents the prices proposed by OER and the DG Board and approved by the Rhode Island PUC for Commercial and Commercial CRDG for a size category of 251-999 kW. The difference in price (and the percentage change) in these categories represent differences from these approved values.
3. This is the maximum CRDG Ceiling Price allowed by law. The calculated 2021 values are 22.05 for Comm. Solar-CRDG (251-750), 18.65 for Comm. Solar CRDG (751-999 kW) and 15.85 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.

Copyright © Sustainable Energy Advantage, LLC.

Summary Results (2): Wind, Hydro & AD (cents/kWh)

Technology	Size Range kW (Modeled Size kW)	2020 Approved CP 20 year Tariff Duration	2021 1st Draft Proposed CP 20 year Tariff Duration	2021 2nd Draft Proposed CP 20 year Tariff Duration	2021 Final Recommended CP 20 year Tariff Duration
Wind	0-5,000 (3,000)	18.85	**19.85 (5%)**	**20.05 (6%)**	**20.05 (6%)**
Large Wind - CRDG	0-5,000 (3,000)	21.05	**22.15 (7%)**	**22.45 (7%)**	**22.45 (7%)**
Hydroelectric	1-5,000 (500)	21.45	**24.55 (14%)**	**26.05 (21%)**	**27.35 (28%)**
Anaerobic Digestion	1-5,000 (750)	15.35	**21.05 (37%)**	**21.25 (38%)**	**21.15 (38%)**

Copyright © Sustainable Energy Advantage, LLC.

Revised Modeling Parameters

Sustainable Energy Advantage, LLC

Summary: Cost & Production Assumptions (Option A)

	Small I	Small II	Medium	Commercial	Commercial CRDG	Large	Large CRDG
Nameplate Capacity (kW)	5	25	250	500	500	4,500 [2,000]	4,500 [2,000]
Capacity Factor	14.00%	14.00%	14.70% [14.00%]	15.20% [14.00%]	15.20% [14.00%]	15.00% [15.30%]	15.00% [15.30%]
Annual Degradation	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Total Cost^ ($/kW)	$3,146 ~~$3,129~~ [$3,279]	$2,883 ~~$2,899~~ [$2,979]	$2,332 ~~$2,288~~ [$2,360]	$1,869 ~~$1,897~~ [$1,988]	$2,019* ~~$2,047*~~ [$2,138*]	$1,492 ~~$1,384~~ [$1,602]	$1,642* ~~$1,534*~~ [$1,752*]
Fixed O&M ($/kW-yr)	$35	$35	$14.57 ~~$12.38~~ [$14]	$12.03 ~~$10.06~~ [$14]	$37.03 ~~$35.06~~ [$37]	$14.50	$39.50 [$37]
O&M Escalation Cost	2.0%	2.0%	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]
Non-O&M Escalation Cost	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Insurance (% of Cost)	0.0%	0.0%	0.27%	0.45% ~~0.27%~~	0.45% ~~0.27%~~	0.45%	0.45%
Project Management ($/yr)	$0	$0	$3,000 ~~$2,375~~	$4,000 ~~$2,375~~	$4,000 ~~$2,375~~	$12,000	$12,000
Site Lease ($/yr)	$0	$0	$12,000 [$10,000]	$20,000	$20,000 [$12,500]	$50,000	$50,000

Values in [Brackets] represent 2020 ceiling price inputs. ~~Red strikeout~~ text denotes 2021 1st draft input values that were updated to values in black text in 2nd draft.
^ Impacts due to solar module trade tariffs are assumed to be incorporated in installed cost data.
* Reflects installed cost of non-CRDG project from same category, plus estimated cost of customer acquisition ($150/kW).

Copyright © Sustainable Energy Advantage, LLC.

Summary: Cost & Production Assumptions (Option B)

	Small I	Small II	Medium	Comm'l (251-750)	Comm'l CRDG (251-750)	Comm'l (751-999)	Comm'l CRDG (751-999)	Large	Large CRDG
Nameplate Capacity (kW)	5	25	250	500	500	900 [500]	900 [500]	4,500 [2,000]	4,500 [2,000]
Capacity Factor	14.00%	14.00%	14.70% [14.00%]	15.20% [14.00%]	15.20% [14.00%]	15.20% [14.00%]	15.20% [14.00%]	15.00% [15.30%]	15.00% [15.30%]
Annual Degradation	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Total Cost^ ($/kW)	$3,146 ~~$3,129~~ [$3,279]	$2,883 ~~$2,899~~ [$2,979]	$2,332 ~~$2,288~~ [$2,360]	$2,097 ~~$1,897~~ [$1,988]	$2,247 ~~$2,047*~~ [$2,138*]	$1,869 ~~$1,897~~ [$1,988]	$2,019 ~~$2,047*~~ [$2,138*]	$1,492 ~~$1,384~~ [$1,602]	$1,642* ~~$1,534*~~ [$1,752*]
Fixed O&M ($/kW-yr)	$35	$35	$14.57 ~~$12.38~~ [$14]	$12.03 ~~$10.06~~ [$14]	$37.03 ~~$35.06~~ [$37]	$12.03 ~~$10.06~~ [$14]	$37.03 ~~$35.06~~ [$37]	$14.50	$39.50 [$37]
O&M Escalation Factor	2.0%	2.0%	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]
Non-O&M Escalation Factor	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Insurance (% of Cost)	0.0%	0.0%	0.27%	0.45% ~~0.27%~~	0.45% ~~0.27%~~	0.45% ~~0.27%~~	0.45% ~~0.27%~~	0.45%	0.45%
Project Management ($/yr)	$0	$0	$3,000 ~~$2,375~~	$4,000 ~~$2,375~~	$4,000 ~~$2,375~~	$4,000 ~~$2,375~~	$4,000 ~~$2,375~~	$12,000	$12,000
Site Lease ($/yr)	$0	$0	$12,000 [$10,000]	$20,000	$20,000 [$12,500]	$20,000	$20,000 [$12,500]	$50,000	$50,000

Values in [Brackets] represent 2020 ceiling price inputs. ~~Red strikeout~~ text denotes 2021 1st draft input values that were updated to values in black text in 2nd draft.

* Reflects installed cost of non-CRDG project from same category, plus estimated cost of customer acquisition ($150/kW).

Copyright © Sustainable Energy Advantage, LLC.

Summary: Financing Assumptions (Small Solar)

	Small I (1-15 kW)			Small II (15-25 kW)		
Assumption Set	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***
Federal Investment Tax Credit (%)	26%	22%	**22% (No Change)**	26%	22%	**22% (No Change)**
% Debt	77%	71%	**71% (No Change)**	40%	60%	**60% (No Change)**
Debt Term (years)	13	13	**13 (No Change)**	15	10	**10 (No Change)**
Interest Rate on Term Debt	5.6%	6.3%	**6.3% (No Change)**	6.7%	7.0%	**7.0% (No Change)**
Lender's Fee (% of total borrowing)	8.5%	4.25%	**4.25% (No Change)**	3.5%	2.3%	**2.3% (No Change)**
Target After-Tax Equity IRR	5.0%	5.2%	**5.2% (No Change)**	9.5%	13.0%	**13.0% (No Change)**

Copyright © Sustainable Energy Advantage, LLC.

Summary: 2021 Financing Assumptions (Solar >25 kW)

	Medium (25-250 kW)			Commercial & Commercial CRDG (Options A & B)			Large and Large CRDG (1 MW-5 MW)		
Assumption Set	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***
Federal Investment Tax Credit (%)	*26%*	*22%*	**22%**	26%	22%	**22%**	26%	22%	**22%**
% Debt	*55%*	*60%*	**60%**	60%	65%	**60%**	60%	65%	**60%**
Debt Term (years)	*15*	*15*	**15**	15	15	**15**	15	15	**15**
Interest Rate on Term Debt	*6.0%*	*5.25%*	**6.0%**	6.0%	5.25%	**5.25%**	6.0%	5.25%	**5.25%**
Lender's Fee (% of total borrowing)	*1.0%*	*1.0%*	**1.0%**	1.0%	1.0%	**1.0%**	2.0%	2.0%	**2.0%**
% Equity Share of Sponsor Equity	*25%*	*25%*	**40%**	25%	25%	**40%**	25%	25%	**40%**
Target After-Tax Equity IRR (Sponsor Equity, Levered Return)	*11.0%*	*13.0%*	**13.5%**	11.0%	12.0%	**12.5%**	11.0%	11.0%	**11.5%**
% Equity Share of Tax Equity	*75%*	*75%*	**60%**	75%	75%	**60%**	75%	75%	**60%**
Target After-Tax Equity IRR (Tax Equity, Levered Return)	*9.0%*	*9.5%*	**9.5%**	9.0%	9.5%	**9.5%**	9.0%	9.5%	**9.5%**
Depreciation Approach	5-Year MACRS	5-Year MACRS	**5-Year MACRS**	5-Year MACRS	5-Year MACRS	**5-Year MACRS**	5-Year MACRS	5-Year MACRS	**5-Year MACRS**

Copyright © Sustainable Energy Advantage, LLC.

Summary: Cost & Production Assumptions
Wind, Hydro, and AD

	Wind	Large 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)	$2,820	$2,970	$9,931	$10,150
Fixed O&M ($/kW-yr)	$26.50	$51.50	$2.00	$600
O&M Inflation	2.0%	2.0%	2.0%	2.0%
Insurance (% of Cost)	0.20%	0.20%	2.0%	1.0%
Project Management ($/yr)	$18,000	$18,000	$3,000	$75,000
Site Lease ($/yr)	$162,000	$162,000	$8,750	$35,000

Note, no changes from the 2021 1st Draft Ceiling Prices or final approved 2020 Ceiling Prices.

1. *Note: For Anaerobic Digestion we use an Availability Factor*
2. *Note: Includes $150 per kW for interconnection costs*

Summary: Financing Assumptions (Wind, Hydro, and AD)

	Wind			Wind - CRDG			Hydroelectric			Anaerobic Digestion		
Assumption Set	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***
Federal Investment Tax Credit	18%	None (Expiring 1/1/2021)	**None (Expiring 1/1/2021)**	18%	None (Expiring 1/1/2021)	**None (Expiring 1/1/2021)**	30%	None (Expiring 1/1/2021)	**None (Expiring 1/1/2021)**	30%	None (Expiring 1/1/2021)	**None (Expiring 1/1/2021)**
% Debt	65%	70%	**70%**	65%	70%	**70%**	65%	70%	**70%**	60%	65%	**65%**
Debt Term (years)	15	15	**15**	15	15	**15**	20	20	**20**	15	15	**15**
Interest Rate on Term Debt	6.5%	5.75%	**6.0%**	6.5%	5.75%	**6.0%**	7.0%	6.25%	**6.25%**	7.0%	6.25%	**6.25%**
Lender's Fee (% of total borrowing)	1.0%	1.0%	**1.0%**	1.0%	1.0%	**1.0%**	1.88%	1.88%	**1.88%**	1.5%	1.5%	**1.5%**
% Equity Share of Sponsor Equity	25%	100%	**100%**	25%	100%	**100%**	20%	100%	**100%**	20%	100%	**100%**
Target After-Tax Equity IRR (Sponsor Equity, Levered Return)	12%	12%	**12.5%**	12.0%	12%	**12.5%**	12%	12%	**12.5%**	12%	12%	**12.5%**
% Equity Share of Tax Equity	75%	0%	**0%**	75%	0%	**0%**	80%	0%	**0%**	80%	0%	**0%**
Target After-Tax Equity IRR (Tax Equity, Levered Return)	9.0%	N/A	**N/A**	9.0%	N/A	**N/A**	9.0%	N/A	**N/A**	9.0%	N/A	**N/A**
Depreciation	Average of 100% bonus and MACRS	Average of 100% bonus and MACRS	**Average of 100% bonus and MACRS**	Average of 100% bonus and MACRS	Average of 100% bonus and MACRS	**Average of 100% bonus and MACRS**	7-year MACRS	7-year MACRS	**7-year MACRS**	5-year MACRS	5-year MACRS	**5-year MACRS**

Copyright © Sustainable Energy Advantage, LLC.

Sustainable Energy Advantage, LLC
161 Worcester Road, Suite 503
Framingham, MA 01701
http://www.seadvantage.com

Contacts:

Jim Kennerly
☎ 508-665-5862
✉ jkennerly@seadvantage.com

Jason Gifford
☎ 508-665-5856
✉ jgifford@seadvantage.com

Kate Daniel
☎ 508-665-5863
✉ kdaniel@seadvantage.com

Toby Armstrong
☎ 508-665-5864
✉ tarmstrong@seadvantage.com

Rhode Island
Renewable Energy Growth Program:

2021 Ceiling Price Recommendations to DG Board

October 26, 2020

Sustainable Energy Advantage, LLC
Mondre Energy, Inc.

Sustainable Energy Advantage, LLC

2021 Ceiling Price Development Process to Date

- Consulting Team emailed stakeholders on June 1, 2020 with Survey and Data Request, requested responses by June 26
  - Received responses from 21 Solar, 3 Non-Solar and 2 both Solar and Non-Solar stakeholders.
- Circulated 1st Draft Proposed 2021 Ceiling Prices on July 14, 2020, ahead of meeting on July 28.
  - Included proposed technology categories, system sizes, and modeled system size, as well as the proposed Ceiling Prices and responses to stakeholder input.
  - Meeting attended by 58 stakeholders, including a broad array of Solar and Non-Solar developers, as well as National Grid.
- Issued Supplemental Data Request on July 29, 2020 requesting responses by August 14. Timeline for Request was extended on August 10 by three additional days (to August 17)
  - Received responses from 19 stakeholders – 17 Solar stakeholders and 2 Solar/Non-Solar stakeholders
- Circulated 2nd Draft Proposed 2021 Ceiling Prices on August 26, 2020 ahead of meeting on September 8, 2020. Sought comments on the materials by September 22.
  - Included proposed options for Commercial Solar pricing (“Option A” vs. “Option B”)
  - Meeting attended by 27 stakeholders, including a broad array of Solar and Non-Solar developers, as well as National Grid
- Issued public versions of the Cost of Renewable Energy Spreadsheet Tool (CREST) utilized to calculate the Ceiling Prices on September 18, 2020, and simultaneously extended the due date of comments on 2nd Draft Proposed Ceiling Prices to September 29
  - Simultaneously Wind Ceiling Price from 20.05 ₵/kWh to 19.85 ₵/kWh and Wind CRDG Ceiling Price from 22.45 ₵/kWh to 22.25 ₵/kWh
  - Received 6 email responses from active industry participants.

Copyright © Sustainable Energy Advantage, LLC.

Changes Considered in Light of Stakeholder Feedback on 2nd Draft of Ceiling Prices

Sustainable Energy Advantage, LLC

Splitting Commercial Class Pricing (at PUC Request)

- As discussed in 2nd Draft Ceiling Price presentation:
  - On August 13, 2020, PUC held technical session regarding several topics, including issues regarding the 2021 Ceiling Price development process
  - PUC Chair Gerwatowski expressed concern at the size of the dropoff between the Commercial and Large Solar classes (e.g., that a project could receive up to 4-5 cents more by simply sizing a project at 999 kW_{DC} (rather than 1 MW_{DC})
  - While Chair Gerwatowski did not specifically order OER and the Board to revise the design of the Commercial ceiling price, the Chairman requested that OER and the Board develop “options” for addressing his concern

Copyright © Sustainable Energy Advantage, LLC.

OER/Board Proposed Commercial Class Pricing Options for Stakeholder Consideration (Ahead of PUC Consideration)

- Option A: (Effectively) Status Quo
  - **M.I. for Full 251-999 kW Range:**
    - **Single 251-999 kW class with 500 kW proxy system size**
    - **No change to upfront capital and operating costs, or financing assumptions (capital costs based on 25th percentile of all bid and state databases)**
- Option B: Splitting Commercial Class
  - Maintain single Commercial class with single capacity allocation for both CRDG and non-CRDG, but apply different Ceiling Prices to 251-750 kW and 751-999 kW projects
    - Challenge: limited dataset of state database projects between 751-999 kW in 2020
  - **M.I. for 251-750 kW**
    - **Set 500 kW proxy size, and set upfront capital cost assumption for 251-750 kW based on median value for 251-999 kW range (vs. 25th percentile for 251-999 kW, as in Option A)**
    - **Maintain Option A OpEx and financing assumptions**
    - **Assume same additional CRDG spending (capped at 15% by law)**
  - **M.I. for 751-999 kW**
    - **Set 900 kW proxy size, and set upfront capital cost assumption for 751-999 kW based 25th percentile for 251-999 kW range**
    - **Maintain Option A OpEx and financing assumptions**
    - **Assume same additional CRDG spending (capped at 15% by law)**

Copyright © Sustainable Energy Advantage, LLC.

Stakeholder Reaction/OER Recommendation

- Most stakeholders commenting supported a more refined system of prices within Solar categories, but most developers opposed Option B as proposed.
  - **Developer #1 (mostly Medium and smaller Commercial Solar):** Supports Option B because there are no economies of scale from 251-750 kW (arguing they only exist >750 kW)
  - **Developer #2 (mostly Commercial Solar):** Recommends subdividing Commercial into 250 kW quartiles with prices tracking inversely, and proposed a similar approach to have the Ceiling Prices for large step down gradually too (but acknowledged potential administrative difficulty with proposed approach)
  - **Developer #3 (mostly Commercial and Large Solar)**: Agrees with Option B approach of tailoring payments to more specific system size categories, as well as more gradual reduction in revenues across the category, but suggested that the problem is in the pricing for 1-1.5 MW projects in the Large category, which (they argue) is too low for projects of that size.
  - **Developer #4 (develops across Medium, Commercial and Large Solar alike):** Only one to oppose Option B, arguing that most projects already lean toward 999 kW size, and argues against making changes benefitting a small portion of projects while hurting more larger projects
  - **The Division of Public Utilities and Carriers (DPUC)** did not express a preference between Options A or B, but advocated that if Option B were to be adopted, that it be implemented in a manner that mitigates ratepayer cost.
- **M.I.: OER recommends that the Board adopt Option B (as described on slide 8)**

Copyright © Sustainable Energy Advantage, LLC.

Capacity Factors for >25 kW Solar Projects

- For 1st and 2nd Draft prices, Solar capacity factors were revised to reflect a factor representative of ground mount projects (in which close-to-ideal tilts and orientations can be more easily obtained)
  - Ground mounted capacity factor was based on a stakeholder-provided dataset of projects under development in Rhode Island
- Initial consulting team assumption: National Grid would propose a Rooftop Solar public policy adder, and thus the Ceiling Prices should explicitly assume a ground-mounted project in order to properly capture the full needed value for the expected Rooftop adder
- However, National Grid is not currently considering or proposing a Rooftop adder, thus necessitating a shift to an adder that better reflects a mix of roof- and ground-mounted projects
- **M.I.: New capacity factors based on a weighted average based on the proportion of roof- and ground-mounted projects in the Medium, Commercial and Large categories since 2018 (see data on next page)**

Copyright © Sustainable Energy Advantage, LLC.

Final Proposed Capacity Factors for Medium, Commercial and Large Solar (Adjusted to Assume Existing Mix of Selected Roof-Mounted Projects)

Class	Mount Type	% Share (2018-2020 1st OE Selected MW)	Assumed Capacity Factor (CF)	Weighted Avg Class CF (Final Proposed 2021 Prices)	CF for 1st & 2nd Draft 2021 Proposed Prices	CF for 2020 Approved Prices
Medium Solar	Roof	54%[1]	14%[3]	**14.5%[5]**	14.7%	14.0%
	Ground	46%[2]	15.1%[4]			
Commercial Solar	Roof	43%[1]	14%[3]	**14.6%[5]**	15.2%	14.0%
	Ground	57%[2]	15.1%[4]			
Large Solar	Roof	0%[1]	N/A (None Selected)	**15.1%[5]**	15.0%	15.3%
	Ground	100%[2]	15.1%[4]			

1. This value represents the share of roof-mounted projects within each Solar class amongst those selected by National Grid in the 2018 Program Year, the 2019 Program Year, and the 1st Open Enrollment of the 2020 Program Year.
2. This value represents the share of ground-mounted projects within each Solar class amongst those selected by National Grid in the 2018 Program Year, the 2019 Program Year, and the 1st Open Enrollment of the 2020 Program Year.
3. This value represents the previous capacity factor utilized in the 2020 final approved Ceiling Prices.
4. This value represents a weighted average capacity factor for all ground-mounted projects in a medium-to-large dataset of Rhode Island DG projects currently under development, as provided by a REG stakeholder.
5. These values represent a weighted average capacity factor for each class, based on a weighted average of the values described in footnotes 1-4 above.

Copyright © Sustainable Energy Advantage, LLC.

Project Useful Lives and Post-Tariff Compensation

- **Project Useful Lives**
  - **DPUC:** 20-year useful life assumed for Wind project appears inconsistent with typical useful lives for wind projects in other jurisdictions
  - Consulting Team agrees that not only should Wind asset useful lives be revisited, but Solar projects also should, in light of recent independent research indicating longer lives are increasingly reasonable to assume.
  - **M.I.: No change for 2021 program year process, but consulting team plans to carefully study this issue as part of 2022 process**
- **Post-Tariff Compensation/Operation**
  - **DPUC:** Several proxy projects in CREST model yield negative cash flow following the term of the tariff (which would not be consistent with continued operation following the expiration of the REG tariff)
  - Consulting team had not previously considered this issue, but agree that this could add approximately 0.1 ¢/kWh, a value that should not be compensated via tariff compensation
  - **M.I.: Medium Solar, Commercial Solar and Hydro are (as a stopgap) now assumed to have 20-year useful lives strictly for the purpose of tariff design, but consulting team plans to revisit the issue of what financiers assume for post-tariff compensation (e.g. installing energy storage, cutting costs, or other measures) for the 2022 Program Year**

Copyright © Sustainable Energy Advantage, LLC.

Modeled Size for Medium Solar Projects

- Developer #1 argued that 150 kW is a more appropriate size to model for the medium category, because 20% of medium scale projects are under 150 kW. These smaller projects are advantageous because they are more likely to be rooftops, and the existing ceiling prices do not reflect their costs.
- **M.I.: No change (Large number of additional changes already made that increase Medium prices, and no evidence suggests 250 kW should not be the proper size break)**

Copyright © Sustainable Energy Advantage, LLC.

Interconnection Costs – Initial v. Final Capital Costs

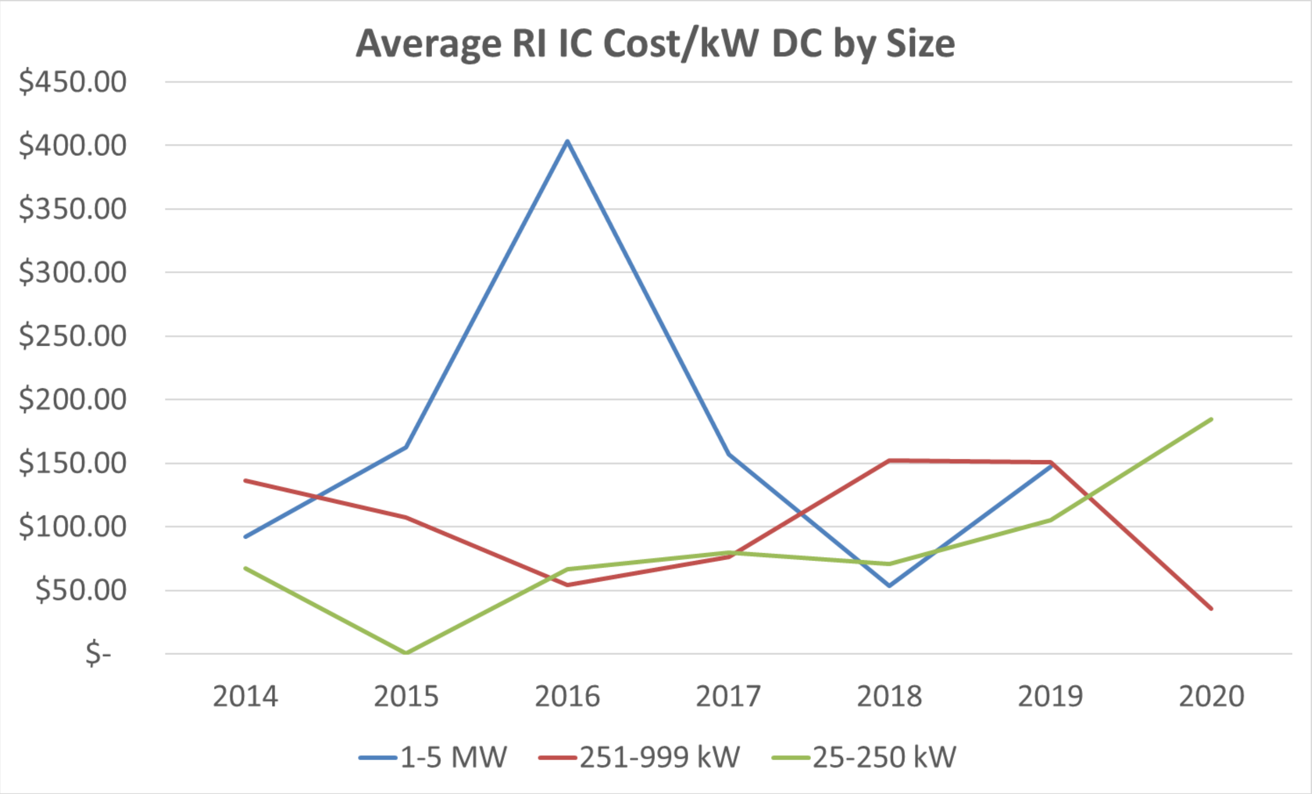
Difference in Initial/Final IC Costs by Size Class of REG Projects (2019-2020)			
Size (DC)	**Avg**	**Median**	**N**
25-250 kW	$(95.35)	$(51.99)	7
251-999 kW	$14.44	$6.29	17
1-5 MW	$(33.57)	$0.20	27

- During second comment period, one stakeholder said that REG bid data does not factor the full cost of interconnection, as projects typically receive the total cost amount after the open enrollment
- Second draft response was to investigate the difference between estimated interconnection costs and final costs
- Data from National Grid (at right) suggests that the difference in average/median interconnection costs by class is just as (if not more) likely to be at or lower than the initial estimate than higher.
- **M.I.: No change for 2021, but SEA will continue to collect this type of data from National Grid to ensure appropriate true-ups in the future**

Copyright © Sustainable Energy Advantage, LLC.

Interconnection Costs – Accounting for Historic Trends

- Several stakeholders expressed interest in utilizing a forward-looking trend to capture future increase in interconnection costs
- Data from National Grid interconnection records (at right) shows a relatively noisy picture that does not paint a picture of clearly-increasing costs across the board
- **M.I.: No change. Data at this point does not show clear trend of increase – however, we strongly agree w/stakeholders that if such a trend emerges, it should be accounted for in the Ceiling Prices.**



Copyright © Sustainable Energy Advantage, LLC.

Finance/Tax Assumptions (1)

- State/Local Taxes
  - The DPUC noted that the CREST model (adapted for RE Growth) does not appear to deduct state income taxes paid when calculating federal taxable income
  - Consulting team's previous understanding was that such deductions were no longer allowable after the Tax Cuts and Jobs Act (TCJA) of 2017, but after consulting IRS Publication 535: Business Expenses, the consulting team has determined that the DPUC was correct in its assessment
  - In addition, the consulting team has confirmed with finance stakeholders that deductions for state/local taxes cannot increase federal taxable income
  - **M.I.: State income taxes and local property taxes are now deducted, but cannot increase federal taxable income (therefore reducing each Ceiling Price for projects assumed to be owned by business taxpayers – all types except for Small Solar I, which are deducted up to $10,000/year TCJA limit)**

Copyright © Sustainable Energy Advantage, LLC.

Finance/Tax Assumptions (2)

- Future Use of Bonus Depreciation over 5-Year MACRS for Solar Projects
  - DPUC requested that consideration should be given in 2022 and thereafter to utilizing bonus depreciation as the ITC declines to 10% (under current law)
  - **M.I.: No input change for 2021, but consulting team agrees w/DPUC (absent other changes to market conditions or laws that would make such an assumption untenable) that this should be the approach once the ITC declines to 10% (under current law, as slated to occur in CY 2022)**
- **Wind Debt Assumption**
  - Previous modeling inadvertently resulted in less debt service coverage than desired for Wind projects
  - Coverage can improve with a slightly smaller share of debt in the capital stack
  - **M.I.: Adjust Wind debt from 70% to 67.5%**

Copyright © Sustainable Energy Advantage, LLC.

Medium, Commercial and Large Solar Capital Costs

- Medium Scale Costs
  - Developer #1: Upfront capital costs are $2.75-$3.25/W
  - **M.I.: No change (Capital costs in REG, except for those that significantly differ from regional averages, have consistently been based on a large sample size, not on individual stakeholder observations, and this cost range is represented in our data set)**
- Commercial Solar Costs
  - Developer #4: Costs of $1.90-$2.00/W more representative
  - **M.I.: No change – as these costs align with our pre-YoY cost decline 2019-2020 estimate**
- Large Solar Costs
  - Developer #4 argued that Large Solar capital cost estimate is still too low, and provided cost documentation of two MA projects to back up.
  - **M.I.: No change. Figures provided by stakeholder were in line with values obtained in incremental cost survey of industry participants (which was incorporated into the weighted capital cost value)**

Copyright © Sustainable Energy Advantage, LLC.

OpEx (Decommissioning and Land Lease)

- Decommissioning
  - Developer #1 cites NYSERDA local guide that quotes typical decommissioning costs for a 2 MW system as $98,900, or $49.45/kW.
  - Developer #3 commented that several towns are requiring decommissioning surety in the form of escrow, crash, or surety bond of 125% of the decommissioning costs
    - Submitted decommissioning estimates of $0.25/W for 1 MW DC system
  - **M.I.: No change, but consulting team will consider a change in 2022 process after requesting more extensive comment (making a change this large needs more documentation than two estimates with highly disparate values)**

- Land Lease
  - Developer #1 acknowledged increase but still finds $12,000/year low for medium-scale projects, particularly with COVID impacts
  - **M.I.: No change (no documentary evidence provided that suggests this is an inappropriate figure, or that COVID-19 pandemic has a discernible impact on land lease economics)**

Copyright © Sustainable Energy Advantage, LLC.

OpEx (Solar O&M)

- **Developer #1:** Utilizing a blend of the guarantee and the basic O&M costs is inappropriate because survey responses said guarantees are industry standard, while only 62.5% of respondents agreed with our prior inputs
- **DPUC:** Input for large should be at least as low as commercial if not lower in the $10-$12-kw/year range
- **M.I.: Change Large Solar O&M to $12/kW-year (from $14), but leave Medium Solar O&M unchanged. While 62.5% respondents indicated this was standard for them, they did not specifically indicate that it was a uniform "industry standard".**

Copyright © Sustainable Energy Advantage, LLC.

Hydro Capital, Financing and Insurance Costs

- **Insurance**
  - Developer #5 commented that our current insurance input is too low, and provided documentation of insurance costs totaling 2.7% of the total project costs.
  - **M.I.: Increase insurance estimate to 2.7% of total costs.**
- **Financing Assumptions**
  - Developer #5 also commented that it is hard to get bank financing at better than 60% debt and still meet DSCR of 1.25, though our equity returns are accurate
  - **M.I.: No change (Our model results output a DSCR result that meets 1.25 threshold)**

Copyright © Sustainable Energy Advantage, LLC.

Recommended 2021 Ceiling Prices

Sustainable Energy Advantage, LLC

Summary Results for Solar (Option A, ¢/kWh)

Technology	Size Range kW (Modeled Size kW)	2020 Approved CP	2021 1st Draft CP (% Change from 2020 Approved)	2021 2nd Draft CP (% Change from 2020 Approved, 22% ITC Statutory Value)	2021 Final Recommended CP (% Change from 2020 Approved, 22% ITC Statutory Value)	2021 2nd Draft CP (% Change from 2020 Approved, Hypothetical 26% ITC)[1]
Small Solar I (15 year tariff)	1-10 (5)	29.65	*29.95 (1%)*	*30.05 (1%)*	**29.95 (1%)**	***28.75 (-3%)***
Small Solar II	11-25 (25)	23.45	*26.15 (11%)*	*26.05 (11%)*	**25.85 (10%)**	***24.35 (4%)***
Medium Solar	26-250 (250)	21.15	*20.95 (-1%)*	*22.35 (6%)*	**22.25 (5%)**	***21.25 (0.5%)***
Commercial Solar (251-999 kW)	251-999 (500)	18.25	*16.05 (-12%)*	*17.25 (-5%)*	**17.65 (-3%)**	***16.95 (-7%)***
Comm. Solar-CRDG (251-999 kW)	251-999 (500)	20.99	*18.46 (-12%)*[2]	*19.84 (-5%)*[2]	**20.30 (-3%)**[2]	***19.49 (-7%)***
Large Solar	1,000-5,000 (4,500)	13.65	*11.25 (-18%)*	*12.25 (-10%)*	**11.85 (-13%)**	***11.25 (-18%)***
Large Solar-CRDG	1,000-5,000 (4,500)	15.70	*12.94 (-18%)*[2]	*14.09 (-10%)*[2]	**13.63 (-13%)**[2]	***12.94 (-18%)***

Proposed 2021 CP increases for Small Solar I and Medium Solar driven mostly by reduction in ITC value; increase in Small Solar II by reduction in ITC value and change in financing assumptions.

1. The values in this column are shown to illustrate the change from the 2020 Approved CP, which also assumes a 26% statutory ITC value (the statutory value for calendar year 2020). The proposed prices, which reflect a 22% statutory ITC value for calendar year 2021, are in the column to the immediate left.

2. This is the maximum CRDG Ceiling Price allowed by law. The calculated 2021 values are 21.05 for Comm. Solar-CRDG (251-999) and 15.35 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.

Copyright © Sustainable Energy Advantage, LLC.

Summary Results for Solar (Option B, ¢/kWh)

Technology	**Size Range kW** (Modeled Size kW)	2020 Approved CP	**2021 1st Draft CP** (% Change from 2020 Approved)	**2021 2nd Draft CP (%** Change from 2020 Approved)	**2021 Final Recommended CP (%** Change from 2020 Approved, 22% ITC Statutory Value)	**2021 2nd Draft CP (%** Change from 2020 Approved @ Hypothetical 26% ITC)[1]
Small Solar I (15 year tariff)	1-10 (5)	29.65	*29.95 (1%)*	*30.05 (1%)*	**29.95 (1%)**	***28.75 (-3%)***
Small Solar II	11-25 (25)	23.45	*26.15 (11%)*	*26.05 (11%)*	**25.85 (10%)**	***24.35 (4%)***
Medium Solar	26-250 (250)	21.15	*20.95 (-1%)*	*22.35 (6%)*	**22.25 (5%)**	***21.25 (0.5%)***
Commercial Solar (251-750 kW)[2]	251-750 (500)	18.25	*16.05 (-12%)*	*18.55 (2%)*	**19.05 (4%)**	***18.15 (-1%)***
Comm. Solar-CRDG (251-750 kW)[2]	251-750 (500)	20.99	*18.46 (-12%)*[3]	*21.33 (2%)*[3]	**21.91 (4%)**	***20.87 (-1%)***
Commercial Solar (751-999 kW)[2]	751-999 (900)	18.25	*16.05 (-12%)*	*15.25 (-16%)*	**15.75 (-14%)**	***14.95 (-18%)***
Comm. Solar-CRDG (751-999 kW)[2]	751-999 (900)	20.99	*18.46 (-12%)*[3]	*17.54 (-16%)*[3]	**18.11 (-14%)**	***17.19 (-18%)***
Large Solar	1,000-5,000 (4,500)	13.65	*11.25 (-18%)*	*12.25 (-10%)*	**11.85 (-13%)**	***11.25 (-18%)***
Large Solar-CRDG	1,000-5,000 (4,500)	15.70	*12.94 (-18%)*[3]	*14.09 (-10%)*[3]	**13.63 (-13%)**	***12.94 (-18%)***

Proposed 2021 CP increases for Small Solar I and Medium Solar driven mostly by reduction in ITC value; increase in Small Solar II by reduction in ITC value and change in financing assumptions.

1. The values in this column are shown to illustrate the change from the 2020 Approved CP, which also assumes a 26% statutory ITC value, which is in effect during calendar year 2020. The proposed prices, which reflect a 22% statutory ITC value in effect during calendar year 2021, are in the column to the immediate left.
2. The 2020 Approved CP in this category represents the prices proposed by OER and the DG Board and approved by the Rhode Island PUC for Commercial and Commercial CRDG for a size category of 251-999 kW. The difference in price (and the percentage change) in these categories represent differences from these approved values.
3. This is the maximum CRDG Ceiling Price allowed by law. The calculated 2021 values are 22.35 for Comm. Solar-CRDG (251-750), 19.05 for Comm. Solar CRDG (751-999 kW) and 15.35 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.

Copyright © Sustainable Energy Advantage, LLC.

Summary Results (2): Wind, Hydro & AD (cents/kWh)

Technology	Size Range kW (Modeled Size kW)	2020 Approved CP 20 year Tariff Duration	2021 1st Draft Proposed CP 20 year Tariff Duration	2021 2nd Draft Proposed CP 20 year Tariff Duration	2021 Final Recommended CP 20 year Tariff Duration
Wind	0-5,000 (3,000)	18.85	*19.85 (5%)*	*19.85 (5%)**	**20.05 (6%)**
Large Wind - CRDG	0-5,000 (3,000)	21.05	*22.15 (7%)*	*22.25 (6%)**	**22.45 (7%)**
Hydroelectric	1-5,000 (500)	21.45	*24.55 (14%)*	*26.05 (21%)*	**27.35 (28%)**
Anaerobic Digestion	1-5,000 (750)	15.35	*21.05 (37%)*	*21.25 (38%)*	**21.15 (38%)**

*Reflects revised ceiling prices sent by email on September 18, 2020 to correct a modeling error. Prices presented at the second stakeholder meeting were 20.05 for Wind and 22.45 for Wind-CRDG.

Copyright © Sustainable Energy Advantage, LLC.

Modeling Parameters

Sustainable
Energy
Advantage, LLC

Summary: Cost & Production Assumptions (Solar, Option A)

	Small I	Small II	Medium	Commercial	Commercial CRDG	Large	Large CRDG
Nameplate Capacity (kW)	5	25	250	500	500	4,500 [2,000]	4,500 [2,000]
Capacity Factor	14.00%	14.00%	14.50% ~~14.70%~~ [14.00%]	14.6% ~~15.20%~~ [14.00%]	14.6% ~~15.20%~~ [14.00%]	15.10% ~~15.00%~~ [15.30%]	15.10% ~~15.00%~~ [15.30%]
Annual Degradation	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Total Cost^ ($/kW)	$3,146 ~~$3,129~~ [$3,279]	$2,883 ~~$2,899~~ [$2,979]	$2,332 ~~$2,288~~ [$2,360]	$1,869 ~~$1,897~~ [$1,988]	$2,019* ~~$2,047*~~ [$2,138*]	$1,492 ~~$1,384~~ [$1,602]	$1,642* ~~$1,534*~~ [$1,752*]
Fixed O&M ($/kW-yr)	$35	$35	$14.57 ~~$12.38~~ [$14]	$12.03 ~~$10.06~~ [$14]	$37.03 ~~$35.06~~ [$37]	$12.03 [$14.50]	$37.03 ~~$39.50~~ [$37]
O&M Escalation Cost	2.0%	2.0%	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]
Non-O&M Escalation Cost	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Insurance (% of Cost)	0.0%	0.0%	0.27%	0.45% ~~0.27%~~	0.45% ~~0.27%~~	0.45%	0.45%
Project Management ($/yr)	$0	$0	$3,000 ~~$2,375~~	$4,000 ~~$2,375~~	$4,000 ~~$2,375~~	$12,000	$12,000
Site Lease ($/yr)	$0	$0	$12,000 [$10,000]	$20,000	$20,000 [$12,500]	$50,000	$50,000

Values in [Brackets] represent 2020 ceiling price inputs. ~~Red strikeout~~ text denotes 2021 1st or 2nd draft input values that were updated to values in black text for final recommended prices.

^ Impacts due to solar module trade tariffs are assumed to be incorporated in installed cost data.

* Reflects installed cost of non-CRDG project from same category, plus estimated cost of customer acquisition ($150/kW).

Copyright © Sustainable Energy Advantage, LLC.

Summary: Cost & Production Assumptions (Solar, Option B)

	Small I	Small II	Medium	Comm'l (251-750)	Comm'l CRDG (251-750)	Comm'l (751-999)	Comm'l CRDG (751-999)	Large	Large CRDG
Nameplate Capacity (kW)	5	25	250	500	500	900 [500]	900 [500]	4,500 [2,000]	4,500 [2,000]
Capacity Factor	14.00%	14.00%	14.50% ~~14.70%~~ [14.00%]	14.6% ~~15.20%~~ [14.00%]	14.6% ~~15.20%~~ [14.00%]	14.6% ~~15.20%~~ [14.00%]	14.6% ~~15.20%~~ [14.00%]	15.10% ~~15.00%~~ [15.30%]	15.10% ~~15.00%~~ [15.30%]
Annual Degradation	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Total Cost^ ($/kW)	$3,146 ~~$3,129~~ [$3,279]	$2,883 ~~$2,899~~ [$2,979]	$2,332 ~~$2,288~~ [$2,360]	$2,097 ~~$1,897~~ [$1,988]	$2,247 ~~$2,047*~~ [$2,138*]	$1,869 ~~$1,897~~ [$1,988]	$2,019 ~~$2,047*~~ [$2,138*]	$1,492 ~~$1,384~~ [$1,602]	$1,642* ~~$1,534*~~ [$1,752*]
Fixed O&M ($/kW-yr)	$35	$35	$14.57 ~~$12.38~~ [$14]	$12.03 ~~$10.06~~ [$14]	$37.03 ~~$35.06~~ [$37]	$12.03 ~~$10.06~~ [$14]	$37.03 ~~$35.06~~ [$37]	$12.03 [$14.50]	$37.03 ~~$39.50~~ [$37]
O&M Escalation Factor	2.0%	2.0%	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]	3.0% [2.0%]
Non-O&M Escalation Factor	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
Insurance (% of Cost)	0.0%	0.0%	0.27%	0.45% ~~0.27%~~	0.45% ~~0.27%~~	0.45% ~~0.27%~~	0.45% ~~0.27%~~	0.45%	0.45%
Project Management ($/yr)	$0	$0	$3,000 ~~$2,375~~	$4,000 ~~$2,375~~	$4,000 ~~$2,375~~	$4,000 ~~$2,375~~	$4,000 ~~$2,375~~	$12,000	$12,000
Site Lease ($/yr)	$0	$0	$12,000 [$10,000]	$20,000	$20,000 [$12,500]	$20,000	$20,000 [$12,500]	$50,000	$50,000

Values in [Brackets] represent 2020 ceiling price inputs. ~~Red strikeout~~ text denotes 2021 1st or 2nd draft input values that were updated to values in black text for final recommended prices.
^ Impacts due to solar module trade tariffs are assumed to be incorporated in installed cost data.
* Reflects installed cost of non-CRDG project from same category, plus estimated cost of customer acquisition ($150/kW).

Copyright © Sustainable Energy Advantage, LLC.

Summary: Financing Assumptions (Solar >25 kW)

	Medium (25-250 kW)				Commercial & Commercial CRDG (Options A & B)				Large & Large CRDG (1 MW-5 MW)			
Assumption Set	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***	***2021 Final***	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***	***2021 Final***	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***	***2021 Final***
Federal Investment Tax Credit (%)	*26%*	*22%*	22%	**22%**	26%	22%	22%	**22%**	26%	22%	22%	**22%**
% Debt	*55%*	*60%*	60%	**60%**	60%	65%	60%	**60%**	60%	65%	60%	**60%**
Debt Term (years)	*15*	*15*	15	**15**	15	15	15	**15**	15	15	15	**15**
Interest Rate on Term Debt	*6.0%*	*5.25%*	6.0%	**6.0%**	6.0%	5.25%	5.25%	**5.25%**	6.0%	5.25%	5.25%	**5.25%**
Lender's Fee (% of total borrowing)	*1.0%*	*1.0%*	1.0%	**1.0%**	1.0%	1.0%	1.0%	**1.0%**	2.0%	2.0%	2.0%	**2.0%**
% Equity Share of Sponsor Equity	*25%*	*25%*	40%	**40%**	25%	25%	40%	**40%**	25%	25%	40%	**40%**
Target After-Tax Equity IRR (Sponsor Equity, Levered Return)	*11.0%*	*13.0%*	13.5%	**13.5%**	11.0%	12.0%	12.5%	**12.5%**	11.0%	11.0%	11.5%	**11.5%**
% Equity Share of Tax Equity	*75%*	*75%*	60%	**60%**	75%	75%	60%	**60%**	75%	75%	60%	**60%**
Target After-Tax Equity IRR (Tax Equity, Levered Return)	*9.0%*	*9.5%*	9.5%	**9.5%**	9.0%	9.5%	9.5%	**9.5%**	9.0%	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	5-Year MACRS	**5-Year MACRS**	5-Year MACRS	5-Year MACRS	5-Year MACRS	**5-Year MACRS**

Copyright © Sustainable Energy Advantage, LLC.

Summary: Financing Assumptions (Solar <=25 kW)

	Small I (1-15 kW)				Small II (15-25 kW)			
Assumption Set	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***	***2021 Final***	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***	***2021 Final***
Federal Investment Tax Credit (%)	26%	22%	22%	**22% (No Change)**	26%	22%	22%	**22% (No Change)**
% Debt	77%	71%	71%	**71% (No Change)**	40%	60%	60%	**60% (No Change)**
Debt Term (years)	13	13	13	**13 (No Change)**	15	10	10	**10 (No Change)**
Interest Rate on Term Debt	5.6%	6.3%	6.3%	**6.3% (No Change)**	6.7%	7.0%	7.0%	**7.0% (No Change)**
Lender's Fee (% of total borrowing)	8.5%	4.25%	4.25%	**4.25% (No Change)**	3.5%	2.3%	2.3%	**2.3% (No Change)**
Target After-Tax Equity IRR	5.0%	5.2%	5.2%	**5.2% (No Change)**	9.5%	13.0%	13.0%	**13.0% (No Change)**

Copyright © Sustainable Energy Advantage, LLC.

Summary: Cost & Production Assumptions
Wind, Hydro, and AD

	Wind	Large 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)	$2,820	$2,970	$9,931	$10,150
Fixed O&M ($/kW-yr)	$26.50	$51.50	$2.00	$600
O&M Inflation	2.0%	2.0%	2.0%	2.0%
Insurance (% of Cost)	0.20%	0.20%	2.7% [2.0%]	1.0%
Project Management ($/yr)	$18,000	$18,000	$3,000	$75,000
Site Lease ($/yr)	$162,000	$162,000	$8,750	$35,000

Copyright © Sustainable Energy Advantage, LLC.

Summary: Financing Assumptions (Wind)

Wind & Wind CRDG				
Assumption Set	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***	***2021 Final***
Federal Investment Tax Credit	18%	None (Expiring 1/1/2021)	None (Expiring 1/1/2021)	**None (Expiring 1/1/2021)**
% Debt	65%	70%	70%	**67.5%**
Debt Term (years)	15	15	15	**15**
Interest Rate on Term Debt	6.5%	5.75%	6.0%	**6.0%**
Lender's Fee (% of total borrowing)	1.0%	1.0%	1.0%	**1.0%**
% Equity Share of Sponsor Equity	25%	100%	100%	**100%**
Target After-Tax Equity IRR (Sponsor Equity, Levered Return)	12%	12%	12.5%	**12.5%**
% Equity Share of Tax Equity	75%	0%	0%	**0%**
Target After-Tax Equity IRR (Tax Equity, Levered Return)	9.0%	N/A	N/A	**N/A**
Depreciation	Average of 100% bonus and MACRS	Average of 100% bonus and MACRS	Average of 100% bonus and MACRS	**Average of 100% bonus and MACRS**

Copyright © Sustainable Energy Advantage, LLC.

Summary: Financing Assumptions (Hydro, and AD)

	Hydroelectric				Anaerobic Digestion			
Assumption Set	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***	***2021 Final***	***2020 Final***	***2021 1st Draft***	***2021 2nd Draft***	***2021 Final***
Federal Investment Tax Credit	30%	None (Expiring 1/1/2021)	None (Expiring 1/1/2021)	**None (Expiring 1/1/2021)**	30%	None (Expiring 1/1/2021)	None (Expiring 1/1/2021)	**None (Expiring 1/1/2021)**
% Debt	65%	70%	70%	**70%**	60%	65%	65%	**65%**
Debt Term (years)	20	20	20	**20**	15	15	15	**15**
Interest Rate on Term Debt	7.0%	6.25%	6.25%	**6.25%**	7.0%	6.25%	6.25%	**6.25%**
Lender's Fee (% of total borrowing)	1.88%	1.88%	1.88%	**1.88%**	1.5%	1.5%	1.5%	**1.5%**
% Equity Share of Sponsor Equity	20%	100%	100%	**100%**	20%	100%	100%	**100%**
Target After-Tax Equity IRR (Sponsor Equity, Levered Return)	12%	12%	12.5%	**12.5%**	12%	12%	12.5%	**12.5%**
% Equity Share of Tax Equity	80%	0%	0%	**0%**	80%	0%	0%	**0%**
Target After-Tax Equity IRR (Tax Equity, Levered Return)	9.0%	N/A	N/A	**N/A**	9.0%	N/A	N/A	**N/A**
Depreciation	7-year MACRS	7-year MACRS	7-year MACRS	**7-year MACRS**	5-year MACRS	5-year MACRS	5-year MACRS	**5-year MACRS**

Copyright © Sustainable Energy Advantage, LLC.

Sustainable Energy Advantage, LLC
161 Worcester Road, Suite 503
Framingham, MA 01701
http://www.seadvantage.com

Contacts:

Jim Kennerly
☎ 508-665-5862
✉ jkennerly@seadvantage.com

Jason Gifford
☎ 508-665-5856
✉ jgifford@seadvantage.com

Kate Daniel
☎ 508-665-5863
✉ kdaniel@seadvantage.com

Toby Armstrong
☎ 508-665-5864
✉ tarmstrong@seadvantage.com