Rhode Island
Renewable Energy Growth Program:

2017 2nd Draft
Ceiling Price Recommendations

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Sustainable Energy Advantage, LLC
Meister Consultants Group, Inc.
Mondre Energy, Inc.

DISCUSSION TOPIC: CRDG

Community Remote DG, initial comments

- Ceiling Prices for Community Remote Distributed Generation (CRDG) facilities are proposed at a 15% premium to projects of the otherwise same technology and size category.
- The following provide support for this recommendation:
  - Many consumers either rent or do not have facilities suitable for on-site generation
  - The REG policy intends to reach these consumers through CRDG
  - Educating, signing up, and retaining these customers requires substantial effort on the part of new market entrants
  - Some projects may require the acquisition of hundreds of customers
  - Billing and customer service functions must also be established, operated and maintained
  - The “community shared” renewables business model is in its infancy, but holds promise for delivering benefits to Rhode Island consumers. As with the other RI REG categories, it is expected that the cost to provide these benefits will reduce as the market matures.

- Reply comments state that this support is largely anecdotal.
  - Such comments are not unreasonable; CRDG is a nascent market.
- SEA has requested customer acquisition cost data for CRDG systems.
- In response, CSS developers have provided additional, quantitative, feedback.
  - (Next slide)

Community Remote DG, data response

	Range Reported by Stakeholders	Value Deployed in Modeling
Customer Acquisition Cost[1,2] (¢/Watt, one-time)	R1: 20 – 30 ¢ R2: 20 – 25 ¢[3,4] R3: 20 – 50 ¢	25 ¢/Watt
Customer Replacement Cost[5] (¢/Watt/year)	R1: 2 ¢ R2: 2 ¢	2 ¢/Watt
Customer Management & Billing Cost (¢/Watt/year)	R1: 2 ¢ R2: 2 ¢ "or maybe less"	1 ¢/Watt

Supplemental Comments:

1. Most developers hire a 3rd-party for lead generation.
2. Conversion rate on prospects is 5 to 10%
3. "It is very difficult to convert leads for less [than amounts quoted]"
4. "The market is immature; participation needs to be driven in order to reduce cost."
5. ~7% of households move each year; this leads to annual replacement costs (ongoing acquisition costs for a portion of participants each year.

Community Remote DG, CP analysis

- Based on feedback provided to date, modeled CRDG CPs using quantitative values provided by market participants result in CPs above the 15% premium.

- Data were not provided that differentiate solar and wind customer acquisition and management costs.

(¢/kWh)	2nd Draft CP @ 15% Premium (Cap)	2nd Draft CP Adj. to Survey Feedback
Commercial Solar, CRDG	20.50	22.25
Large Solar, CRDG	16.60	18.65
Wind I, CRDG	20.20	20.25
Wind II, CRDG	19.40	19.65
Wind III, CRDG	18.70	19.05

SUMMARY RESULTS

Draft Proposed Ceiling Prices, 2017 REG Program (1)

(cents/kWh)

Technology	Size Range (Modeled Size)	Analysis Run	15 year Tariff Duration	20 year Tariff Duration
Small Solar I, Host Owned, Residential	1 to 10 kW (5)	2016 Final CP 2017 1st Draft 2017 2nd Draft	37.65 28.15 (-25%) 29.65 (-21%)	33.45 25.45 (-24%) 27.65 (-16%)
Small Solar I, Host Owned, Non-Residential	1 to 10 kW (5)	2016 Final CP 2017 1st Draft 2017 2nd Draft	NA 28.65 29.15	NA 25.85 26.85
Small Solar I, TPO, Residential	1 to 10 kW (5)	2016 Final CP 2017 1st Draft 2017 2nd Draft	28.35 26.25 (-7%) 27.65 (-2%)	24.70 24.55 (-1%) 24.55 (-1%)
Small Solar I, TPO, Non-Residential	1 to 10 kW (5)	2016 Final CP 2017 1st Draft 2017 2nd Draft	NA 26.75 27.05	NA 23.75 24.25

When comparing Ceiling Prices, please note that property taxes were applied to residential projects for 2016 CPs and are not applied to residential projects for 2017 CPs.

Draft Proposed Ceiling Prices, 2017 REG Program (2)

(cents/kWh)

Technology	Size Range	Analysis Run	20-Yr Tariff
Small Solar II, Residential	11 to 25 kW (25)	2016 Final CP 2017 1st Draft 2017 2nd Draft	24.90 23.65 (-5%) 24.65 (-1%)
Small Solar II, Non-Residential	11 to 25 kW (25)	2016 Final CP 2017 1st Draft 2017 2nd Draft	NA 23.25 23.95
Medium Solar	26 to 250 kW (140)	2016 Final CP 2017 1st Draft 2017 2nd Draft	22.55 22.25 (-1%) 22.25 (-1%)
Commercial Solar	251 to 999 kW (500)	2016 Final CP 2017 1st Draft 2017 2nd Draft	19.30 18.35 (-5%) 17.85 (-8%)
Commercial Solar, Community Remote DG	251 to 999 kW (500)	2016 Final CP 2017 1st Draft 2017 2nd Draft	NA 18.45 20.50
Large Solar	1 to 5 MW (2)	2016 Final CP 2017 1st Draft 2017 2nd Draft	15.10 14.95 (-1%) 14.45 (-4%)
Large Solar, Community Remote DG	1 to 5 MW (2)	2016 Final CP 2017 1st Draft 2017 2nd Draft	NA NA 16.60

Draft Proposed Ceiling Prices, 2017 REG Program (3)

(cents/kWh)

Technology	Size Range	Analysis Run	20-Yr Tariff
Small Wind	1 – 999 kW (100 kW)	2016 Final CP 2017 1st Draft 2017 2nd Draft	NA 20.95 20.95
Wind I	1 – 3 MW (1.65 MW	2016 Final CP 2017 1st Draft 2017 2nd Draft	18.75 17.55 (-6%) 17.55 (-6%)
Wind I, Community Remote DG	1 – 3 MW (1.65 MW	2016 Final CP 2017 1st Draft 2017 2nd Draft	NA NA 20.20
Wind II	3 – 5 MW (3.3 MW)	2016 Final CP 2017 1st Draft 2017 2nd Draft	18.00 16.85 (-6%) 16.85 (-6%)
Wind II, Community Remote DG	3 – 5 MW (3.3 MW)	2016 Final CP 2017 1st Draft 2017 2nd Draft	NA NA 19.40
Wind III	3 – 5 MW (4.95 MW)	2016 Final CP 2017 1st Draft 2017 2nd Draft	17.40 16.25 (-7%) 16.25 (-7%)
Wind III, Community Remote DG	3 – 5 MW (4.95 MW)	2016 Final CP 2017 1st Draft 2017 2nd Draft	NA NA 18.70

The analysis assumes that wind projects qualify for 80% of the full ITC value.

Draft Proposed Ceiling Prices, 2017 REG Program (4)

(cents/kWh)

Technology	Size Range	Analysis Run	20-Yr Tariff
Hydro I	10 – 250 kW (150 kW)	**2016 Final CP** **2017 1st Draft** **2017 2nd Draft**	**18.65** **22.15 (19%)** **22.15 (19%)**
Hydro II	251 kW – 5 MW (500 kW)	**2016 Final CP** **2017 1st Draft** **2017 2nd Draft**	**17.45** **20.75 (19%)** **20.75 (19%)**
AD I	150 – 500 kW (325 kW)	**2016 Final CP** **2017 1st Draft** **2017 2nd Draft**	**20.20** **19.45 (-4%)** **20.15 (-0.25%)**
AD II	501 kW – 5 MW (750 kW)	**2016 Final CP** **2017 1st Draft** **2017 2nd Draft**	**20.20** **20.15 (-0.25%)** **20.15 (-0.25%)**

The Production Tax Credit has expired for both hydroelectric and anaerobic digester facilities. As a result, 2016 CPs included PTCs, 2017 proposed CPs do not.

MODELED PARAMETERS: SOLAR

SOLAR: Cost & Production Inputs

Modeled Parameters

No changes to this set of inputs.

		Small Solar I Resi (1-10 kW)	Small Solar I Comm (1-10 kW)	Small Solar II (11-25 kW)	Medium Solar (26-250 kW)	Commercial Solar (251-1,000 kW)	Large Solar (1-5 MW)
Nameplate Capacity	kW	5		25	140	500	2,000
Capacity Factor		13.49%	13.49%	13.49%	**14.00%** **[13.45%]**	**14.40%** **[13.59%]**	**15.30%** **[14.18%]**
Annual Degradation	%	0.5%					
Cost, Less Interconnection	$/kW	**$3,800** **(+ $161 inverter warrantee)** **[$3,839 + $161 inverter warrantee]**		**$3,541** **[$3,680]**	**$2,724** **[$2,799]**	**$2,293** **[$1,939]**	**$2,150** **[$1,784]**
Interconnection	$/kW	$0			**$129** **[$128]**	**$97** **[$513]**	**$91** **[$237]**
Total Cost	$/kW	**$3,961** **[$4,000]**		**$3,541** **[$3,680]**	**$2,853** **[$2,927]**	**$2,390** **[$2,452]**	**$2,241** **[$2,021]**

Blue = change from 2016 value.

[Bracketed] values show 2016 CP inputs, where different

Ongoing Cost Assumptions

Modeled Parameters

No changes to this set of inputs.

		Small Solar I Resi (1-10 kW)	Small Solar I Comm (1-10 kW)	Small Solar II (11-25 kW)	Medium Solar (26-250 kW)	Commercial Solar (251-1,000 kW)	Large Solar (1-5 MW)
Fixed O&M Expense, Yr 1	$/kW-yr	**$50** **[$15]**	**$50** **[$15]**	**$50** **[$15]**	**$34** **[$15]**	**$24** **[$15]**	$15
O&M Cost Inflation	%	2%					
Insurance, Yr 1 (% of Total Cost)	%	0.00%			**0.27%** **[0.25%]**		
Management Yr 1	$/yr	**Included in O&M.** **[$150]**			**$750** **[$500]**	**$3,000** **[$3,300]**	**$7,700** **[$10,000]**
Land Lease	$/yr	$0			**$3,500** **[$0]**	**$12,500** **[$6,000]**	**$50,000** **[$24,000]**

Blue = change from 2016 value.

[Bracketed] values show 2016 CP inputs, where different

Financing Assumptions

Modeled Parameters

		Small Solar I, Host, Residential (1-10 kW) (15 / 20 yrs)	Small Solar I, Host, Non-Residential (1-10 kW) (15 / 20 yrs)	Small Solar I, TPO, Residential (1-10 kW) (15 / 20 yrs)	Small Solar I, TPO, Non-Res. (1-10 kW) (15 / 20 yrs)
% Debt	%	100% [0%]	45%	50%	55%
Debt Term	yrs	10/15 [N/A]	10	12/15 [13/18]	10/12
Interest Rate on Term Debt	%	6.5%/70% 5.5% [N/A]	6.5%	6.5%/7.0% 5.5%/5.75% [6.5%]	5.5%/5.75%
Lender's Fee (% of total borrowing)	%	2.0% [2.25%, N/A for Small Solar I Resi (1-10 kW)]			
Required Minimum Annual DSCR		1.00			
Required Average DSCR		1.35			
Target After-Tax Equity IRR	%	5.0% 5.5% [5.0%]	8.0%	8.0%	8.0%

Green = change from 1st draft **Blue** = change from 2016 value. **[Bracketed]** values show 2016 CP inputs, where different

Financing Assumptions

Modeled Parameters

		Small Solar II, Residential (11-25 kW)	Small Solar II, Non-Res. (11-25 kW)	Medium Solar (26-250 kW)	Commercial Solar (251-1,000 kW)	Large Solar (1-5 MW)
% Debt	%	100%	45% [50%]	45% [50%]	40% [50%]	40% [50%]
Debt Term	yrs	10	12 [18, 10, 15]			15
Interest Rate on Term Debt	%	6.5%	6.0%, 6.0%, 5.75% 5.5% [6.5%, 6.5%, 6.0%]			5.75% [6.0%]
Lender's Fee (% of total borrowing)	%	2.0% [2.25%, N/A for Small Solar I Resi (1-10 kW)]				
Required Minimum Annual DSCR		1.00				
Required Average DSCR		1.35				
Target After-Tax Equity IRR	%	5.0%, 8.0%. 7.5%, 7.0%, 7.0% 8.0% [5.0%, 8.0%, 7.5%, 7.0%, 7.0%]				

Green = change from 1st draft **Blue** = change from 2016 value. **[Bracketed]** values show 2016 CP inputs, where different

MODELED PARAMETERS: WIND

Production and Capital Cost Assumptions

No changes to this set of inputs.

Modeled Parameters

		Small Wind	Wind I	Wind II	Wind III
Nameplate Capacity	kW	**100**	1,650	3,300	4,950
Capacity Factor	%	**21%**	21%		
Annual Degradation	%	**0.0%**	0.0%		
Generation Equipment	$/kW	**$4,000**	$3,200	**$3,025** **[$3,100]**	**$2,850** **[$3,000]**
Interconnection	$/kW	**$54**	**$102** **[$241]**	**$100** **[$181]**	**$100** **[$160]**

Blue = change from 2016 value.

[Bracketed] values show 2016 CP inputs, where different

Ongoing Cost Assumptions

Modeled Parameters

No changes to this set of inputs.

		Small Wind	Wind I	Wind II	Wind III
Fixed O&M Expense, Yr 1	$/kW-yr	**$30.00**	**$45.00** **[$25.00]**		
O&M Cost Inflation	%	**2%**	2%		
Insurance, Yr 1 (% of Total Cost)	%	**0.25%**	**0.45%** **[0.60%]**		
Management Yr 1	$/yr	**Incl.**	Included in O&M		
Land Lease	$/yr	**$5,000**	**$54K** **[$52.5K]**	**$108K** **[$105K]**	**$162K** **[$157.5K]**

Blue = change from 2016 value.

[Bracketed] values show 2016 CP inputs, where different

Financing Assumptions

Modeled Parameters

No changes to this set of inputs.

		Small Wind	Wind I	Wind II	Wind III
% Debt	%	**45%**	**60%** **[70%]**		
Debt Term	yrs	**15**	**15** **[18]**		
Interest Rate on Term Debt	%	**6.25%**	**6.25%** **[6.50%]**		
Lender's Fee (% of total borrowing)	%	**2.00%**	**2.00%** **[2.25%]**		
Required Minimum Annual DSCR		**1.00**	1.00		
Required Average DSCR		**1.45**	1.45		
Target After-Tax Equity IRR	%	**10%**	10%		
Reserve Requirement	$	**Incl.**	6 mos of debt service		
Major Equipment Replacements		**Incl.**	**Yrs 12, 15, 18, 19, $30/kW** **[$0/kW]**		

Blue = change from 2016 value.

[Bracketed] values show 2016 CP inputs, where different

MODELED PARAMETERS:
ANAEROBIC DIGESTION

PROJECT PERFORMANCE ASSUMPTIONS

No changes to this set of inputs.

Modeled Parameters

		Anaerobic Digestion I	Anaerobic Digestion II
Generator Nameplate Capacity	*kW*	**325**	**725**
Biogas Consumption per Day	*cubic feet/day*	**131,729** **157,911** **[120,066]**	**293,856** **[267,840]**
Energy Content per Cubic Foot	*BTU/cubic foot*	**550** **[600]**	
Heat Rate	*BTU/kWh*	**8,979** **10,339** **[8,928]**	**8,979** **[8,928]**
Availability	*%*	**92%**	
Station Service (Parasitic Load)	*%*	**20%**	
Annual Production Degradation	*%*	**0%**	
Project Useful Life	*years*	**20**	

Blue = change from 2016 value.

[Bracketed] values show 2016 CP inputs, where different

CAPITAL, INTERCONNECTION AND O&M COSTS

No changes to this set of inputs.

Modeled Parameters

		Anaerobic Digestion I	Anaerobic Digestion II
Generation Equipment	*$/kW*	**$10,000**	**$10,000**
Interconnection Costs	*$/kW*	**$150**	
Fixed O&M Expense	*$/kW-yr*	**$600**	
Variable O&M Expense	*¢/kWh*	**2.00**	
O&M Cost Inflation	*%*	**2%**	

Blue = change from 2016 value.

[Bracketed] values show 2016 CP inputs, where different

ONGOING EXPENSE ASSUMPTIONS

No changes to this set of inputs.

Modeled Parameters

		Anaerobic Digestion I	Anaerobic Digestion II
Insurance, Yr 1 (% of Total Cost)	*%*	**1.0%**	
Project Management Yr 1	*$/yr*	**$33,621**	**$75,000**
Water & Sewer Expenses	*$/yr*	**$0**	
Digestate Disposal Cost (if handled as an expense)	*$/ton*	**$0.00**	
Land Lease	*$/yr*	**$15,690**	**$35,000**

Blue = change from 2016 value.

[Bracketed] values show 2016 CP inputs, where different

FINANCING ASSUMPTIONS

Modeled Parameters

No changes to this set of inputs.

		Anaerobic Digestion I	Anaerobic Digestion II
% Debt (% of hard costs) (mortgage-style amort.)	*%*	**60%**	
Debt Term	*years*	**15** **[18]**	
Interest Rate on Term Debt	*%*	**6.25%** **[6.50%]**	
Lender's Fee (% of total borrowing)	*%*	**0%**	
Required Minimum Annual DSCR	*Ratio*	**1.00**	
Required Average DSCR	*Ratio*	**1.50**	
Target After-Tax Equity IRR	*%*	**10%**	
Other Closing Costs	*$*	**$0**	
Reserve Requirement	*$*	**$0**	

Blue = change from 2016 value.

[Bracketed] values show 2016 CP inputs, where different

SUPPLEMENTAL REVENUE ASSUMPTIONS

Modeled Parameters

No changes to this set of inputs.

		Anaerobic Digestion I	Anaerobic Digestion II
Tipping Fee	*$/ton*	**$25.00** **[$22.50]**	
Quantity Received Each Year	*tons per year*	**10,000**	**22,308**
Digestate (if merchantable for additional revenue)	*$/gallon*	**$0**	

Blue = change from 2016 value.

[Bracketed] values show 2016 CP inputs, where different

MODELED PARAMETERS: HYDRO

Production and Capital Cost Assumptions

No changes to this set of inputs.

Modeled Parameters

		Hydro I	Hydro II
Nameplate Capacity	kW	**150**	**500**
Capacity Factor	%	**40%**	
Annual Degradation	%	**0.0%**	
Cost Excluding Interconnection	$/kW	**$6,000** **[$4,500, $4,200]**	
Interconnection	$/kW	**$100**	

Blue = change from 2016 value.

[Bracketed] values show 2016 CP inputs, where different

ONGOING EXPENSES

No changes to this set of inputs.

Modeled Parameters

		Hydro I	Hydro II
Variable O&M Expense, Yr 1	¢/kWh	**2.00**	
O&M Cost Inflation	%	**2.00%** **[3.00%]**	
Insurance, Yr 1 (% of Total Cost)	%	**0.50%**	
Management Yr 1	$/yr	**$10,000** **[$5,000]**	**$15,000**
Land Lease	$/yr	**$3,750** **[$3,000]**	**$12,500** **[$10,000]**

Blue = change from 2016 value.

[Bracketed] values show 2016 CP inputs, where different

FINANCING ASSUMPTIONS

No changes to this set of inputs.

Modeled Parameters

		Hydro I	Hydro II
% Debt	%	60% [50%]	
Debt Term	yrs	15 [18]	
Interest Rate on Term Debt	%	6.25% [6.50%]	
Lender's Fee (% of total borrowing)	%	2.00% [2.25%]	
Required Minimum Annual DSCR		1.00	
Required Average DSCR		1.45	
Target After-Tax Equity IRR	%	10%	
Reserve Requirement	$	$0	

Blue = change from 2016 value.

[Bracketed] values show 2016 CP inputs, where different

MODELED PARAMETERS: ADDITIONAL ASSUMPTIONS, ALL TECHNOLOGIES

Property Taxes

- Methodology Supporting 2016 Ceiling Price
  - Start at 80% of cost basis
  - Reduce by 5% per year to floor of 30%
  - Multiply by Mill rate.
  - Effect: Tax expense starts high, decreases over time
- Methodology supporting 2017 Ceiling Price
  - Fixed rate, $5.00 per kWac installed
    - Rate ultimately subject to regulatory approval
  - Effect: Tax expense is fixed and flat
  - Hydroelectric facilities are exempt from property tax per Title 44, § 44-3-3

Incentives: Tax Credits

- Solar:
  - 30% ITC for projects commencing construction on or before 12/31/2019.
  - Assumed to apply to all projects selected in 2017 solicitations.
  - No monetization “haircut” assumed. “Discount” on ITC taken into account in equity rate of return.

- Wind
  - Wind facilities participating in the 2017 REG Program are assumed to qualify for 80% of the

- AD & Hydro
  - No PTC (or ITC in lieu thereof) for facilities commencing construction after 12/31/2016.
  - Given REG eligibility criteria that facilities not be under construction, PTC/ITC assumed not available to facilities participating in 2017 solicitations.

Incentives: NOL Carryforward

- MACRS depreciation creates deduction benefit by reducing taxable income.
- Where depreciation expense is > operating income, the project will most likely experience a net operating loss (NOL) for the specified year.
- This NOL is passed through to the facility owner, creating a benefit by reducing that entity's eligible taxable income.
- NOL benefits are assumed to be applied "as generated" to both state and federal tax liabilities

- No federal, state, local or other grants assumed.

- Policy Objective: Encourage projects able to make most effective use of tax benefits

Additional Assumptions:
Forecast of Market Value of Production

Project Year	Calendar Year	Market Value of Production (incl. energy, capacity & RECs) (cents/kWh)	
		Solar	Hydro
21	2037	11.96	11.30
22	2038	12.57	11.88
23	2039	13.22	12.49
24	2040	13.90	13.14
25	2041	14.61	13.81
26	2042		14.52
27	2043		15.27
28	2044		16.05
29	2045		16.87
30	2046		17.74