



Rhode Island  
Renewable Energy Growth Program:

*2nd Revision to Proposed  
2015 Ceiling Price Recommendations*

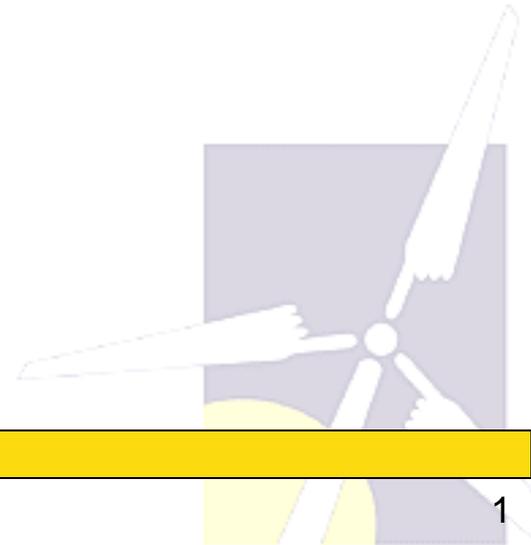
December 9, 2014

Sustainable Energy Advantage, LLC





# SUMMARY RESULTS





## 2015 Ceiling Prices, Draft Recommendations to PUC

Technology	System Size	Proposed CP w/ ITC 15-yr Tariff	Proposed CP w/ ITC/PTC 20-yr Tariff	Proposed CP w/o ITC/PTC 20-yr Tariff
Sm. Solar I, Host-Owned	1 to 10 kW	<b>41.35</b>	<b>37.75</b>	
Small Solar I, TPO	1 to 10 kW		<b>32.95</b>	
Small Solar II,	10 to 25 kW		<b>29.80</b>	
Medium Solar	26-250 kW		<b>24.40</b>	
Commercial Solar	251 -999 kW		<b>20.95</b>	
Large Solar	1-5 MW		<b>16.70</b>	
Wind I	1.5 to 2.99 MW			<b>22.75</b>
Wind II	3-5 MW			<b>22.35</b>
Anaerobic Digestion I	150 to 500 kW			<b>20.60</b>
Anaerobic Digestion II	501 kW to 1 MW			<b>20.60</b>
Hydro I	10 -250 kW			<b>21.35</b>
Hydro II	251 kW -1 MW			<b>20.10</b>



## Draft 2015 Ceiling Prices, Solar

Technology	System Size	2015 Proposed CP w/ ITC 15 year Tariff Duration	2015 Proposed CP w/ ITC 20 year Tariff Duration
Small Solar I, <b>Host</b> -Owned	1 to 10 kW	<b>41.35 (+4%)</b> 39.70	<b>37.75 (+3%)</b> 36.50
Small Solar I, Third-Party Owned	1 to 10 kW	<b>N/A</b> 34.05	<b>32.95 (+12%)</b> 29.35

Technology	System Size	2015 Proposed CP w/ ITC 20 year Tariff Duration
Small Solar II,	10 to 25 kW	<b>29.80 (-7%)</b> 31.95
Medium Solar	26-250 kW	<b>24.40 (-13%)</b> 28.05
Commercial Solar	251 -999 kW	<b>20.95 (-5%)</b> 21.95
Large Solar	1-5 MW	<b>16.70 (-8%)</b> 18.20

**Initial CPs are shown in Blue.**  
**Revised CPs are in Red.**

## Draft 2015 Ceiling Prices, Wind – AD – Hydro

Technology	System Size	2015 Proposed CP w/ ITC ILO PTC 20 year Tariff Duration	2015 Proposed CP w PTC 20 year Tariff Duration	2015 Proposed CP w/o PTC or ITC 20 year Tariff Duration
Wind I,	1.5 to 2.99 MW	<b>18.40 (+6%)</b> 17.30	<b>19.85 (+1%)</b> 19.75	<b>22.75</b> 22.75
Wind II	3-5 MW	<b>18.20 (+7%)</b> 17.00	<b>19.45% (+1%)</b> 19.35	<b>22.35</b> 22.35

Technology	System Size	2015 Proposed CP w/ PTC 20 year Tariff Duration	2015 Proposed CP w/o PTC 20 year Tariff Duration
Anaerobic Digestion I	150 to 500 kW	<b>20.20 (+8%)</b> 18.65	<b>20.60 (+2%)</b> 20.15
Anaerobic Digestion II	501 kW to 1 MW	<b>20.20 (+8%)</b> 18.65	<b>20.60 (+2%)</b> 20.15
Hydro I	10 -250 kW	<b>19.80 (+6%)</b> 18.65	<b>21.35 (+6%)</b> 20.20
Hydro II	251 kW -1 MW	<b>18.55 (-1%)</b> 18.65	<b>20.10 (-0.5%)</b> 20.20

Initial CPs are shown in **Blue**.  
Revised CPs are in **Red**.

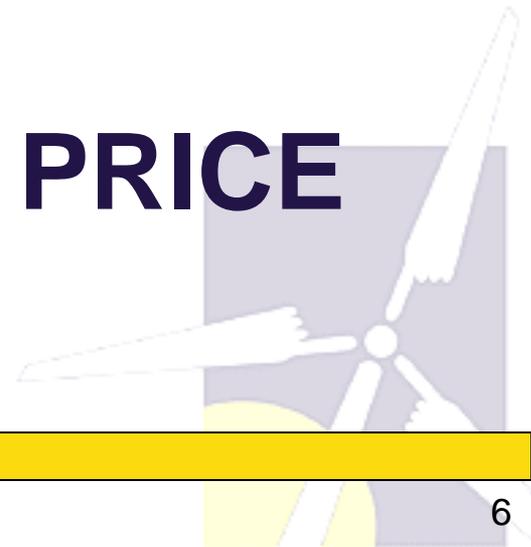


# Federal Incentives' Impact on Ceiling Prices

- Renewable energy investing is tax-driven
- Incentive program assumptions are important
  - ITC
  - PTC
  - MACRS Depreciation
- The leverage afforded by Federal incentives should inure to the benefit of RI ratepayers to the maximum extent possible
- Recommendation:
  - Each project should certify and validate its eligibility, or ineligibility, for Federal incentives as part of its bid/tariff application.



# **HISTORICAL CEILING PRICE COMPARISON**





# Ceiling Prices, 2011-2015 Comparison

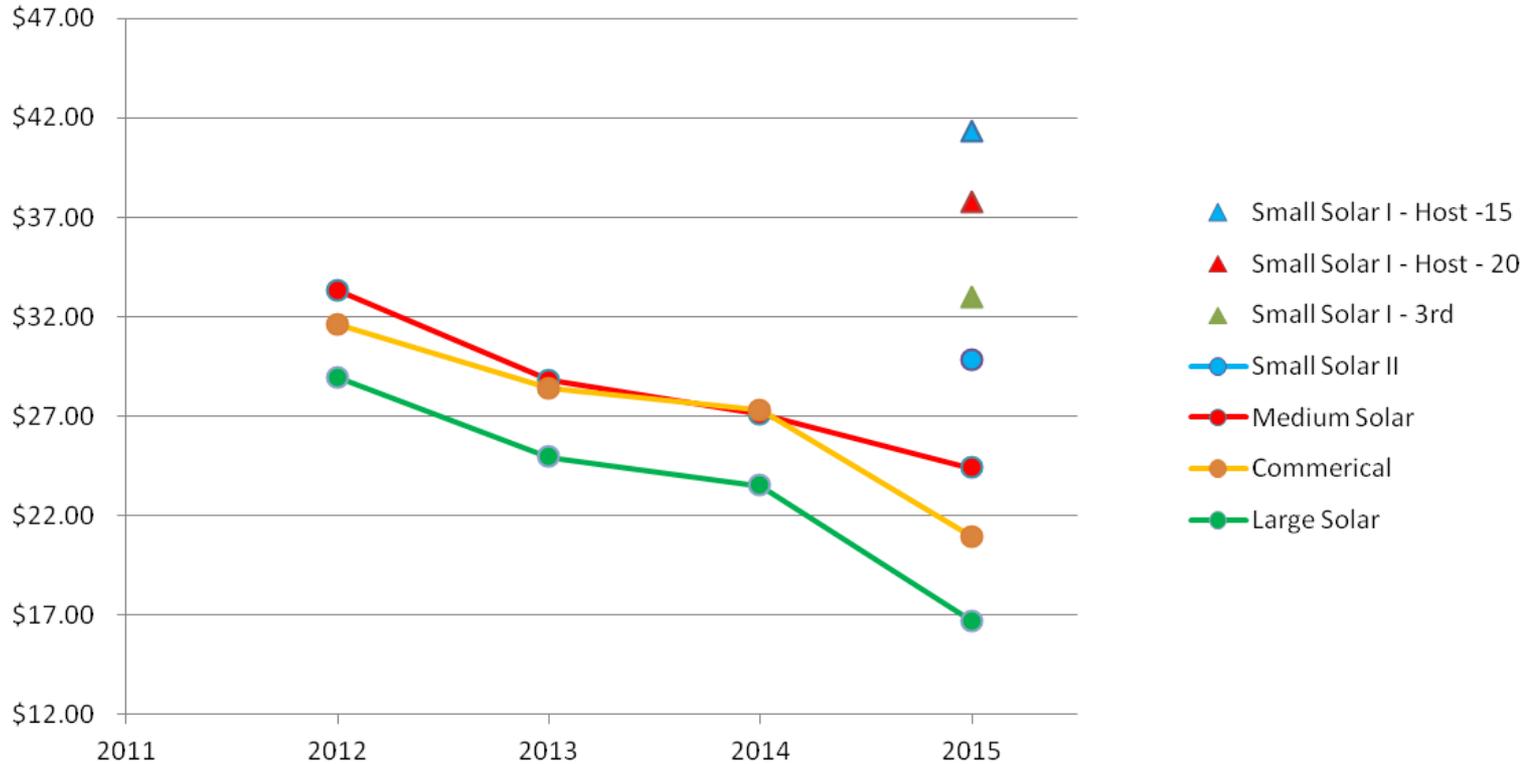
## Distributed Growth Program Ceiling Prices 2012-2015 (c/kWh) [ITC (Solar, Wind) or PTC (Hydro, AD), without Bonus Depreciation]

2015 Technology Class	2015*		2014		2013		2012	
	Size	Price (c/kWh)	Size	Price (c/kWh)	Size	Price (c/kWh)	Size	Price (c/kWh)
Small Solar I - Host -15	1 - 10 kW	\$ 41.35						
Small Solar I - Host - 20	1 - 10 kW	\$ 37.75						
Small Solar I - 3rd	1 - 10 kW	\$ 32.95						
Small Solar II	10 - 25 kW	\$ 29.80						
Medium Solar	26 - 250 kW	\$ 24.40	50 - 200 kW	\$ 27.10	101 - 250 kW	\$ 28.80	10 - 150 kW	\$ 33.35
Commerical	251 - 999 kW	\$ 20.95	201 - 500 kW	\$ 27.30	251 - 499 kW	\$ 28.40	151 - 500 kW	\$ 31.60
Large Solar	1 - 5 MW	\$ 16.70	501 - 3000 kW	\$ 23.50	> 500 kW	\$ 24.95	501 - 1000 kW	\$ 28.95
Wind I	1500 - 2999 kW	\$ 18.40	1.0 - 1.5 MW	\$ 17.50	1.0 - 1.5 MW	\$ 14.80	N/A	\$ 13.35
Wind II	3000 - 5000 kW	\$ 18.20						
Hydro I*	10 - 250 kW	\$ 19.80	50 kW - 1.0 MW	\$ 17.90				
Hydro II*	250 - 1000 MW	\$ 18.55	50 kW - 1.0 MW	\$ 17.90	400-500kW	\$ 17.90		
AD I*	150 - 500 kW	\$ 20.20	50 kW - 1.0 MW	\$ 18.55				
AD II*	501 - 1000 MW	\$ 20.20	50 kW - 1.0 MW	\$ 18.55	0.5-1.0 MW	\$ 18.55		

\* Recommended

# Ceiling Prices, 2011-2015 Comparison

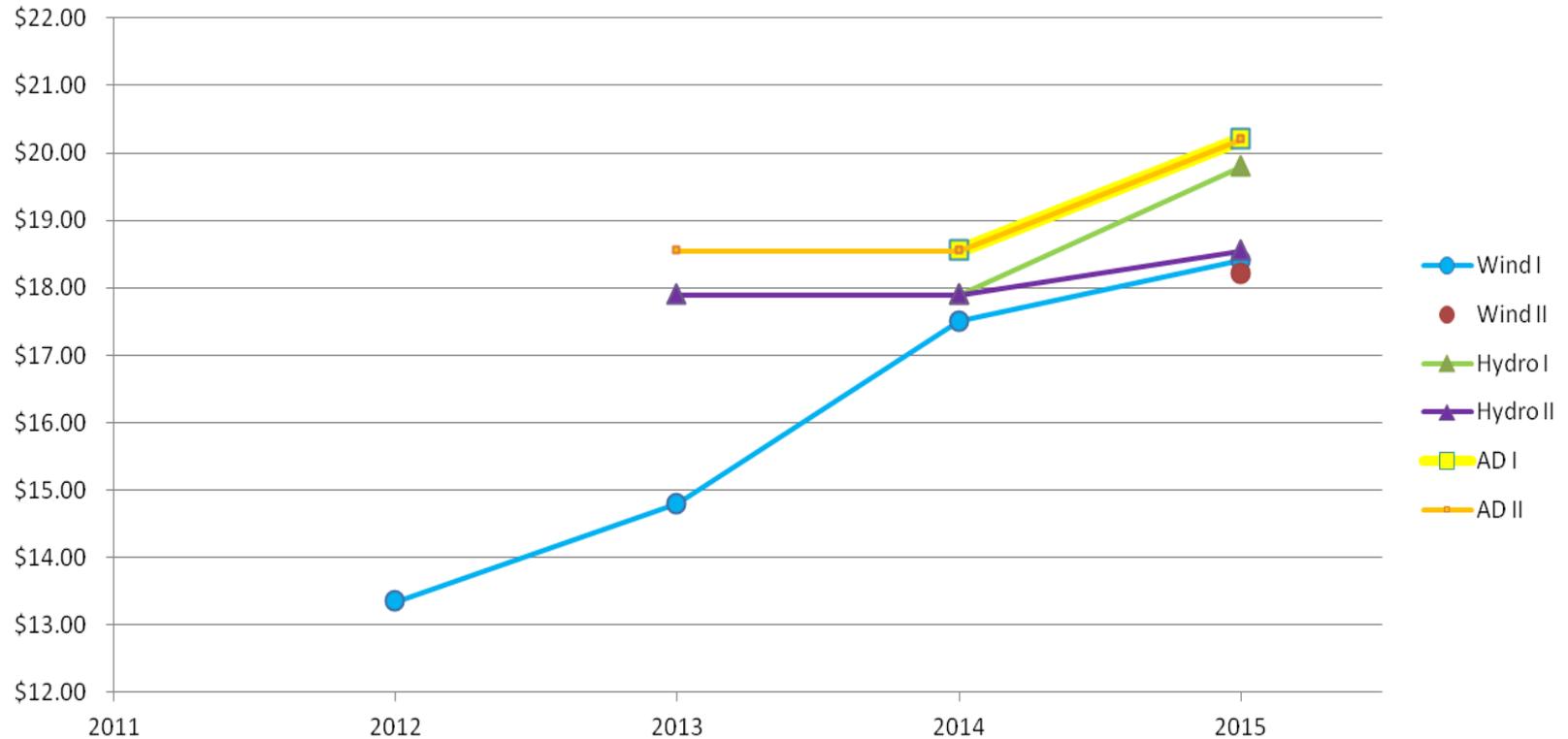
Distributed Growth Program Ceiling Prices 2012-2015 (c/kWH) : Solar (ITC, without Bonus Depreciation)



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

# Ceiling Prices, 2011-2015 Comparison

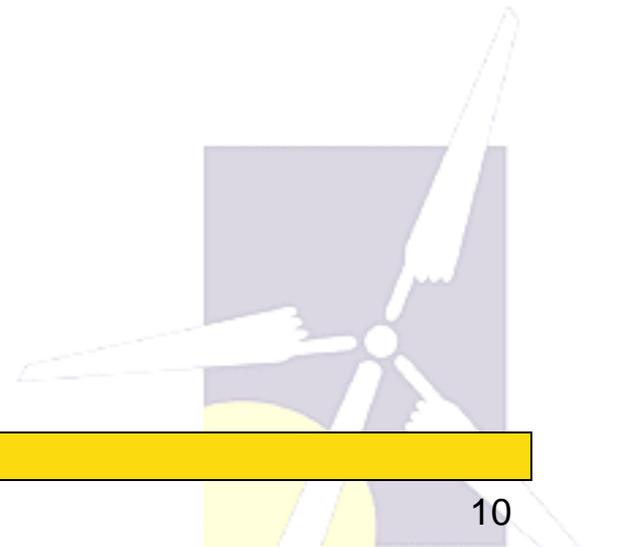
Distributed Growth Program Ceiling Prices 2012-2015 (c/kWH) : Wind, Hydro, AD (ITC (WIND) or PTC (HYDRO/AD), no Bonus Depreciation)



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



# PROPERTY TAX ASSUMPTIONS





# PROPERTY TAX ASSUMPTIONS (1)

- Property Tax Data from the 39 cities and towns in Rhode Island was reviewed by SEA
  - a) Outlier data from three cities and towns (North Kingston, Smithfield and Westerly), was removed at the request of the DG Board.
- Using this data, SEA determined an Average Mill Rate for the different ceiling price classes:
  - a) The “**Private Property**” Mill Rate was used for all classes.
  - b) For Small Solar I & II, as well as Hydropower, a **straight average** of the Mill Rates was used to determine ceiling prices.
  - c) For all other classes, a **weighted average** was used, with weighting based on total MW of past DG projects installed in each municipality.



## PROPERTY TAX ASSUMPTIONS (2)

- Using the Average Mill Rate determined above, total annual Property Tax payments were determined for each class of projects
- The Tax Basis for each class was assumed to be:
  - a) For Small Solar I & II, **60%** of the system's Installed Cost (excluding Interconnection Cost).
  - b) For all other classes, **80%** of the system's Installed Cost (excluding Interconnection Cost).
  - c) The different between (a) and (b) reveals the expectation that small (particularly residential) systems will receive more favorable tax treatment.

Note: For Ceiling Prices presented on 10/20/2014, the Basis was assumed to be **95%** of the system's Installed Cost.

- Tax Basis was assumed to decline for all projects by 5% annually, to a floor of 30%.



# SOLAR CEILING PRICE ASSUMPTIONS (CHANGES V. INITIAL INPUTS)

Initial Inputs are shown in **Black**.

Revised Inputs are in **Red**.

All Inputs that were not changed are listed in the Appendix, if not listed in the proceeding tables.



# Small Solar I – Host Owned

Category:	Depreciation:	Federal Income Tax Rate:	State Income Tax Rate:	Target After Tax Equity IRR:	Fixed O&M	Project Management Yr-1:
Input:	<b>Unavailable MACRS</b>	<b>0% 35%</b>	<b>0% 9%</b>	<b>7.5% 8.0%</b>	<b>\$15.00 \$10.00</b>	<b>\$150 \$0</b>



# Small Solar I – Host Owned (Brief Discussion)

- **Depreciation:**

- ❖ Analysis originally included MACRS type depreciation for Host-Owned Systems.
- ❖ Residents, however, cannot take advantage of depreciation under the IRC.
- ❖ CREST analysis no longer includes depreciation tax benefits for Host-Owned systems.

- **Income Tax:**

- ❖ NMC offsets & PBI payments are not considered income, currently.
- ❖ National Grid does not issue 1099's with NMC/PBI payments to residents.
- ❖ As such, it is assumed 'Hosts' are not taxed on NMC/PBI Benefits.

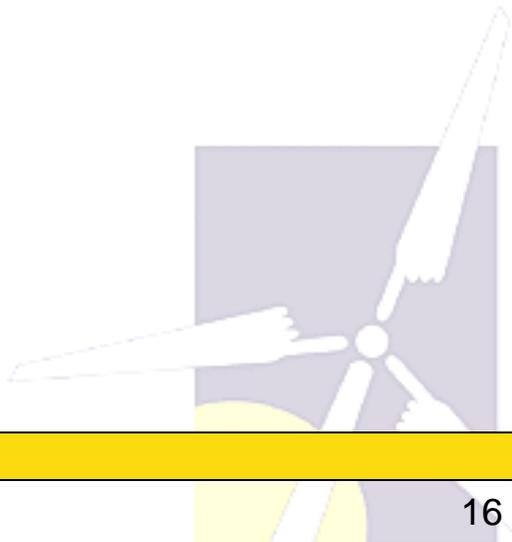
- **Target IRR:**

- ❖ Decreased from 8% to 7.5%, to reflect lower associated risk.
- ❖ Decision made not to reduce further, to keep Host-Owned IRR at par with Third Party-Owned IRR.



# Small Solar I – 3<sup>rd</sup> Party

Category:	Target After Tax Equity IRR:	Fixed O&M	Project Management Yr-1:
Input:	<b>7.5%</b> <b>10.0%</b>	<b>\$15.00</b> <b>\$10.00</b>	<b>\$150</b> <b>\$0</b>





# Small Solar II

Category:	Capacity Factor:	Target After Tax Equity IRR:	Fixed O&M	Project Management Yr-1:	Land Lease:	Insurance Yr-1:
Input:	<b>13.49%</b> 13.79%	<b>7.5%</b> 10.0%	<b>\$15.00</b> \$10.00	<b>\$150</b> \$0	<b>\$0</b> \$417	<b>0.00%</b> 0.25%



# Medium Solar

Category:	Capacity Factor:	Installed Cost (\$/kW)**:	Target After Tax Equity IRR:	Fixed O&M:	Project Management Yr-1:	Land Lease:
Input:	<b>13.45%*</b> <b>13.49%</b>	<b>\$3,305</b> <b>\$3,566</b>	<b>7.5%</b> <b>10.0%</b>	<b>\$15.00</b> <b>\$10.00</b>	<b>\$150</b> <b>\$250</b>	<b>\$0</b> <b>\$1500</b>

*\* Typo in initial presentation. 13.45% is the rate that has been used in CREST consistently throughout the process.*

**\*\* Includes Interconnection**



# Commercial Solar

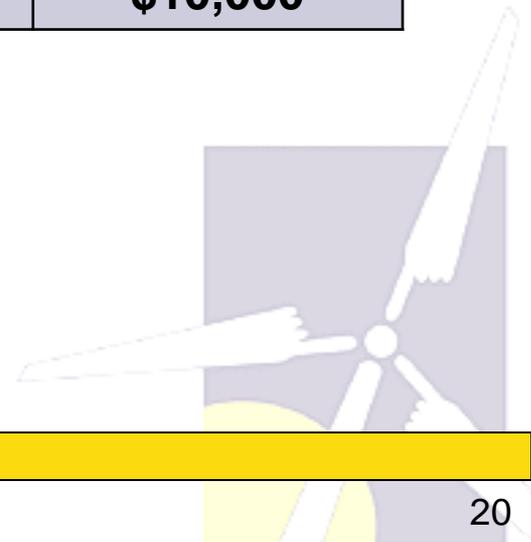
Category:	Target After Tax Equity IRR (%):	Interest Rate on Term Debt (%):	Land Lease:
Input:	<b>7.0%</b> 7.0%	<b>6.0%</b> 5.5%	<b>\$6,000* w/ 2% Escalation</b> <b>\$10,000</b>

\* \$1,500/acre; ~8 acres per MW (NREL)



# Large Solar

Category:	Target After Tax Equity IRR (%):	Interest Rate on Term Debt (%):	Land Lease:
Input:	<b>7.0%</b> 7.0%	<b>6.0%</b> 5.0%	<b>\$18,000* w/ 2% Escalation</b> <b>\$10,000</b>



\* \$1,500/acre; ~8 acres per MW (NREL)



# Incentives

- Fed. Investment Tax Credit (ITC) assumed available:
  - At 30% for all solar projects operational on or before 12/31/2016.
  - At 10% for commercially-owned projects on-line beginning 1/1/2017
  - At 0% for homeowner-owned projects on-line beginning 1/1/2017
- ITC Monetization %:

Category	Res. 5 kW	Res./Com. 25 kW	140 kW	500 kW	1,500 kW
%	<b>75%</b> 100%	<b>75%</b> 100%	<b>90%</b> 100%	90%	90%

- Ceiling prices evaluated without Bonus Depreciation
- Benefit of Net Operating Loss at state level assessed both “as generated” and “carried-forward”. Proposed CPs are an average of these two results.
- No federal, state, local or other grants assumed.



# Target IRR Comparison, Across Classes

Class:	Small Solar I – Host Owned	Small Solar I – 3 <sup>rd</sup> Party Owned	Small Solar II	Medium Solar	Commercial Solar	Large Solar
Target IRR:	<b>7.5%</b> <b>8.0%</b>	<b>7.5%</b> <b>10.0%</b>	<b>7.5%</b> <b>10.0%</b>	<b>7.5%</b> <b>10.0%</b>	<b>7.0%</b> <b>7.0%</b>	<b>7.0%</b> <b>7.0%</b>

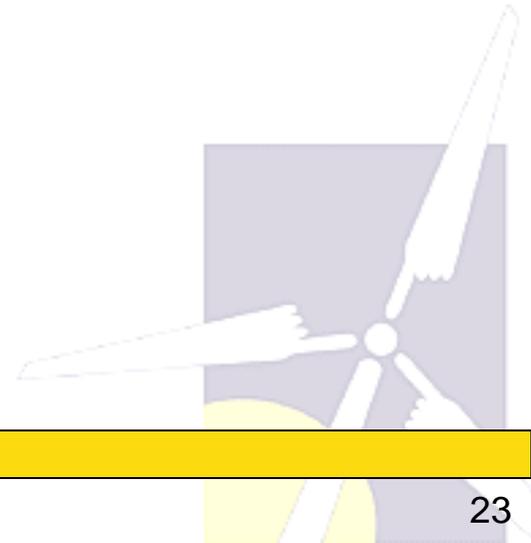


# WIND (CHANGES V. INITIAL INPUTS)

Initial Inputs are shown in **Black**.

Revised Inputs are in **Red**.

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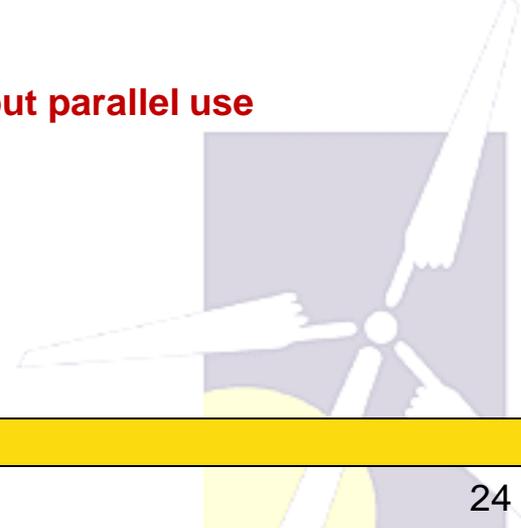


# Wind I

Category:	Generation Equipment:	Capacity Factor (%):	Target After Tax Equity IRR:	Fixed O&M:	Land Lease:	% Debt
Input:	<b>\$3,200</b> <b>\$3,500</b>	<b>21.00%</b> <b>23.00%</b>	<b>10.0%</b> <b>11.0%</b>	<b>\$25.00</b> <b>\$20.00</b>	<b>\$52,000** w/ 2% Escalation</b> <b>\$30,00</b>	<b>70%/60%/70%*</b> <b>70%</b>

**\*\$1,500/acre; ~35 acres per turbine. More land may be required, but parallel use may also be possible.**

**\*\* Based on whether PTC / ITC / No ITC**





# Wind II

Category:	Generation Equipment:	Capacity Factor (%):	Target After Tax Equity IRR:	Fixed O&M:	Land Lease:	% Debt
Input:	<b>\$3,100</b> <b>\$3,400</b>	<b>21.00%</b> <b>23.00%</b>	<b>10.0%</b> <b>11.0%</b>	<b>\$25.00</b> <b>\$20.00</b>	<b>\$105,000** w/ 2% Escalation</b> <b>\$60,00</b>	<b>70%/60%/70%*</b> <b>70%</b>

**\*\$1,500/acre; ~35 acres per turbine. More land may be required, but parallel use may also be possible.**

**\*\* Based on whether PTC / ITC / No ITC**



# Incentives

- Current Production Tax Credit (PTC) available to projects under construction as of 12/31/2013.
  - Qualifying projects may elect the PTC or ITC in lieu thereof
- Ceiling prices evaluated without Bonus Depreciation
- Ceiling prices evaluated assuming **75%** ~~70%~~ monetization of ITC, or **100%** monetization of PTC.
- Benefit of Net Operating Loss at state level assessed both “as generated” and “carried-forward.” Proposed ceiling prices are an average of these two results.
- No federal, state, local or other grants assumed.



# Effect of Changes to CF on Ceiling Prices

Technology, CF	System Size	2015 Proposed CP w/ ITC ILO PTC 20 year Tariff Duration	2015 Proposed CP w PTC 20 year Tariff Duration	2015 Proposed CP w/o PTC or ITC 20 year Tariff Duration
Wind I, 21%	1.5 to 2.99 MW	18.40	19.85	22.75
Wind I, 20%	1.5 to 2.99 MW	19.35 (+5.16%)	20.95 (+5.54%)	23.90 (+5.05%)
Wind I, 23%	1.5 to 2.99 MW	16.80 (-8.7%)	17.85 (-10.08%)	20.75 (-8.79%)
Wind II, 21%	3-5 MW	18.20	19.45	22.35
Wind II, 20%	3-5 MW	19.10 (+4.95%)	20.55 (+5.66%)	23.50 (+5.15%)
Wind II, 23%	3-5 MW	16.55 (-9.07%)	17.50 (-10.03%)	20.04 (-8.72%)

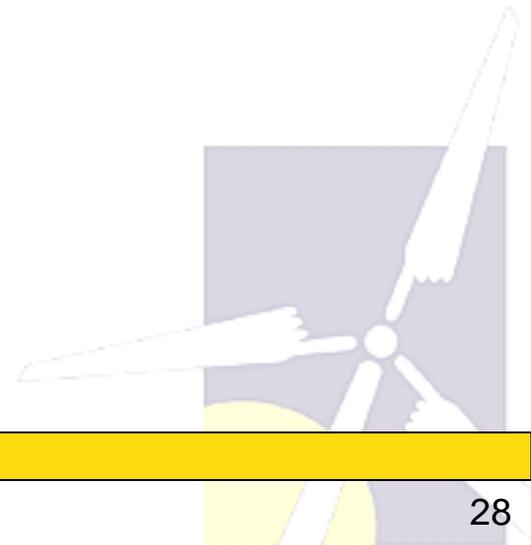


# ANAEROBIC DIGESTION (CHANGES V. INITIAL INPUTS)

Initial Inputs are shown in **Black**.

Revised Inputs are in **Red**.

All Inputs that were not changed are listed in the Appendix, if not listed in the proceeding tables.





# Anaerobic Digestion I & II

Category:	Tipping Fee (\$/ton):	Interest Rate on Debt Term (%):	Target After Tax Equity IRR:	% Debt (% of hard costs)
Input:	<b>\$20</b> <b>\$25</b>	<b>6.5%</b> <b>7.0%</b>	<b>10.0%</b> <b>11.0%</b>	<b>60% / 70%*</b> <b>60%</b>

\* with/without PTC



# Incentives

- Current Production Tax Credit (PTC) available to projects under construction as of 12/31/2013.
  - Anaerobic digesters eligible for 50% of face value
  - Ceiling prices calculated both with and without PTC extension.
- Ceiling prices evaluated without Bonus Depreciation
- Ceiling prices evaluated assuming **full** monetization of federal PTC
- Benefit of Net Operating Loss at state level assessed both “as generated” and “carried-forward.” Proposed ceiling prices are an average of these two results.
- No federal, state, local or other grants assumed.

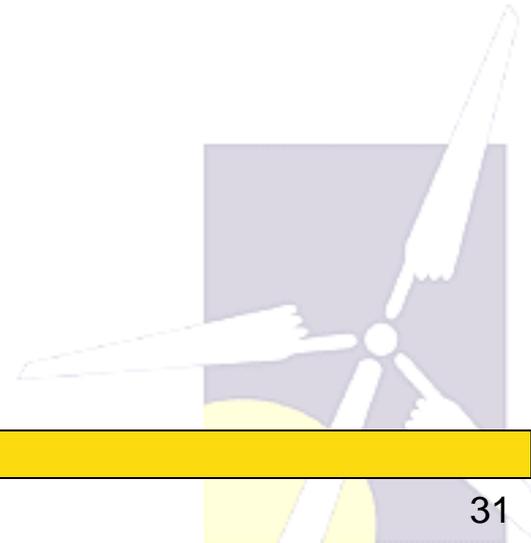


# HYDRO (CHANGES V. INITIAL INPUTS)

Initial Inputs are shown in **Black**.

Revised Inputs are in **Red**.

All Inputs that were not changed are listed in the Appendix, if not listed in the proceeding tables.





# Hydro I

Category:	Generation Equipment:	O&M Cost Inflation (%):	Target After Tax Equity IRR:	Land Lease:
Input:	<b>\$4,500</b> \$4,000	<b>3.0%</b> 2.0%	<b>10.0%</b> 11.0%	<b>\$3,000 w/ 2% Escalation</b> \$2,500



# Hydro II

Category:	Generation Equipment:	O&M Cost Inflation (%):	Target After Tax Equity IRR:	Land Lease:
Input:	<b>\$4,200</b> <b>\$4,000</b>	<b>3.0%</b> <b>2.0%</b>	<b>10.0%</b> <b>11.0%</b>	<b>\$10,000</b> <b>w/</b> <b>2% Escalation</b>



## **Sustainable Energy Advantage, LLC**

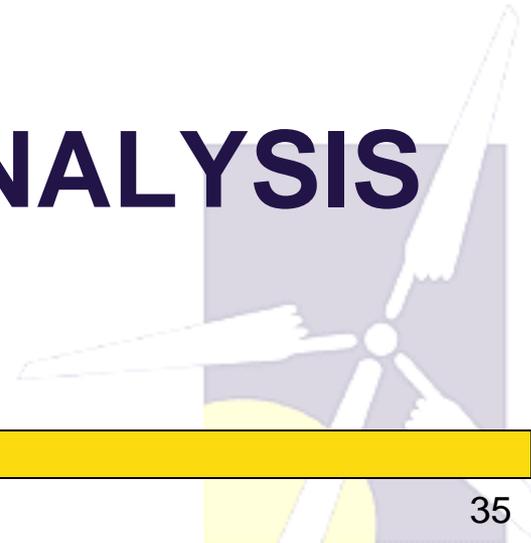
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# **COST SENSITIVITY ANALYSIS**





# Explanation of Sensitivity Analysis

- Somewhat comparable to a step-wise regression, which models the correlation of one variable to the result
- Specific Cost Inputs are “**Zeroed Out**” (i.e. set at \$0.00, 0%, etc.)
- Ceiling Prices are then recalculated, with all other inputs held constant
- The “Zeroed Out” Ceiling Price is then compared to the Original Ceiling price, to determine how much of the ceiling price is affected by that input
- **Note**: This is not a pure regression, as the result is somewhat based on the magnitude of the original cost. These results only relate to the specific ceiling prices discussed in this presentation, not CREST generally. However, the results are useful to understand the relative importance of certain inputs.



# Solar Cost Sensitivity Analysis

Decrease in Ceiling Price, as a % of Original

“Zeroed Out” Input:	Interconnection Cost	Property Tax	Fixed O&M Cost	Land Lease*
Small Solar I, Host-Owned, 15	0.73 %	12.09 %	4.59 %	0%
Small Solar I, Host-Owned, 20	0.79 %	11.66 %	4.50 %	0%
Small Solar I, Third-Party Owned - 20	0.76 %	13.51 %	5.16 %	0%
Small Solar II	1.01 %	14.77 %	5.70 %	0%
Medium Solar	1.23 %	20.49 %	6.97 %	0%
Commercial Solar	3.58 %	18.85 %	8.11 %	6.44%
Large Solar	7.78 %	17.37 %	9.58 %	7.78%

\*No Land Lease expense for Small Solar I, II and Medium Solar, hence 0% Sensitivity



# Wind Cost Sensitivity Analysis\*

Decrease in Ceiling Price, as a % of Original

"Zeroed Out" Input:	Interconnection Cost	Property Tax	O&M Cost	Land Lease
Wind I	3.80 %	9.78 %	8.15 %	10.60 %
Wind II	4.95 %	9.89 %	8.79 %	10.99 %

\*Using Wind-ITC price



# AD Cost Sensitivity Analysis\*

Decrease in Ceiling Price, as a % of Original

"Zeroed Out" Input:	Interconnection	Fixed O&M	Variable O&M	Project Management	Tipping Fee
AD I	2.48 %	44.06%	11.39 %	8.42 %	+42.57%**
AD II	2.48 %	44.06%	11.39 %	8.42 %	+42.57%**

\* Using AD-PTC price

\*\* As Tipping Fee is supplemental Revenue, "Zeroing-Out" Tipping Fee increases Ceiling Prices



# Hydro Cost Sensitivity Analysis

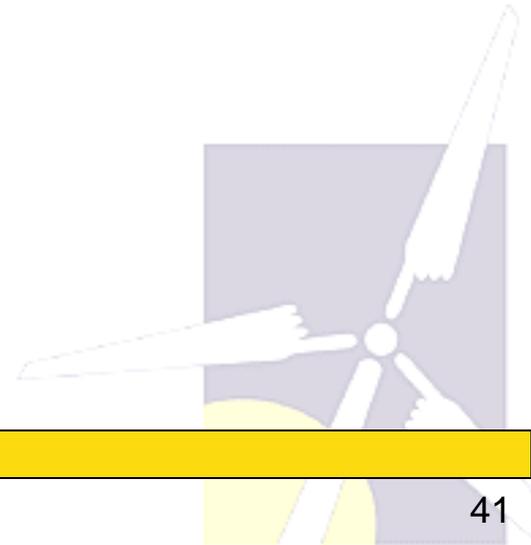
Decrease in Ceiling Price, as a % of Original

"Zeroed Out" Input:	Interconnection Cost	Property Tax	O&M Cost	Land Lease
Wind I	3.80 %	9.78 %	8.15 %	10.60 %
Wind II	4.95 %	9.89 %	8.79 %	10.99 %
Hydro I	1.77 %	10.86 %	2.78 %	3.79 %
Hydro II	2.16 %	10.78 %	3.23 %	4.31 %

\* Hydro-PTC Price



# APPENDICES





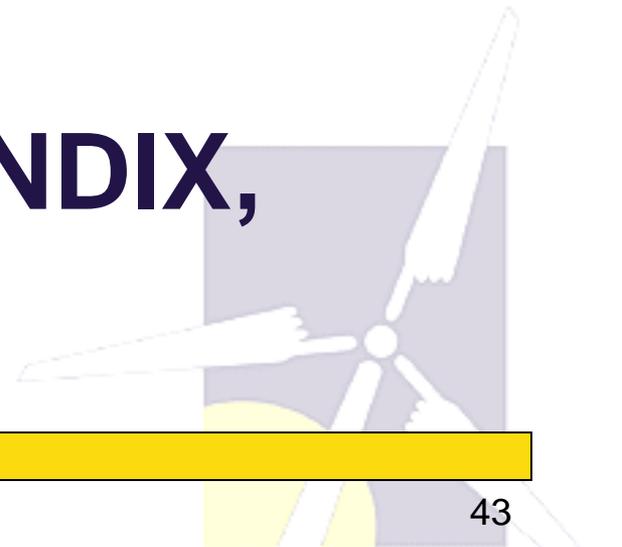
# Ceiling Price Categories

Eligible Technology	System Size for CP Development	Eligible System Size Range	Tariff Length
Small Solar I*	5 kW	1 to 10 kW	15 and 20 Years Options
Small Solar II	25 kW	11 to 25 kW	20 Years
Medium Solar	140 kW	26 to 250 kW	20 Years
Commercial Solar	500 kW	251 to 999 kW	20 Years
Large Solar	1.5 MW	1 to 5 MW	20 Years
Wind I	1.65 MW	1.5 to 2.99 MW	20 Years
Wind II	3.3 MW	3 to 5 MW	20 Years
Anaerobic Digestion I	325 kW	150 to 500 kW	20 Years
Anaerobic Digestion II	750 kW	501 kW to 1 MW	20 Years
Small Scale Hydropower I	150 kW	10 to 250 kW	20 Years
Small Scale Hydropower II	500 kW	251 to 1 MW	20 Years

\* The Small Solar I (5 kW) category will be used to evaluate both residential and small business installations. Residential installations will be evaluated under both homeowner and third-party ownership.



# **ASSUMPTIONS APPENDIX, SOLAR**





# Proposed Installed Cost\*

Class	Small Solar I (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)
Value	\$4,281	\$4,216	<b>\$3,305</b> \$3,566	\$2,676	\$2,151
Source	Average of REF Data	Average of REF Data	Average of <del>REF</del> and DG Pilot Bid Data	Average of DG Pilot Bid Data	Average of DG Pilot Bid Data

- Cost data is in \$/kW of Installed Capacity, DC

\*Including Interconnection Costs



# Capacity Factor Research & Assumptions

## Modeled Parameters

Size Class	PV Watts CF	SAM	Proposed CF for 2015*
1-10	15.21%	10.5%	13.49%
11-25	15.21%	14.71%	<b>13.49%</b> 13.79%
25-250	15.21%	15.19%	<b>13.45%</b> 13.49% <i>(typo in initial presentation)</i>
251-1,000	15.21%	15.23%	13.59%
1,001-5,000	15.21%	15.25%	14.18%

\*Based on Massachusetts system performance database multiplied by 1.0221 correction factor for RI45 insolation



# Production and Capital Costs Assumptions

## Modeled Parameters

		Small Solar I, Host (1-10 kW)	Small Solar I TPO (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	1500
Annual Degradation	%	0.5%					
Cost Excluding Interconnection	\$/kW	\$4,250		\$4,185	<b>\$3,274</b> \$3,535	\$2,590	\$1,996
Interconnection	\$/kW	\$31				\$86	\$155



# Ongoing Cost Assumptions

## Modeled Parameters

		Small Solar I, Host (1-10 kW)	Small Solar I TPO (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	<b>\$15.00</b> \$10.00			<b>\$15.00</b> \$12.50	\$15.00	\$15.00
O&M Cost Inflation	%	2%					
Insurance, Yr 1 (% of Total Cost)	%	0.00%		<b>0.00%</b> 0.25%		0.25%	
Management Yr 1	\$/yr	<b>\$150</b> \$0		<b>\$150</b> \$250	\$500	\$3,300	\$10,000
Land Lease	\$/yr			<b>\$0</b> \$417	<b>\$0</b> \$1,500	<b>\$6,000*</b> w/ 2% esc. \$10,000	<b>\$18,000*</b> w/ 2% esc. \$30,000

\* \$1,500/acre; ~8 acres per MW (NREL)



# Financing Assumptions

## Modeled Parameters

		Small Solar I <b>Host</b> (1-10 kW)	Small Solar I <b>TPO</b> (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)
% Debt	%	0%	50% / 60%*				
Debt Term	yrs	N/A	18				
Interest Rate on Term Debt	%	N/A	6.0%			<b>6.0%</b> 5.5%	<b>6.0%</b> 5.0%
Lender's Fee (% of total borrowing)	%	N/A	2.25%				
Required Minimum Annual DSCR		N/A	1.00				
Required Average DSCR		N/A	1.35				
Target After-Tax Equity IRR	%	<b>6%</b> 8%	<b>7.5%</b> 10%			<b>7.0% / 6.5%*</b> 7%	
Decommissioning	\$	Assumed funded through salvage value of materials.					

\* with/without ITC



# Additional Assumptions

- COD achieved in 2015
- Project Useful Life: 25 years
- 0.5%/yr production degradation
- Debt Service Coverage Ratio Target: 1.35X
- Interconn. Costs depreciated on 15-year MACRS schedule
- All other project costs:
  - 96% depreciated on 5-year MACRS
  - 2% depreciated on 15-year MACRS
  - 2% not depreciable
- Income Tax rates\*:
  - Federal: Commercial 35%;
  - State: Commercial 9%
- *Assumed NEPOOL Membership costs either covered by NGRID as lead participant, or spread over many installations and therefore negligible*
- Market value of production (assumed revenue) post-contract = 90% of sum of **solar-weighted** energy and capacity price forecasts from 2013 Avoided Energy Supply Cost Study and \$5/REC (next slide)

\* Small Solar I, Host-Owned, assumes no income tax (state or federal) for system owner.



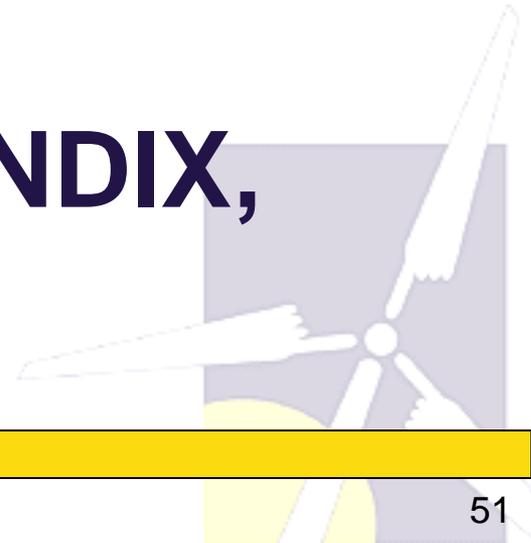
# Additional Assumptions: Forecast of Market Value of Production

<u>Project Year</u>	<u>Calendar Year</u>	<u>Time-of-Production Weighted Market Value of Production (incl. energy, capacity &amp; RECs) (cents/kWh)</u>
16	2029	12.13
17	2030	12.53
18	2031	12.94
19	2032	13.36
20	2033	13.79
21	2034	14.24
22	2035	14.7
23	2036	15.18
24	2037	15.67
25	2038	16.17

**No Change**



# **ASSUMPTIONS APPENDIX, WIND**





# Production and Capital Cost Assumptions

## Modeled Parameters

		Wind I	Wind II
Nameplate Capacity	kW	1,650	3,300
Annual Degradation	%	0.0%	
Generation Equipment	\$/kW	<b>\$3,200</b> \$3,500	<b>\$3,100</b> \$3,400
Interconnection	\$/kW	\$107	\$136



# Capacity Factor Assumptions

## Modeled Parameters

Size Class	Proposed CF for 2015
Wind I	<b>21.00%</b> 23.00%
Wind II	<b>21.00%</b> 23.00%



# Ongoing Cost Assumptions

## Modeled Parameters

		Wind I	Wind II
Fixed O&M Expense, Yr 1	\$/kW-yr	\$25.00 \$20.00	
O&M Cost Inflation	%	2%	
Insurance, Yr 1 (% of Total Cost)	%	0.60%	
Management Yr 1	\$/yr	Included in fixed O&M	
Land Lease	\$/yr	\$52,000* w/ 2% esc. \$30,000	\$105,000* w/ 2% esc. \$60,000

\* \$1,500/acre; ~35 acres per turbine. More land may be required, but parallel use may also be possible.



# Financing Assumptions

## Modeled Parameters

		Wind I	Wind II
% Debt	%	70%/60%/70%*	
Debt Term	yrs	18	
Interest Rate on Term Debt	%	6.5%	
Lender's Fee (% of total borrowing)	%	2.25%	
Required Minimum Annual DSCR		1.00	
Required Average DSCR		1.45	
Target After-Tax Equity IRR	%	10% 11%	
Reserve Requirement	\$	\$0	

\*Based on whether PTC / ITC / No ITC



# Additional Assumptions

- Commercial operation achieved in 2015
- Project Useful Life: 20 years
- Average Debt Service Coverage Ratio Target: 1.45X
- Interconnection Costs depreciated on 15-year MACRS schedule
- All other project costs:
  - 96% depreciated on 5-year MACRS
  - 2% depreciated on 15-year MACRS
  - 2% not depreciable
- Federal Income Tax rate 35%; State rate 9%



No Change

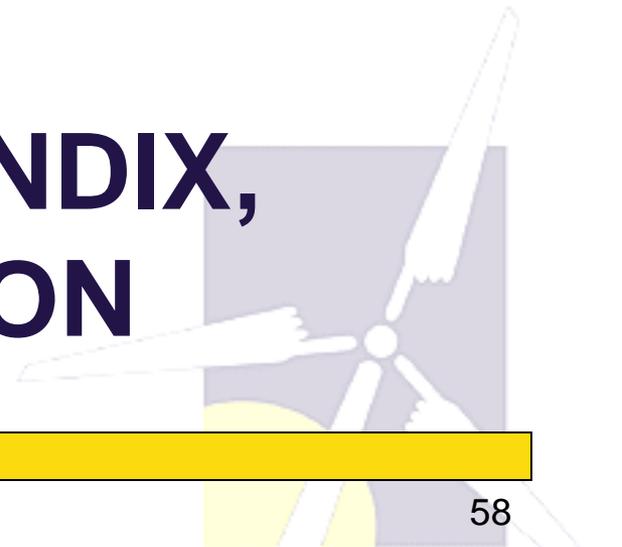


## Additional Cost Data From MassCEC

Project Name	COD	Capacity (kW)	Total Cost (\$)	Total Cost (\$/kW)
DOC Gardner	4/1/2013	3,300	9,000,000	\$2,727
Varian Semiconductor	12/6/2012	2,500	7,763,615.18	\$3,105
Camelot Wind	12/1/2012	1,500	4,351,547	\$2,901
Kingston Community Wind	5/18/2012	2,000	Not Reported	N/A
Fairhaven	5/2/2012	3,000	Not Reported	N/A
Lightolier	4/20/2012	2,000	4,478,500	\$2,239



# **ASSUMPTIONS APPENDIX, ANAEROBIC DIGESTION**





# FINANCING ASSUMPTIONS

## Modeled Parameters

		Anaerobic Digestion I	Anaerobic Digestion II
% Debt (% of hard costs) (mortgage-style amort.)	%	<b>60% / 70%*</b>	<b>60%</b>
Debt Term	<i>years</i>		<b>18</b>
Interest Rate on Term Debt	%	<b>6.5%</b>	<b>7%</b>
Lender's Fee (% of total borrowing)	%		<b>0%</b>
Required Minimum Annual DSCR	<i>Ratio</i>		<b>1.00</b>
Required Average DSCR	<i>Ratio</i>		<b>1.50</b>
Target After-Tax Equity IRR	%	<b>10%</b>	<b>11%</b>
Other Closing Costs	\$	<b>Included in total cost.</b>	
Reserve Requirement	\$		<b>\$0</b>

\* with/without PTC



# SUPPLEMENTAL REVENUE ASSUMPTIONS

## Modeled Parameters

		Anaerobic Digestion I	Anaerobic Digestion II
Tipping Fee	<i>\$/ton</i>	<b>\$20</b> <b>\$25</b>	
Quantity Received Each Year	<i>tons per year</i>	<b>10,000</b>	<b>22,308</b>
Digestate (if merchantable for additional revenue)	<i>\$/gallon</i>		<b>\$0</b>



# PROJECT PERFORMANCE ASSUMPTIONS

## Modeled Parameters

		Anaerobic Digestion I	Anaerobic Digestion II
Generator Nameplate Capacity	<i>kW</i>	<b>325</b>	<b>725</b>
Biogas Consumption per Day	<i>cubic feet/day</i>	<b>120,066</b>	<b>267,840</b>
Energy Content per Cubic Foot	<i>BTU/cubic foot</i>	<b>600</b>	
Heat Rate	<i>BTU/kWh</i>	<b>8,928</b>	
Availability	<i>%</i>	<b>92%</b>	
Station Service (Parasitic Load)	<i>%</i>	<b>15%</b>	
Annual Production Degradation	<i>%</i>	<b>0%</b>	
Project Useful Life	<i>years</i>	<b>20</b>	

**No Change**



# CAPITAL, INTERCONNECTION AND O&M COSTS

## Modeled Parameters

		Anaerobic Digestion I	Anaerobic Digestion II
Generation Equipment	\$/kW		\$10,000
Interconnection Costs	\$/kW		\$275
Fixed O&M Expense	\$/kW-yr		\$550
Variable O&M Expense	¢/kWh		2.00
O&M Cost Inflation	%		2%



No Change



# ONGOING EXPENSE ASSUMPTIONS

## 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

No Change



# Additional Assumptions

- Commercial operation achieved in 2015
- Project Useful Life: 20 years
- Average Debt Service Coverage Ratio Target: 1.50X
- Interconnection Costs depreciated on 15-year MACRS schedule
- All other project costs:
  - 96% depreciated on 5-year MACRS
  - 2% depreciated on 15-year MACRS
  - 2% not depreciable
- Federal Income Tax rate 35%; State rate 9%



No Change



# **ASSUMPTIONS APPENDIX, HYDRO**





# Production and Capital Cost Assumptions

## Modeled Parameters

		Hydro I	Hydro II
Nameplate Capacity	kW	150	500
Annual Degradation	%	0.0%	
Cost Excluding Interconnection	\$/kW	<b>\$4,500</b> \$4,000	<b>\$4,200</b> \$4,000
Interconnection	\$/kW	\$100	



# Production and Capital Cost Assumptions

## Modeled Parameters

Size Class	Proposed CF for 2015
Hydro I	40.00%
Hydro II	40.00%

No Change



# ONGOING EXPENSES

## Modeled Parameters

		Hydro I	Hydro II
Fixed O&M Expense, Yr 1	\$/kW-yr	\$13.00	
Variable O&M	¢/kWh	2.00	
O&M Cost Inflation	%	3% 2%	
Insurance, Yr 1 (% of Total Cost)	%	0.50%	
Management Yr 1	\$/yr	\$5,000	\$15,000
Land Lease	\$/yr	\$3,000 w/ 2% esc. \$2,500	\$10,000 w/ 2% esc.
Royalties	%	3.5%	



# FINANCING ASSUMPTIONS

## Modeled Parameters

		Hydro I	Hydro II
% Debt	%	<b>50%</b>	
Debt Term	yrs	<b>18</b>	
Interest Rate on Term Debt	%	<b>6.5%</b>	
Lender's Fee (% of total borrowing)	%	<b>2.25%</b>	
Required Minimum Annual DSCR		<b>1.00</b>	
Required Average DSCR		<b>1.45</b>	
Target After-Tax Equity IRR	%	<b>10%</b> <b>11%</b>	
Reserve Requirement	\$	<b>\$0</b>	



# Incentives

- Current Production Tax Credit (PTC) available to projects under construction as of 12/31/2013.
  - Hydro is eligible for 50% of face value
  - Ceiling prices calculated both with and without PTC extension.
- Ceiling prices evaluated without Bonus Depreciation
- Ceiling prices evaluated assuming full monetization of federal PTC
- Benefit of Net Operating Loss at state level assessed both “as generated” and “carried-forward.” Proposed ceiling prices are an average of these two results.
- No federal, state, local or other grants assumed.



No Change



# Additional Assumptions

- Commercial operation achieved in 2016
- Project Useful Life: 30 years
- Interconnection Costs depreciated on 15-year MACRS schedule
- All other project costs:
  - 96% depreciated on 5-year MACRS
  - 2% depreciated on 15-year MACRS
  - 2% not depreciable
- Federal Income Tax rate 35%; State rate 9%
- Market value of production (assumed revenue) post-contract = 75% of sum of energy and capacity price forecasts from 2013 Avoided Energy Supply Cost Study and \$5/REC (see next slide)

No Change



# Additional Assumptions: Forecast of Market Value of Production

Project Year	Calendar Year	Market Value of Production (incl. energy, capacity & RECs) (cents/kWh)
21	2034	13.28
22	2035	13.67
23	2036	14.07
24	2037	14.49
25	2038	14.91
26	2039	15.35
27	2040	15.80
28	2041	16.26
29	2042	16.74
30	2043	17.23



No Change