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NJ SOLAR TRANSITION

Transition Incentive: Modeling Approach, Assumptions and Selected Sensitivities Technical Work Session: – 9/6/2019

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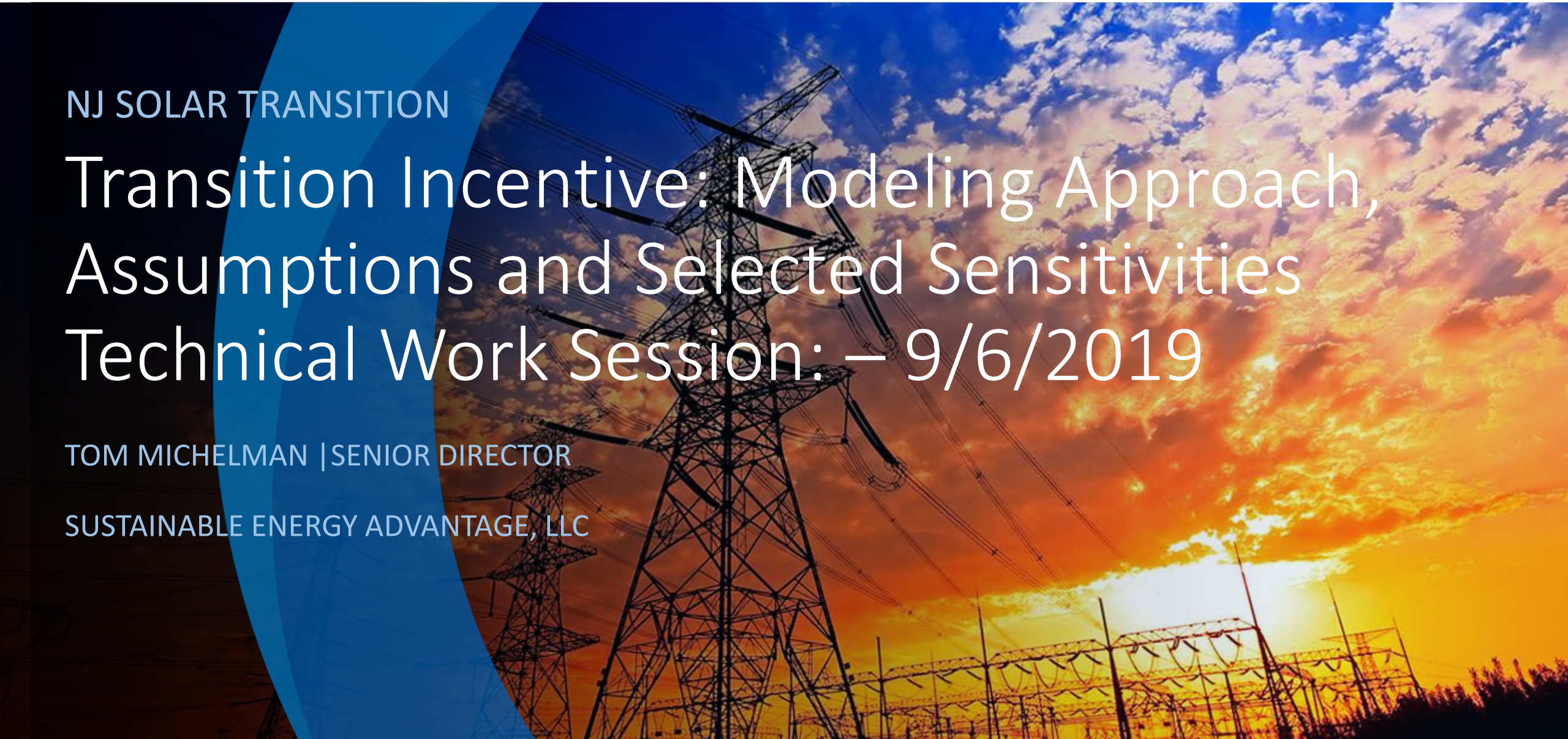

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Overview

Domain of Today's Discussion

- Cadmus and SEA hired as the Solar Transition Consultant by the BPU
  - As consultants we do not make policy, but provide the BPU Staff with input and analyses and recommendations so the Staff can take that input and recommend to the Board what policy to implement
- This morning we will
  - Present and expound on approach and assumptions, and provide some additional Transition Incentive (TI) model result sensitivities focused on <25 kW sector
  - Informally, we will answer your questions to the best of our ability
- After today's session
  - We will respond to questions and conduct additional analysis as directed by the BPU
  - Formally, you must submit critiques, questions, requests for additional analysis to solar.transitions@bpu.nj.gov

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Additional Previously Non-Explicit Assumptions

Unpeeling the onion

- Savings offered by TPO to Host = 15% for all projects including Community Shared (CS) projects
- CS projects assumed to have net metered credit based on host customer small commercial rate class, thus kWh monetized at host's meter. NJ will have CS projects revenue monetized at offtakers' meter's rate class. → the larger fraction of residential offtake the higher the incentive compared to the actual COE
- Solar carport costs – we adopt a $750/kW premium for solar carport project types, incremental to the base installed cost ($/kW) for the project type's size
- Retail rates (see next slide)

Retail Rate Forecasts

Details on Methodology

Avoided kWh value, so only includes kWh charges; Used PSEG rates for compensation for entire state. 1) PSEG is largest, 2) Except for residential rate class, PSEG had lowest ¢/kWh value → highest COE gap of any EDC (except residential)

2019 Starting Values (cents/kWh, PSEG)

Rate Component↓ Rate Class →	Residential	Small Commercial	Medium Commercial/Industrial
Generation Component	¢12.84	¢6.01	¢5.28
Other Components	¢4.72	¢1.59	¢1.23
Total Rate	¢17.55	¢7.59	¢6.51

Rate Index

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
EIA AEO 2019 NJ Capacity and Energy Index	1.00	1.02	1.00	0.97	0.99	1.01	1.03	1.01	1.00	0.98	0.99	1.00
EIA AEO 2019 T&D Index (RFC-E Region)	1.00	1.15	1.27	1.32	1.37	1.43	1.49	1.55	1.60	1.66	1.72	1.77

TI Analysis – Sensitivity Changing Assumptions

Case → Variable/Input ↓	High Cost	Base Cost	Low Cost
Installed Cost	$3,326/kW - $1,632/kW	$3,071/kW - $1,572/kW	$2,724/kW -$1,550/kW
% Debt	Unhedged Incentive: 30% - 35% Hedged Incentive: 38% - 43%	Unhedged Incentive: 35% - 40% Hedged Incentive: 43% - 48%	Unhedged Incentive: 40% - 45% Hedged Incentive: 48% - 53%
Debt Term	Unhedged Incentive: 5-10yrs Hedged Incentive: 8-13yrs	Unhedged Incentive: 7 – 12yrs Hedged Incentive: 10-15yrs	Unhedged Incentive: 9 – 14yrs Hedged Incentive: 12-17yrs
Interest Rate on Debt	6.0% - 7.0%	5.5% - 6.5%	5.0% - 6.0%
After Tax Equity IRR (Third Party Owned)	Unhedged Incentive: 11.4% Hedged Incentive: 10.9%	Unhedged Incentive: 10.4% Hedged Incentive: 9.9%	Unhedged Incentive: 9.4% Hedged Incentive: 8.9%
After Tax Equity IRR (Host Owned)	Unhedged Incentive: 8-14% Hedged Incentive: 7.5-13.5%	Unhedged Incentive: 7-13% Hedged Incentive: 6.5-12.5%	Unhedged Incentive: 6-12% Hedged Incentive: 5.5-11.5%

Note: Ranges represent inputs that vary by project type and ownership structure (when unspecified)

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Cost Assumptions

Percentiles and Weighted Averages

- We define Base, Low, and High costs as the 37.5%, 25%, and 50% of the costs for a Project Type. That is for the Base cost case it means 37.5% of the projects within in a Project Type would have a lower $/kW installed cost and 62.5% would have a higher $/kW installed cost
  - This in of itself is an implicit policy choice. It will incent project to be more cost efficient and likely drive some portion of the inefficient projects out of the market
- Also note that within a Incentive Group we take the weighted average of project types to calculate the COE Incentive Gap.
  - This implicitly means that the more expense Project Types within an Incentive Group are uneconomic (or a lower percentile of them are economic) and lower prices within the Incentive Group being averaged are relatively over-compensated.
  - Again, this is an implicit policy choice, and the modeling could just as easily elect the 'highest of' rather than 'weighted average' of the Incentive Grouped Project Types to set incentive → of course this would produce a different result for both projects and ratepayers

TI Analysis – Detailed Inputs for Cost Cases

Project Type	Capacity (kW)	Low Cost ($/kW)	Base Cost ($/kW)	High Cost ($/kW)
Residential Roof Mount	6.5	$2,724.32	$3,070.72	$3,325.57
Small Commercial Roof Mount	13.2	$2,724.32	$3,070.72	$3,325.57
Medium Commercial Roof Mount	250	$2,100.00	$2,240.26	$2,376.90
Medium Commercial Roof Mount (LMI)	250	$2,100.00	$2,240.26	$2,376.90
Medium Commercial Lot Carport	250	$2,850.00	$2,990.26	$3,126.90
Medium Commercial Building Mounted	500	$1,725.00	$1,893.49	$2,009.77
Medium Commercial Ground Mounted	500	$1,725.00	$1,893.49	$2,009.77
Large Commercial Building Mounted	1000	$1,639.63	$1,789.46	$1,967.87
Large Commercial Ground Mounted	1000	$1,639.63	$1,789.46	$1,967.87
Large Commercial/Campus Lot Carport	1000	$2,389.63	$2,539.46	$2,717.87
Small Landfill/Brownfield	1000	$1,717.24	$1,869.97	$2,048.85
Small Community Solar	1000	$1,639.63	$1,789.46	$1,967.87
Small Community Solar (LMI)	1000	$1,639.63	$1,789.46	$1,967.87
Very Large Building Mounted	2000	$1,710.00	$1,804.58	$2,000.31
Very Large Building Mounted Community Solar	2000	$1,710.00	$1,804.58	$2,000.31
Very Large Carport	2000	$2,460.00	$2,554.58	$2,750.31
Medium Community Solar	2000	$1,710.00	$1,804.58	$2,000.31
Medium Community Solar (LMI)	2000	$1,710.00	$1,804.58	$2,000.31
Large Community Solar	5000	$1,710.00	$1,804.58	$2,000.31
Large Community Solar (LMI)	5000	$1,710.00	$1,804.58	$2,000.31
Large Landfill/Brownfield	5000	$1,964.43	$2,059.65	$2,275.07
Large Ground Mounted	5000	$1,710.00	$1,804.58	$2,000.31
Very Large Ground Mounted (Fixed Tilt)	10000	$1,550.00	$1,571.94	$1,631.69

Note: Installed cost includes interconnection costs

TI Incentive Rate Methodology

We categorize project types into the following Incentive Groups:

Project Type	Incentive Group
Residential Roof Mount	<25 kW
Small Commercial Roof Mount	
Medium Commercial Building Mounted	Building Mounted
Large Commercial Building Mounted	
Medium Commercial Roof Mount	
Very Large Building Mounted	
Very Large Ground Mounted (1-Axis Tracking)	Ground Mounted
Very Large Ground Mounted (Fixed Tilt)	
Medium Commercial Ground Mounted	
Large Commercial Ground Mounted	
Large Ground Mounted	
Small Community Solar	Community Solar
Medium Community Solar	
Large Community Solar	
Very Large Building Mounted Community Solar	
Small Community Solar (LMI)	Low/Moderate Income
Medium Community Solar (LMI)	
Large Community Solar (LMI)	
Medium Commercial Roof Mount (LMI)	
Small Landfill/Brownfield	Preferred Siting
Large Landfill/Brownfield	
Very Large Carport	
Large Commercial/Campus Lot Carport	
Medium Commercial Lot Carport	

TI Analysis – Sensitivity Results

Already Published Bounding Analysis Results for Model TI-2a - Weighted Average Levelized Incentive Gap

Incentive Group → Cases and Sensitivities (Cost Profile & Incentive Term)↓	Preferred Siting	Building Mounted	Community Solar	LMI	Ground Mounted	<=25 kW
TI-2a - DO w/SREC Factors (Base Cost -15 Years)	$141	$141	$113	$110	$84	$32
TI-2a - DO w/SREC Factors (Base Cost - 20 Year)	$128	$129	$102	$99	$76	$29
TI-2a - DO w/SREC Factors (Low Cost - 20 Year)	$101	$101	$80	$77	$59	$7
TI-2a - DO w/SREC Factors (Base Cost -10 Year)	$171	$169	$138	$134	$102	$41
TI-2a - DO w/SREC Factors (High Cost - 10 Year)	$216	$211	$176	$174	$129	$101

Results of <=25 kW Sector Sensitivities

Prepared by Cadmus and Sustainable Energy Advantage for the NJ Board of Public Utilities, August 2019

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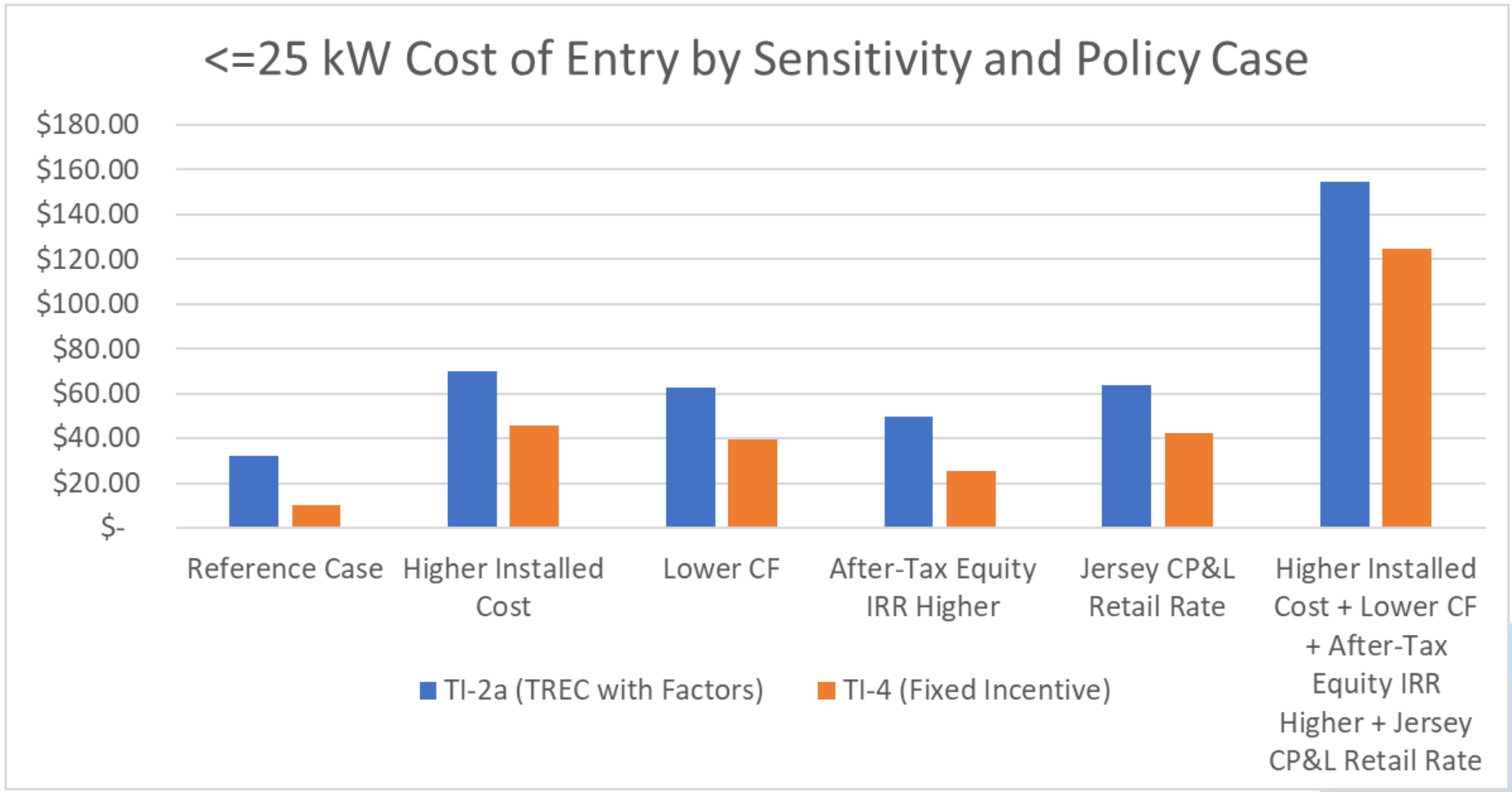
Sensitivity Cases for <= 25 kW Incentive Group

Variable/Input → Case ↓	%ile of Solar Registration Program Installed Cost	Lifetime Capacity Factor	After-Tax Equity IRR (Sponsor/Tax Weighted)	2019 Retail Rate
Reference	37.5% ($3,071/kW)	14.4%	10.4%	PSEG (17.55 cents/kWh)
Higher Installed Cost	62.5% ($3,564/kW)	14.4%	10.4%	PSEG (17.55 cents/kWh)
Lower CF	37.5% ($3,071/kW)	13.0%	10.4%	PSEG (17.55 cents/kWh)
After-Tax Equity IRR Higher	37.5% ($3,071/kW)	14.4%	11.4%	PSEG (17.55 cents/kWh)
Jersey CP&L Retail Rate	37.5% ($3,071/kW)	14.4%	10.4%	Jersey CP&L (14.26 cents/kWh)
Higher Installed Cost + Lower CF + After-Tax Equity IRR Higher + CP&L Retail Rate	62.5% ($3,564/kW)	13.0%	11.4%	Jersey CP&L (14.26 cents/kWh)

Results of Sensitivity Analysis – Cost of Entry



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Detailed Results of Sensitivity Analysis (<=25 kW)

Policy Case	Project Type	Sensitivity Case → / Ownership Structure ↓	*Reference Case*	*Higher Installed Cost*	*Lower CF*	*After-Tax Equity IRR Higher*	*Jersey CP&L Retail Rate*	*Higher Installed Cost + Lower CF + After-Tax Equity IRR Higher + Jersey CP&L Retail Rate*
TI-2a (TREC with Factors)	Residential Roof Mount	Third Party Owned	$25.56	$61.61	$54.94	$41.94	$56.72	$142.22
		Host Owned	$50.06	$92.22	$84.06	$71.28	$81.83	$187.50
		Blended*	$32.17	$69.88	$62.80	$49.86	$63.50	$154.45
	Small Commercial Roof Mount	Third Party Owned	$26.72	$62.22	$55.56	$43.50	$58.17	$144.94
		Host Owned	$45.56	$87.28	$78.89	$65.56	$77.50	$180.39
		Blended*	$31.81	$68.99	$61.86	$49.46	$63.39	$154.51
	<=25 kW Incentive Group Final Incentive**:		$32.13	$69.79	$62.71	$49.82	$63.49	$154.45
TI-4 (Fixed Incentive)	Residential Roof Mount	Third Party Owned	$3.39	$36.72	$31.17	$17.39	$35.06	$112.22
		Host Owned	$28.88	$68.89	$61.28	$47.17	$61.17	$157.83
		Blended*	$10.27	$45.41	$39.30	$25.43	$42.11	$124.54
	Small Commercial Roof Mount	Third Party Owned	$3.39	$38.17	$32.22	$18.89	$35.56	$114.17
		Host Owned	$28.88	$68.50	$61.17	$46.72	$61.06	$156.94
		Blended*	$10.27	$46.36	$40.04	$26.40	$42.44	$125.72
	<=25 kW Incentive Group Final Incentive**:		$10.27	$45.50	$39.37	$25.53	$42.14	$124.66

**Blended rates take a weighted average of both ownership structure's rates assuming 73% of projects are owned by third parties (based on historic averages).*

***Final Incentive rates take a weighted average of both project type's rates assuming 90% of <25 kW projects are residential.*

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Results of Sensitivity Analysis

<=25 kW TREC Factors

Sensitivity Case → Policy Case ↓	Reference Case	Higher Installed Cost	Lower CF	After-Tax Equity IRR Higher	Jersey CP&L Retail Rate	Higher Installed Cost + Lower CF + After-Tax Equity IRR Higher + Jersey CP&L Retail Rate
TI-2a (TREC with Factors)	0.23	0.49	0.44	0.35	0.45	1.09
TI-4 (Fixed Incentive)	0.08	0.36	0.31	0.20	0.33	.97

- TREC factors are computed by dividing the COE of the Incentive Group in question by the COE of the highest cost Incentive Group (in this case, Preferred Siting)
- For instance, for our TI-2a Reference Case, the Preferred Siting Incentive Group has a COE Incentive Gap of $141/MWh and the <=25 kW Incentive Group has a COE Incentive Gap of $32/MWh. Thus, the <=25 kW TREC Factor is 32/141= 0.23

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Thank You

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