

# The Cost of New Jersey's Solar PV Transition

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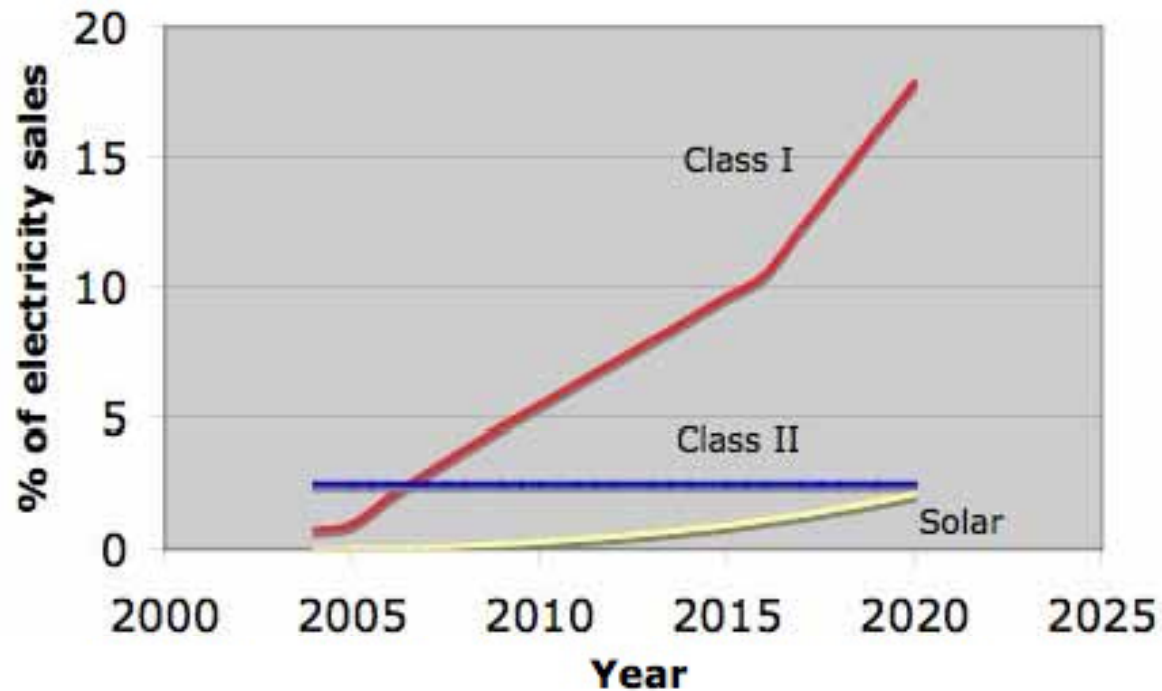


# Overview of Presentation

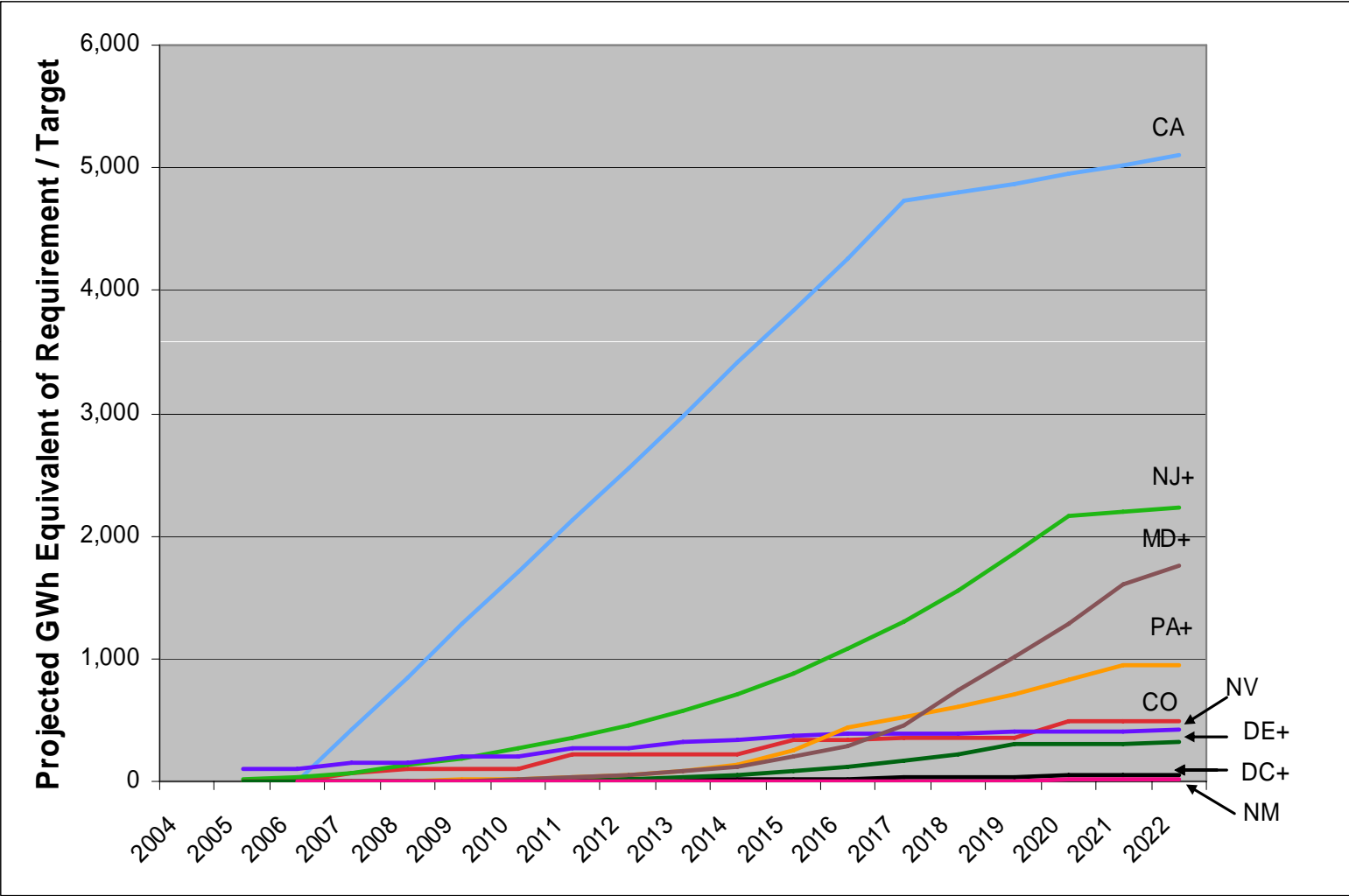
- NJ Renewable Energy Market Context
- Analysis Goals and Evaluative Criteria
- Summary of Market Transition Options Reviewed
- Analysis Methods and Parameters
- Analysis Results and Key Findings
- Current Status of NJ Solar Market Decision-Making

# New Jersey Renewables Market

- Market driven by RPS demand
- REC-based RPS compliance
- **Solar Alternative Compliance Payment (SACP):** currently \$300 for solar, (\$50 for Class I resources); SACP changing in 2009

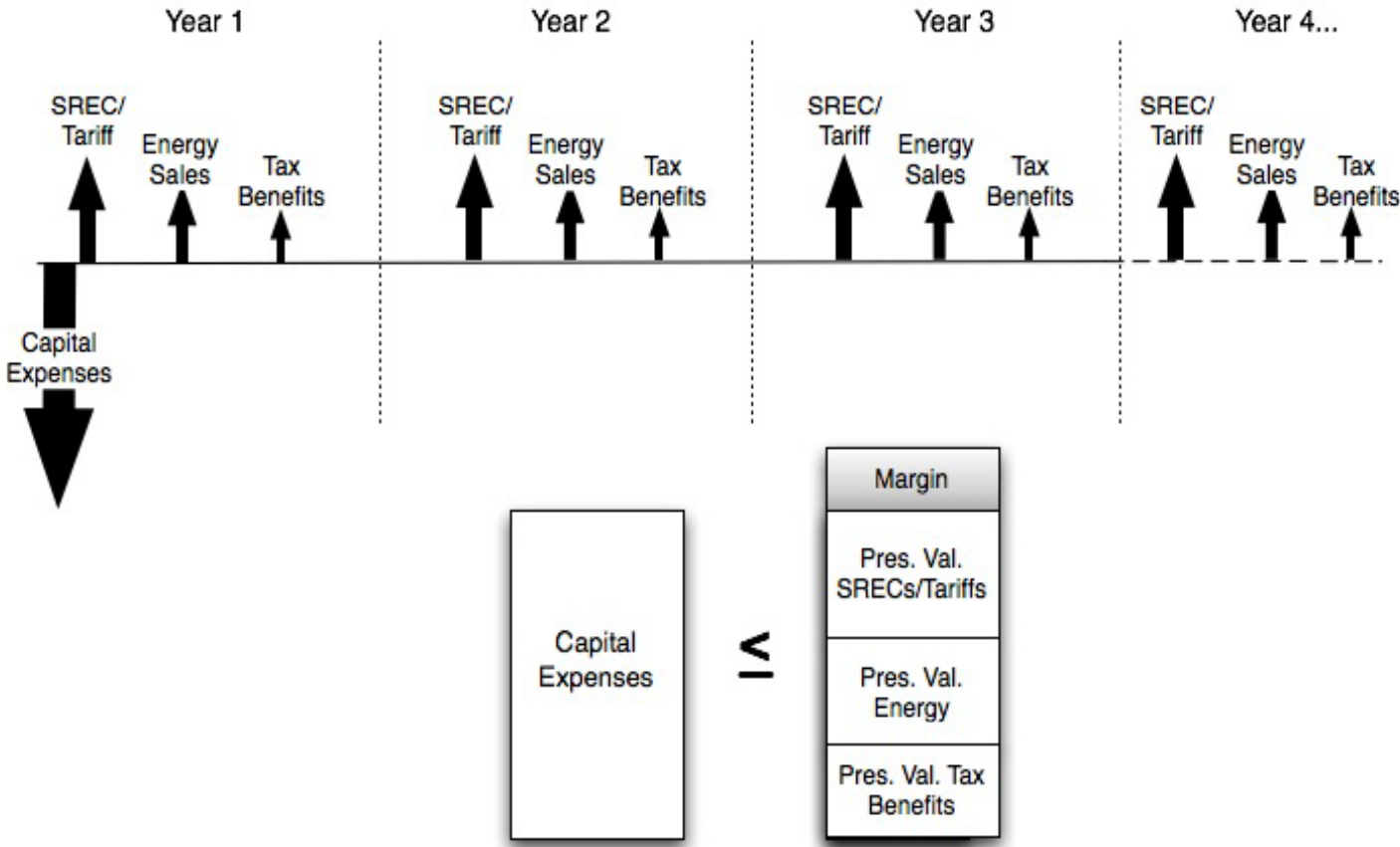


# NJ Solar Goals Relative to Other States



Notes: 1) States shown with a "+" have an SACP 2) Arizona also has a 4% DG set-aside

# PV Project Economics



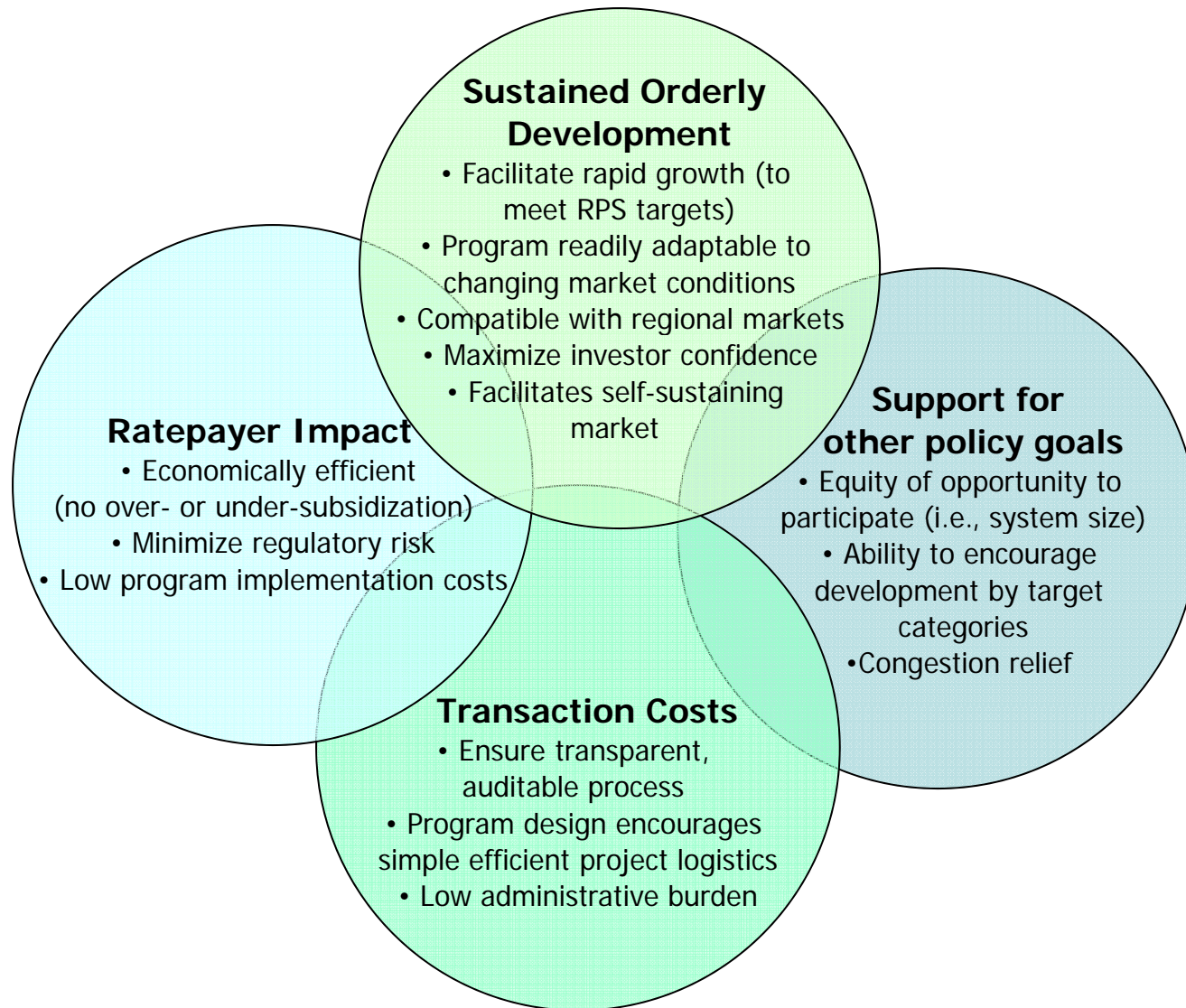
# Customer Onsite Renewable Energy Program (CORE)

- Provides rebates to PV, wind and biomass projects up to 1 MW; offsets >50% of project costs
- Accomplishments through June 2007
  - > 2,200 projects funded, representing 40 MWdc of solar capacity installed and \$144 million in solar rebates paid
- CORE Program Constraints
  - > 2007 rebate request in queue exceeds available funds by over 400%
  - > ~2,300 MW solar capacity required to meet RPS requirements for 2021
  - > Under current system, would require \$10.9 billion in solar rebates to meet RPS goal
- Is this the best approach for achieving RPS?

# Goals of Analysis

- Provide NJ Office of Clean Energy with timely, unbiased review of key options based on standard criteria to inform decision-making
- Qualitative Assessment: Highlight issues / topics for further consideration in public discussion
- Ratepayer Impact Analysis (focus of paper): Estimate ratepayer costs of various models under consideration

# Assessment Criteria





# Market Models Assessed

Models Proposed by RPS Transition Working Group:

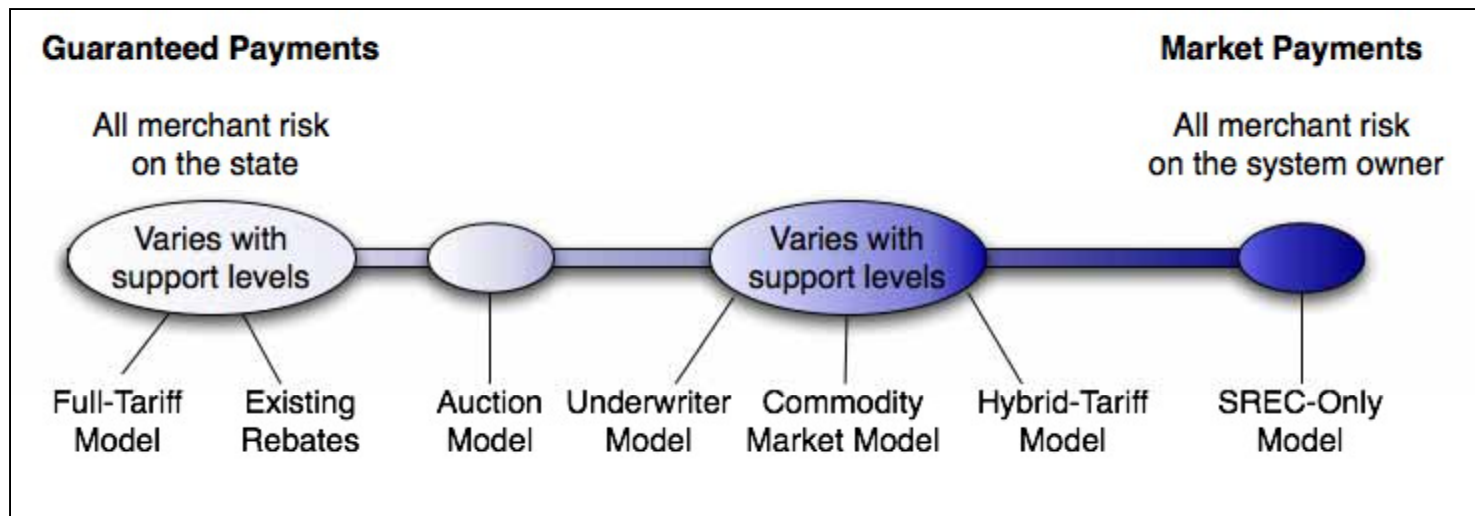
- Underwriter Model
- Commodity Market Model
- Auction Model
- Hybrid-Tariff Model

Other Models:

- Full Tariff / 15-Year Tariff Model
- SREC-Only Model
- Continued Rebates with SREC Model (Baseline)

# Risk Allocation Across Market Participants

- Equipment Risk
- Performance Risk
- **Merchant Risk** (Regulatory Risk)
  - > Need open, transparent, and liquid market
  - > Developers put a premium on uncertain incentives



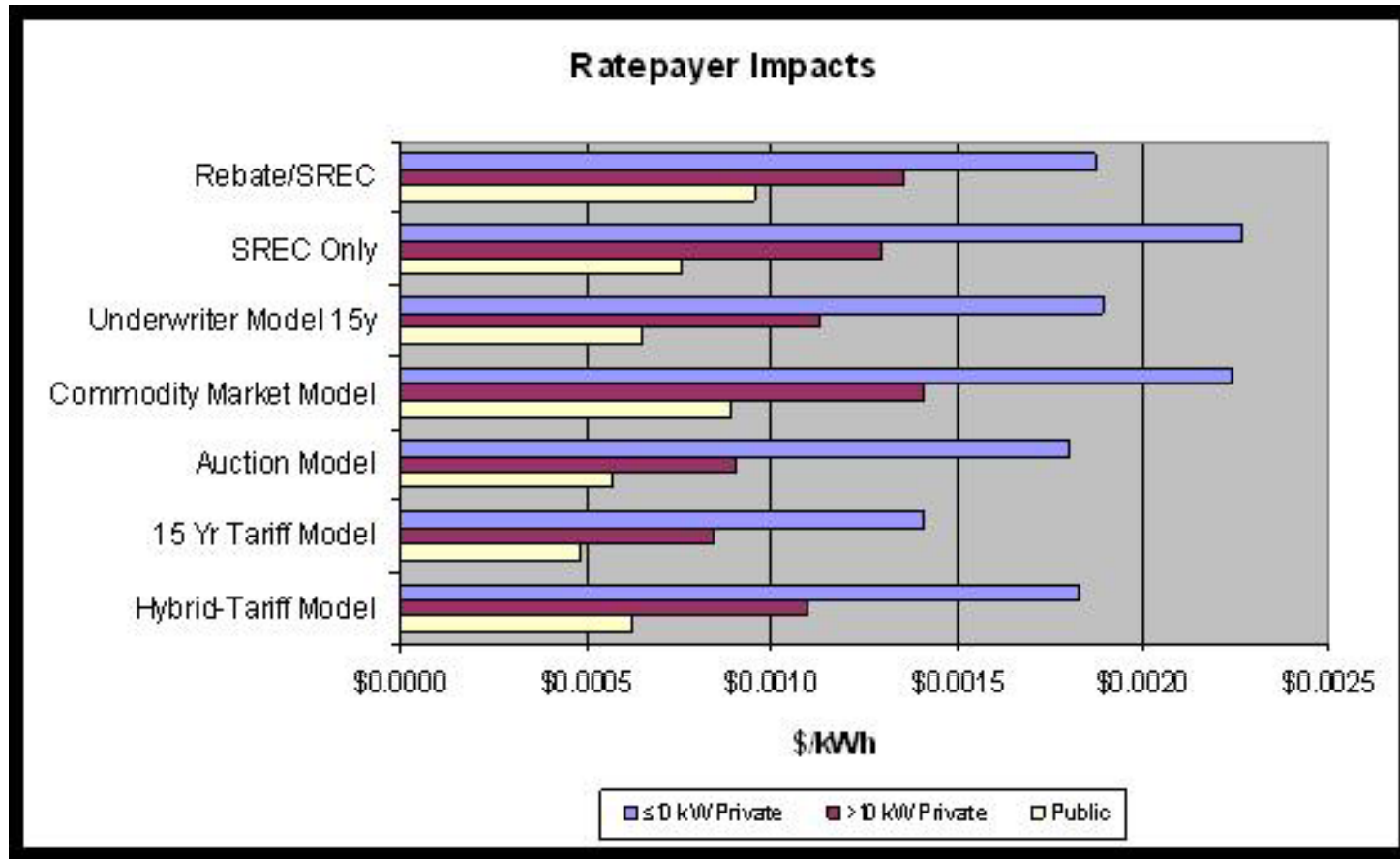
# Modeling Approach and Methods

- Approach: For each model, incentive levels (rebate, tariff, or SREC) calculated to meet the investment target (IRR) for each project type.
- Method:
  - 1) Select standard assumptions.
  - 2) Compare options using standard assumptions.
  - 3) Sensitivity Analysis: Adjust standard assumptions to determine key variables to RPI (ran high / med / low cases for each).
  - 4) Select probability distribution for key variables for Monte Carlo analysis.
  - 5) Conduct a Monte Carlo simulation to determine expected range of RPI for each option.

# General Assumptions

- SREC prices will track the change in PV installed costs.
- Federal incentives will decrease over time to match decreasing PV installed costs.
- Projects built after first year of the analysis will seek a consistent IRR as federal incentives track down. For example, if federal incentives disappear, SREC values will need to increase to make up the difference.

# Comparison of Ratepayer Impacts: Standard Inputs



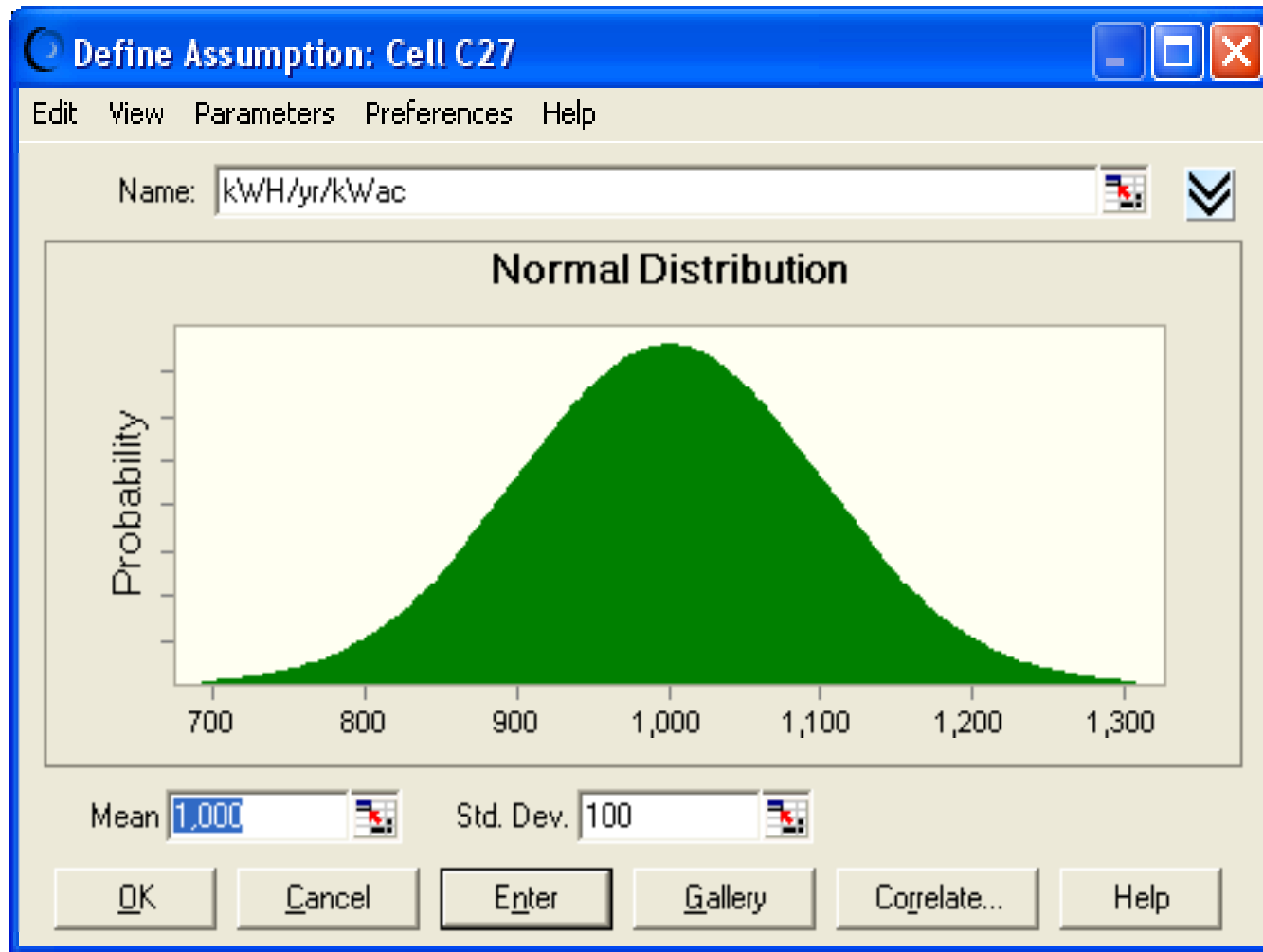
# Sensitivity Analysis

- Analysis revealed following key variables:
  - > Project type IRR targets
  - > Discount rate
  - > Annual generation of installed systems
  - > Installed cost of PV system
- Other variables considered:
  - > Financial risk premium
  - > Annual change in installed cost prices
  - > Electric sales growth rates
  - > Annual change in electric rates

# Monte Carlo Analysis

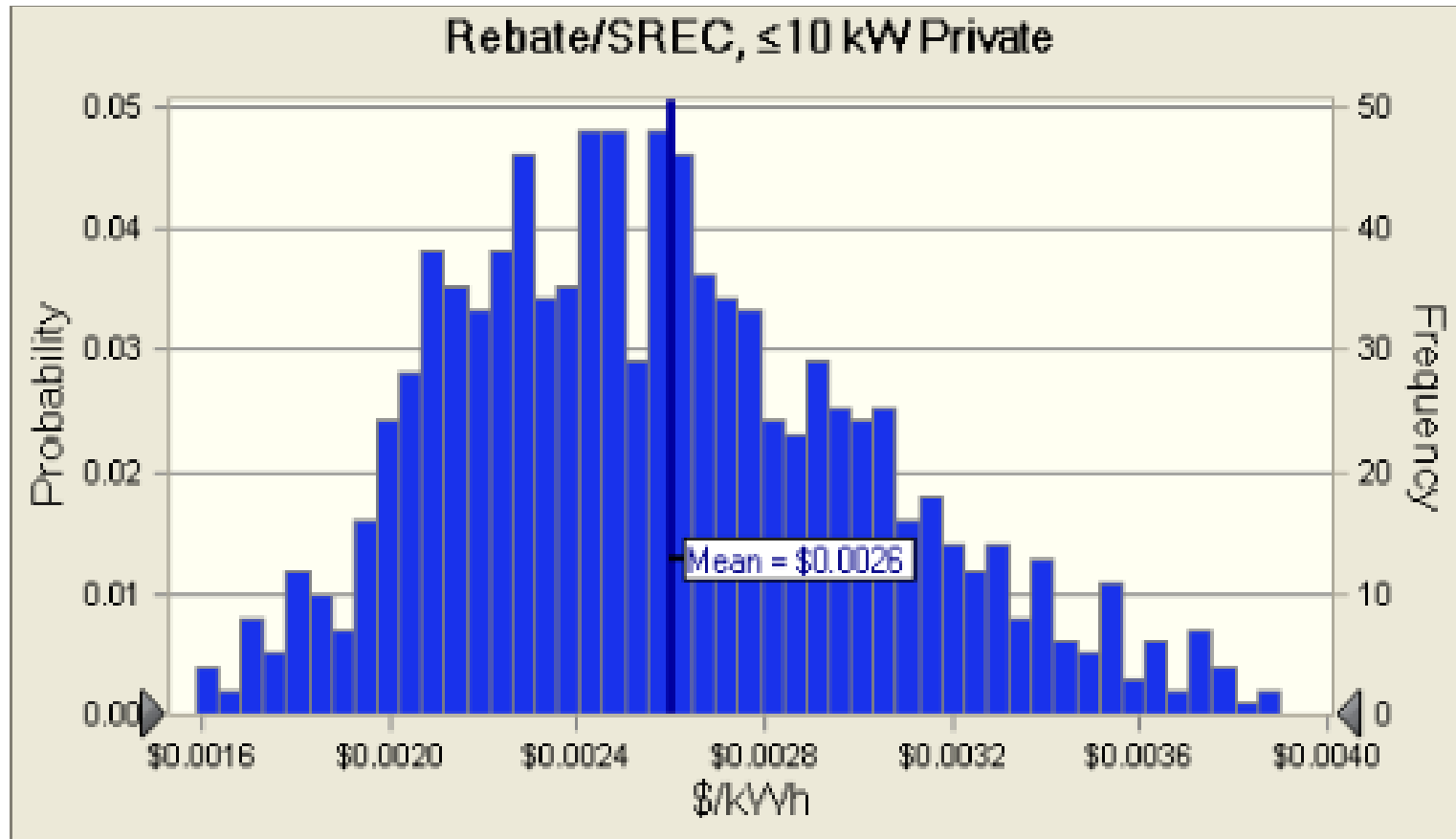
- Assign probability distribution to key variables
  - > Discount rate
  - > Annual generation of installed systems
  - > Installed cost of PV system
  - > Project type IRR targets
- Rerun the models to calculate the expected RPI
  - > Produce probability distribution for each of the model and project type combinations
  - > Mean values
  - > Standard deviations
  - > Sensitivity chart

# Example: Annual Generation

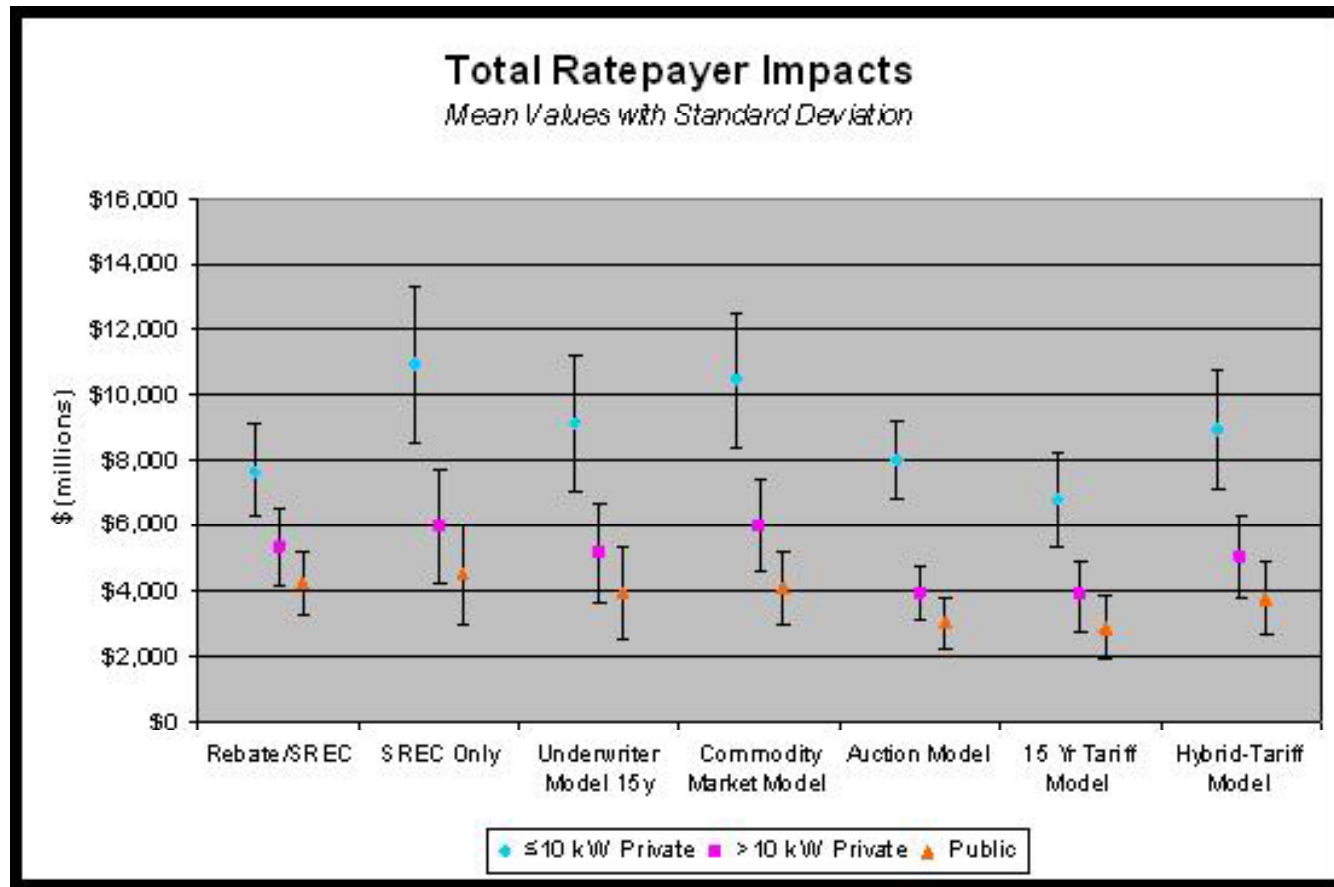




# Example RPI Probability Distribution



# Results of Monte Carlo Simulation



# OCE / BPU Decision-Making

- Summit Blue performed additional analysis of an OCE Straw Proposal (set 8-year SACP schedule).
- All options considered by BPU were based on full set of evaluative criteria. Ratepayer impacts was one of several factors considered.

	Sustained Orderly Development	Transaction Costs	Ratepayer Impact	Support for Other Policy Goals
Rebate/SREC		✓	Medium	✓
SREC Only			High	
Underwriter Model 15y	✓	✓	Medium	
Commodity Market Model	✓		High	✓
Auction Model			Low	✓
Full / 15 Yr Tariff Model	✓	✓	Low	✓
Hybrid-Tariff Model	✓	✓	Medium	✓
OCE Revised Straw		✓	Low	

# NJ BPU's Decision: 8-Year Rolling SACP Schedule

- September 12, 2007 Board Order (released 12/07):
  - > 8-year rolling SACP schedule with levels set using 12% IRR target.
  - > 15 year qualification life (QL); legacy projects also get 15-year QL starting from year of rebate.
  - > 2-year SREC trading life, community solar program.
- Stakeholders concerned about amount of financial risk. Therefore, new stakeholder process underway exploring options for providing additional "securitization."

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Link to full report: <http://www.njcleanenergy.com/files/file/2NJ-BPU%20SACP%20RPI%20Analysis%20Report-revised-0806.pdf>

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# Standard Assumptions

Inputs	Project Type		
	≤10 kW Private	>10 kW Private	Public
Project Distribution	40%	42%	18%
System Size (kWdc)	6.5	51.3	110.0
kWac	5.130	40.272	86.374
kWH/yr/kWac	1,000	1,000	1,000
Annual Energy Generation	5,130	40,272	86,374
Electric Rates	Residential	Commercial	Commercial
Install Costs (2006\$) (\$/kW)	\$7,553	\$6,822	\$6,268
Construction Cost	\$49,360	\$349,999	\$689,637
Production Factor (first year, kwhr/Wdc STC)	1.00	1.00	1.00
System Performance Degradation (%/yr)	0.50%	0.50%	0.50%
System Maintenance Costs (\$/kWh)	\$0.02	\$0.02	\$0.02
Federal Marginal Tax Rate	0.2	0.35	0.35
Rebates Taxable	FALSE	FALSE	FALSE
MACRS Eligible	FALSE	TRUE	TRUE
Targeted IRR	6%	12%	8%

# Standard Assumptions (*cont'd*)

- Discount Rate = 10%
- PV install costs decrease by 1.4% annually (EIA)
- 2008 Electric Sales = 73,800,000 MWh (PJM adj)
  - > Adjusted for updated analysis to 84,372,144 MWh
- Annual electric sales growth rate = 1.5% (EIA)
- Annual electric retail rate growth rate (EIA)
  - 2.99% residential
  - 3.24% commercial

# Ranking of Weighted Average Ratepayer Impacts: Standard Inputs

Model	≤10 kW Private	>10 kW Private	Public	Weighted Average
15-year Full Tariff	\$4,158	\$2,494	\$1,423	\$2,960
Auction	\$5,308	\$2,670	\$1,694	\$3,537
Hybrid Tariff	\$5,399	\$3,232	\$1,840	\$3,838
Underwriter, 15 Year	\$5,580	\$3,316	\$1,919	\$3,960
Rebate/SREC	\$5,516	\$3,994	\$2,819	\$4,385
SREC Only	\$6,688	\$3,830	\$2,232	\$4,673
Commodity Market	\$6,621	\$4,157	\$2,627	\$4,856