



How Solar Costs and Pricing Impact REC Claims

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Presentation Outline

- How have solar costs declined?
- How are solar products priced?
- How do solar costs and pricing impact REC claims?
- Case studies:
 - Xcel (Colorado) community solar bids
 - Arizona's phase out of incentives
 - California Solar Initiative REC model
- Future pricing methodologies

Distributed PV at ~\$4/W; Nearly 12 GW Total Capacity

Solar PV: Distributed

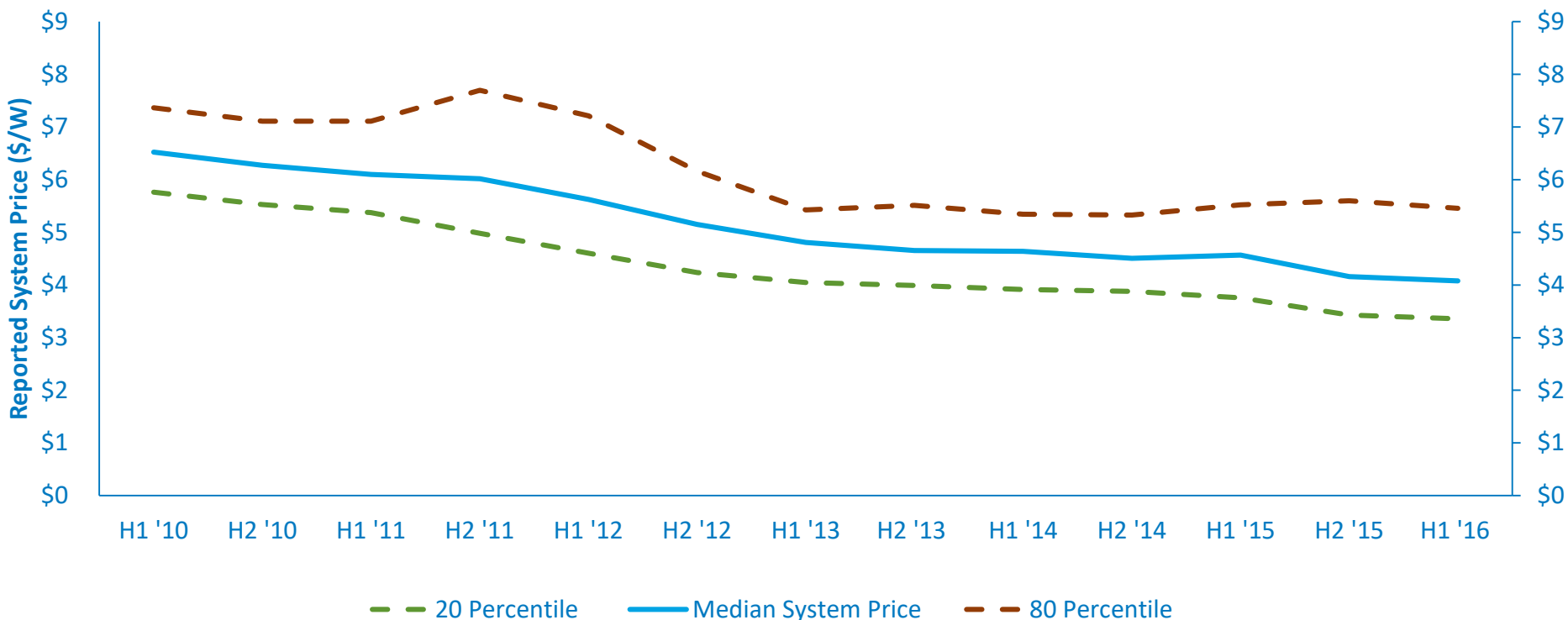


Cost data from reference [5], deployment data from reference [16]. Costs are average installation costs for residential sector PV and exclude the effect of the Investment Tax Credit. 1 GW = 1,000 MW.

- Distributed PV costs have declined by 54% since 2008
- In 20 states, financing a residential PV systems costs less than electricity from utility.

System Pricing from Select States

2.5 kW – 10 kW



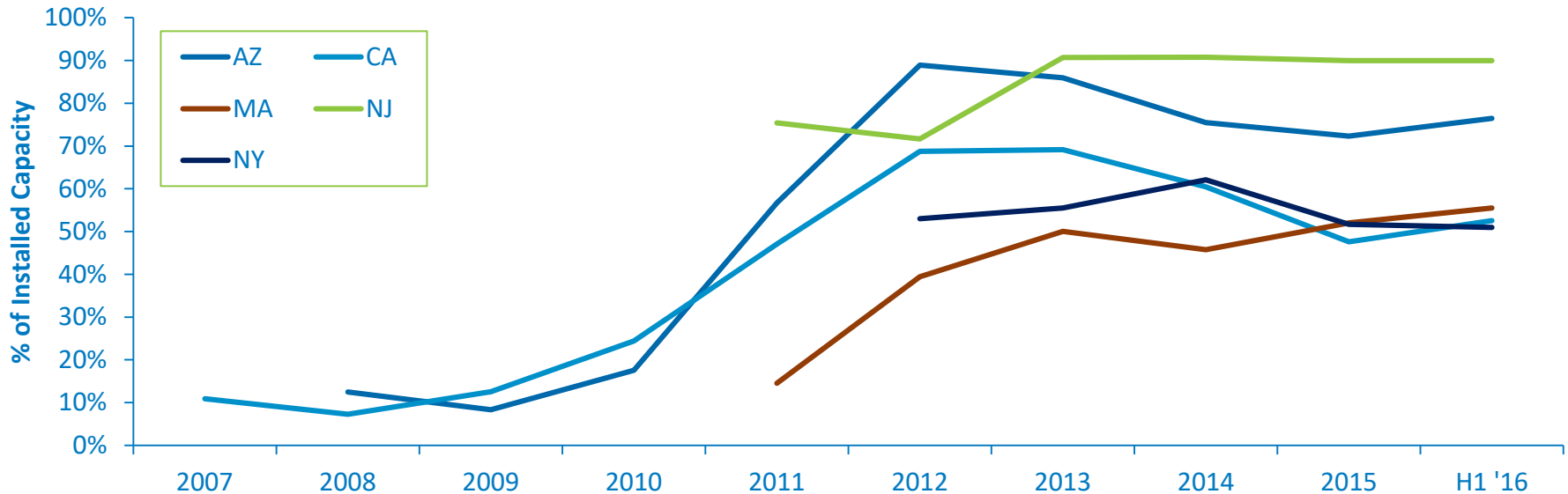
- System prices generally trending downwards but considerable variation exists in average reported pricing
- System prices fell, on average 3% between H2 '15 to H1 '16
- Lowest prices (20th percentile) are seen in AZ (\$3.10/W) while highest (80th percentile are seen in NY (\$5.60/W)

H1 '16 MW: AZ (24); CA (169); MA HO (25); MA 3-P (32); MD (0.1) NY H.O (32); NY 3rd-P (41).

Note: MA does not report whether a system is 3rd-party owned therefore it was estimated using the “applicant entity” or “installer” for the following organizations: SolarCity, CPF Capital, SunRun, Vivint, Sungevity.

Sources: CA NEM database; MA SREC Program; Arizona Public Services, & Salt River Project; MD Energy Administration; NY PV Incentive Program, accessed (8/5/16)

Residential 3rd-Party System Ownership by State

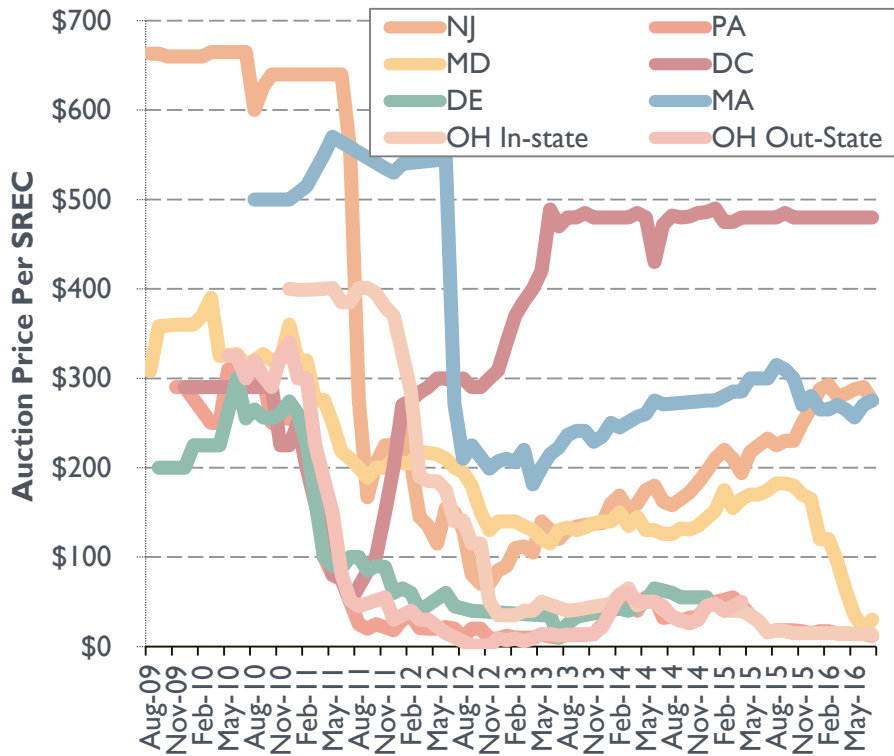


- 3rd-party ownership continues to dominate residential sector in several markets, while declining nationally
- Many markets appear to have stabilized around 50% TPO following two years of gradual decline
- TPO has recently become legal in SC, RI, and GA, there is a ballot initiative to make it legal in FL. Legislation is currently being considered in NC to legalize the business model
- Strong TPO presence in NJ can partially be explained by homeowners not wanting to take SREC risk

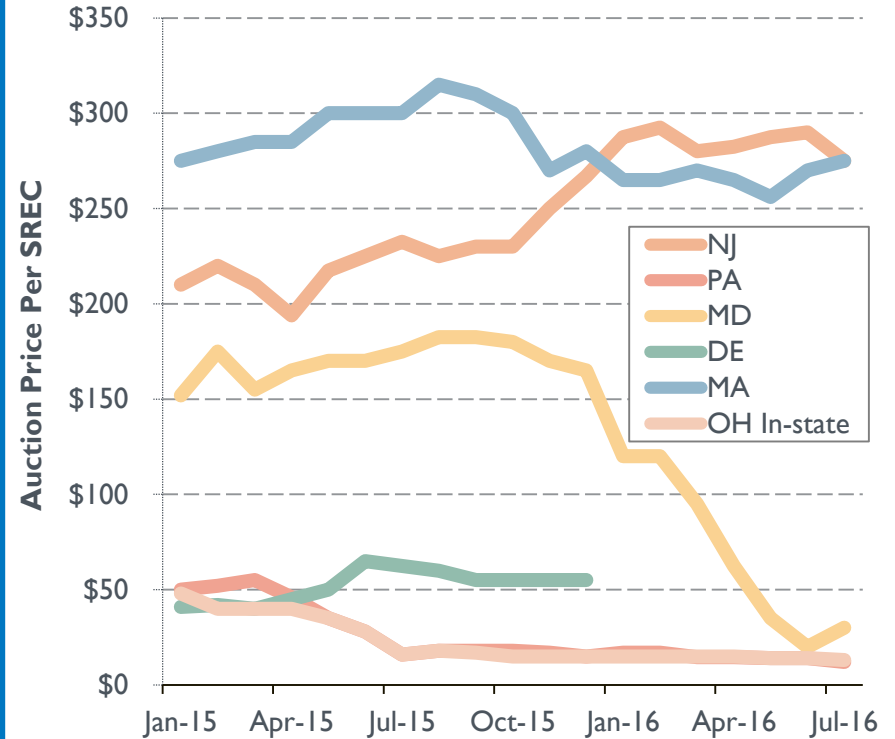
Sources: CA NEM database; MA SREC Program; Arizona Public Services, & Salt River; MD Energy Administration; NJCEP; NY PV Incentive Program, accessed 08/05/16.

SREC Markets

7-year Trends

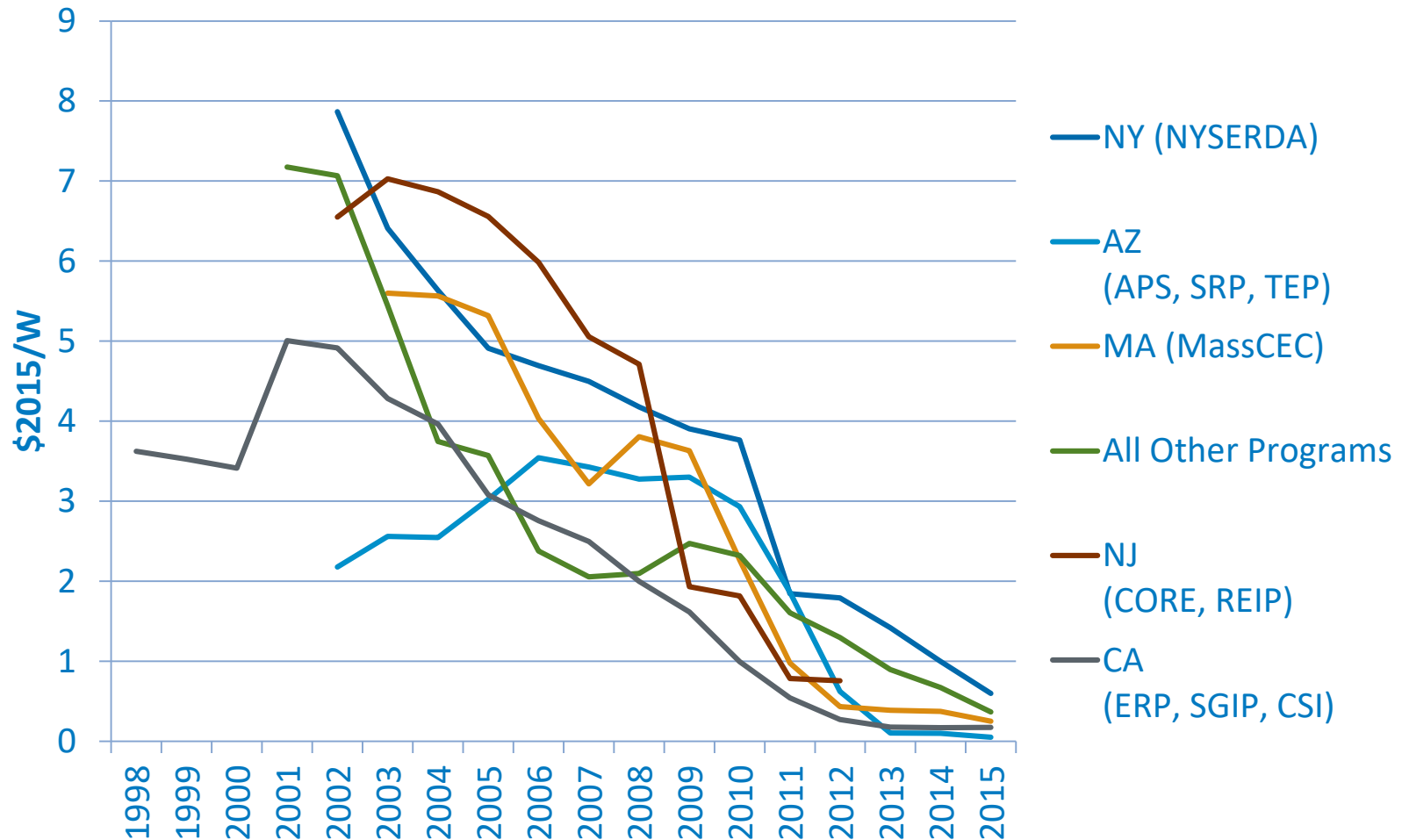


18-month Trends



- SREC prices mostly increased or were flat in H1 '16
- Ohio, Pennsylvania see modest drops in prices while Maryland see SREC values plummet
 - Oversupply of SRECs in Maryland has caused a dramatic drop in auction prices
 - Value is expected to continue to decline unless an RPS expansion is passed

Solar Incentives in Major Markets Have been Declining



Notes: The figure depicts the pre-tax value of rebates and PBI payments (calculated on a present-value basis) provided through state/utility PV incentive programs, among only those systems that received such incentives. Although not shown in the figure, a growing portion of the sample received no direct cash incentive. Also note that the data are organized according to the year of installation, not the year in which incentives were reserved.

How are Solar Products Priced?

- Onsite owned:
 - System will be purchased with cash (\$/kW); purchaser could also take out a loan to finance the ownership
- Onsite leased:
 - System is leased for a fixed monthly payment (sometimes with an annual escalation) (\$/month)
- Onsite PPA:
 - Energy output from the system is purchased (\$/kWh)
- Community Solar
 - Structures vary

Case Study: Xcel (Colorado) Community Solar Proposals

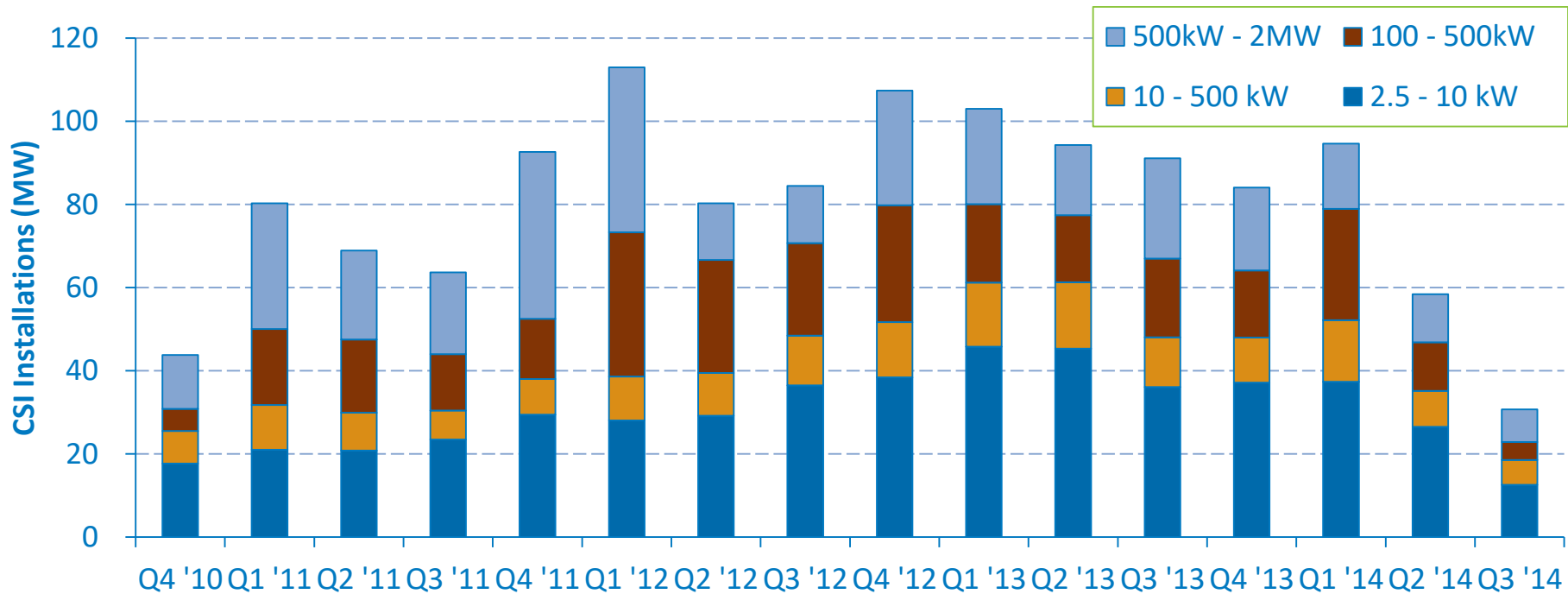
- Xcel is required to retire solar RECs to meet their Solar Garden requirement.
- Xcel issues RFPs for community solar gardens to be developed by private developers.
- Private developers proposed negative REC prices and the Colorado Public Utilities Commission agreed that negative REC pricing does not violate any statute or Commission rule.
- Xcel accepted negative bids for RECs.
- Developers expressed concerns that negative RECs would provide a disincentive for them to target certain types of customers.
- Ultimately, the issue was decided through settlement agreement that set REC prices at \$0.03/kWh

Arizona: Phasing Out Incentives Where RECs are used for Compliance

- The Arizona Corporation Commission (ACC) ruled that utilities could meet their distributed generation targets without acquiring the RECs from those projects.
- This ruling allows RECs generated within the utility's service territory to be double-counted.
- As a result of this ruling, Green-e Energy Participants must take extra steps to ensure that projects are not being counted towards Arizona RPS requirements.



California Solar Initiative: Incentives without REC Exchange



- The general CSI program started in January 2007, and has a 10 year budget of \$1.95B to install 1,750 MW of PV by 2016
- California does an RPS but no solar carve out.
- Incentive payments not structured to give the RECs to the utility for compliance.

Future of Incentives and REC Claims

- Incentives through utility programs are declining
- Some utilities and states are considering new models to compensate solar/DG
 - E.g. value of solar tariffs
- Regulators may not be interested in setting a precedent of “negative RECs”
 - What would this mean for regulated utilities?
 - What would this mean for consumer?

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