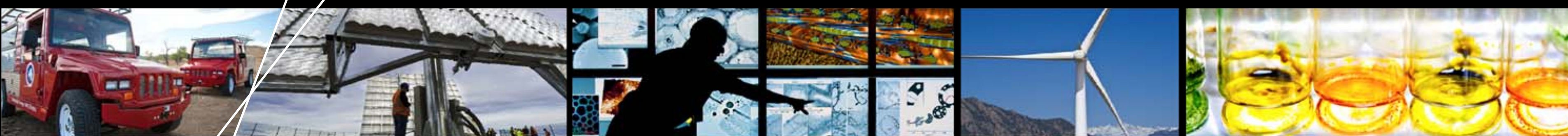
NREL
NATIONAL RENEWABLE ENERGY LABORATORY

U.S. PV market landscape

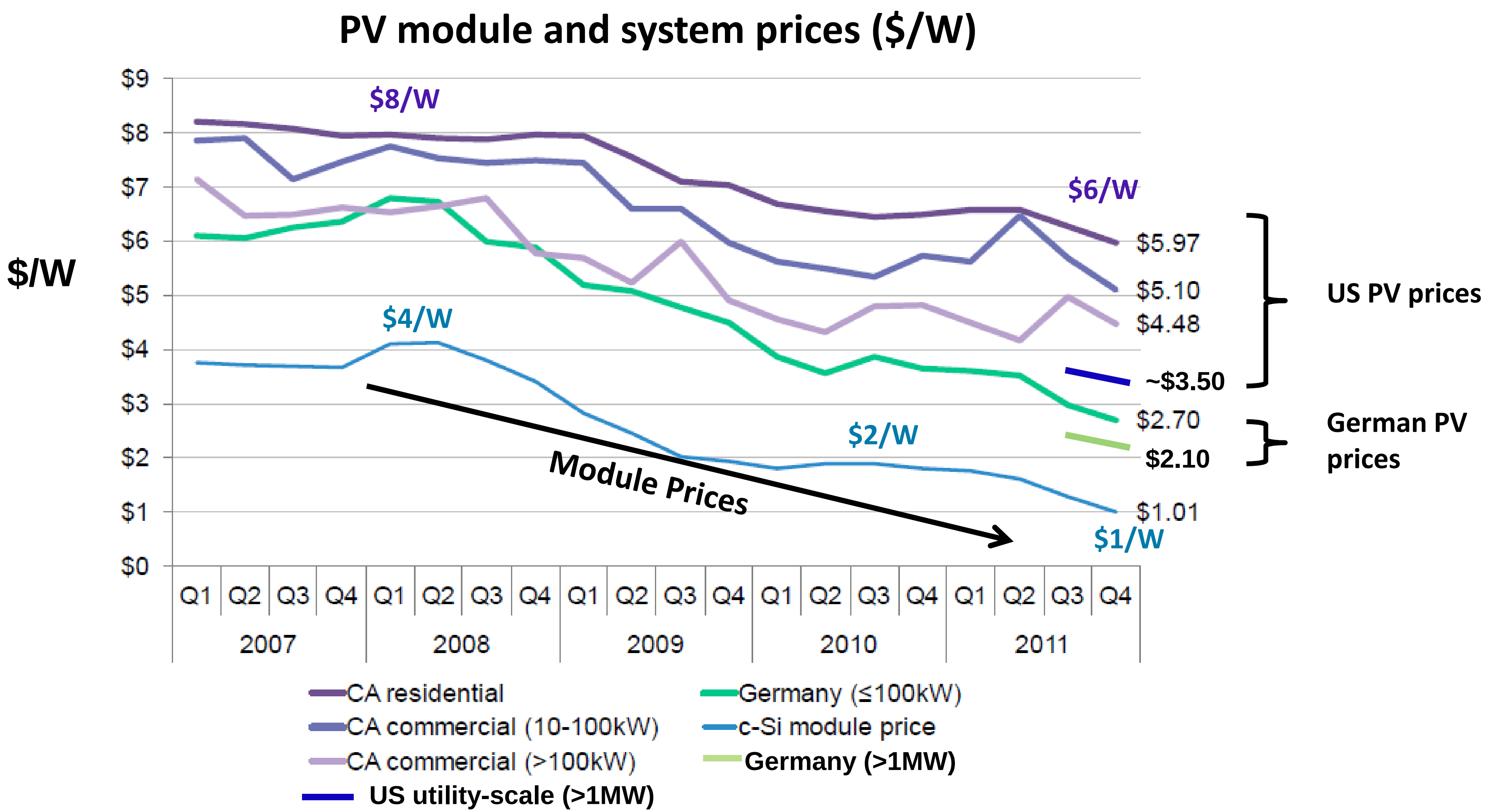


Easan Drury

Robert Margolis, Paul Denholm, David Feldman, Mackay Miller, Ted James

4/19/2012

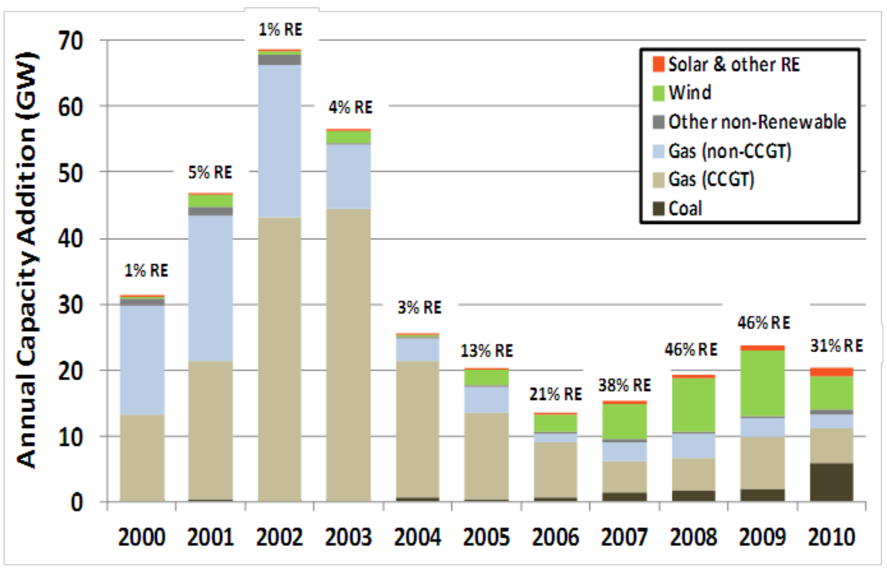
Significant decline in PV prices since 2008



Source: Bloomberg New Energy Finance; US: California Solar Initiative; Germany: BSW, EuPD

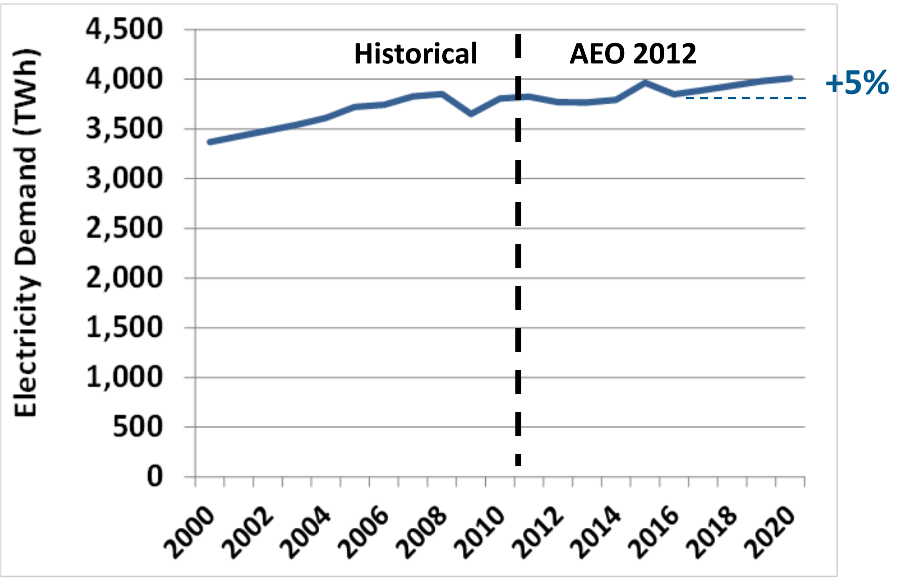
U.S. Electric Sector Trends

Recent Capacity Additions



Source: EIA 2011

U.S. Electric Sector Demand (TWh)

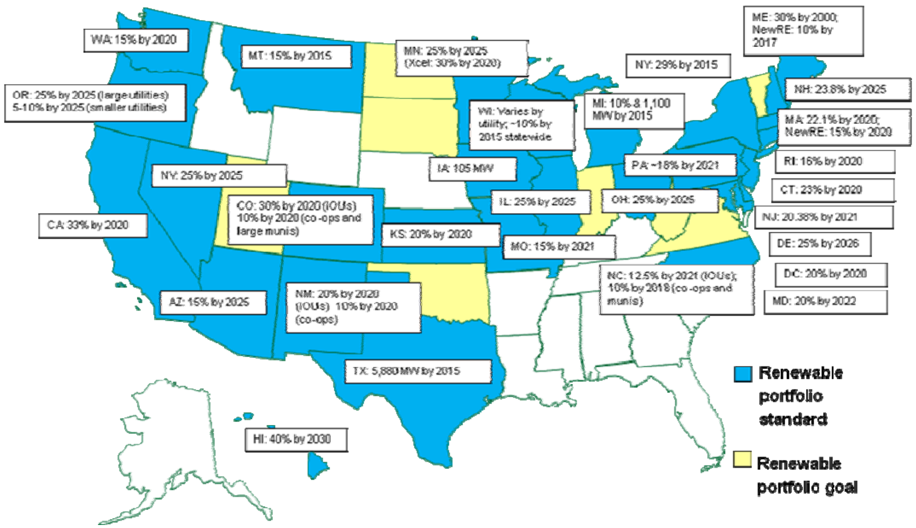


Source: EIA 2012

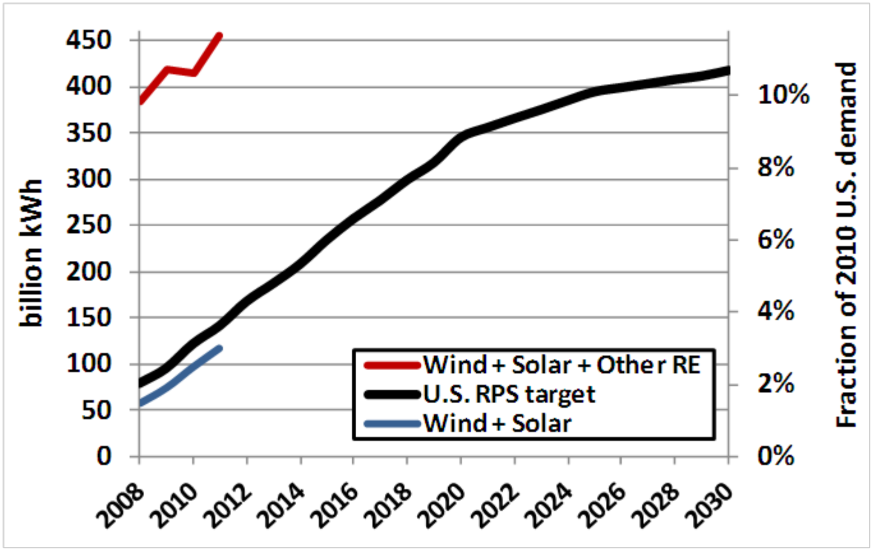
- Significant development of generation capacity over the past decade
- Primarily combined cycle natural gas (CCGT)
- Wind is primary RE technology developed (3.2% US gen) with a small contribution from solar (~0.2% US gen)
- Electricity demand has remained flat since 2008, projected to remain mostly flat for the next decade.

What is driving near term RE deployment?

Renewable Portfolio Standards (RPS)



Possible RPS-driven Growth

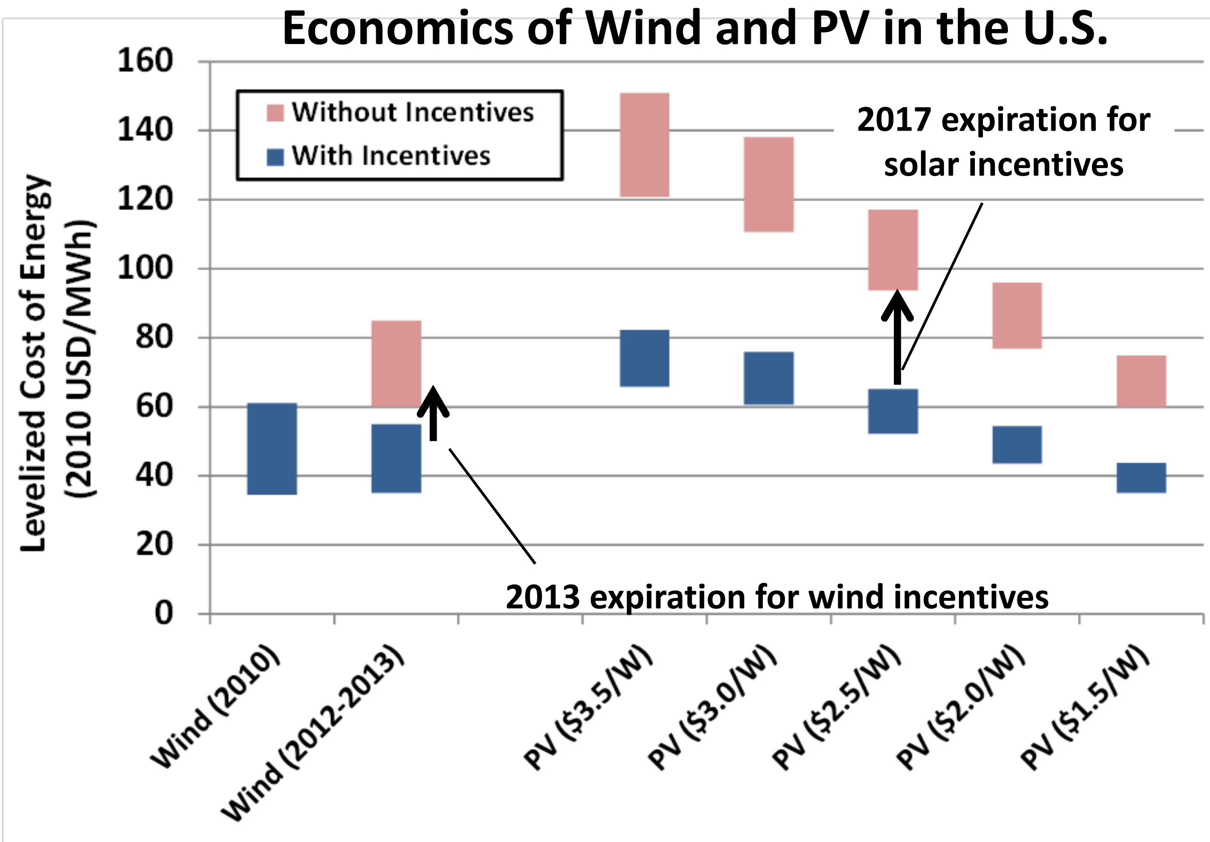


1% electricity demand = ~ 25 GW PV (at 18% CF)

- **State Renewable Portfolio Standards (RPS) may drive near-term renewable energy deployment**
- **If all RPS targets are met, new RE could reach 11% of U.S. electricity demand by 2030**
- **Not all RPS's are created equal**

Competition between wind and PV

What RE technology will be used to meet RPS targets?



Wind incentives :

- **$23/MWh production tax credit for 10 years**
- **Expires at the end of 2012**

PV incentives:

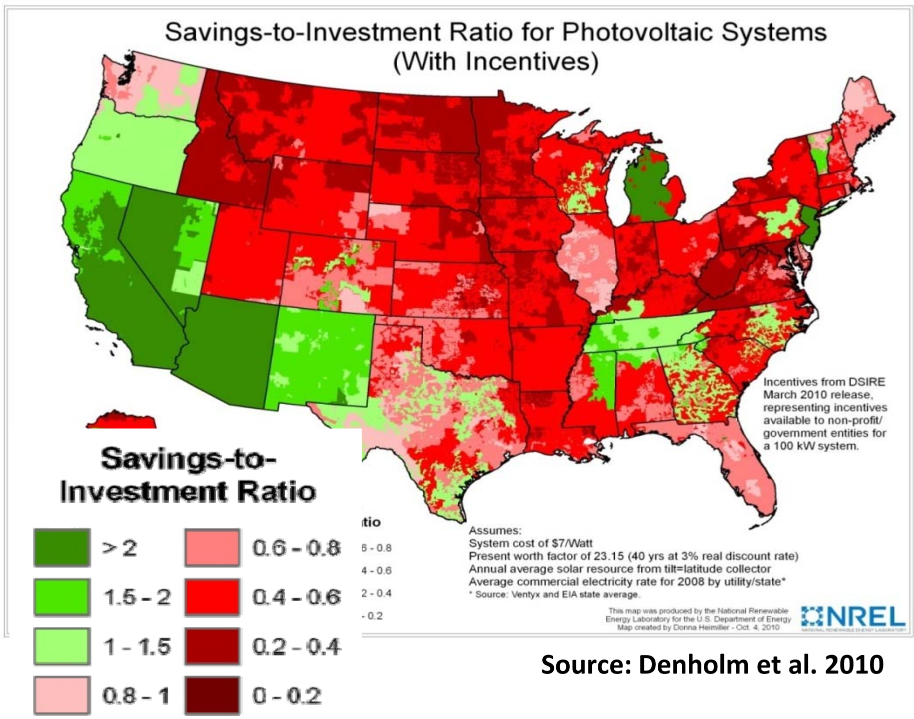
- **30% investment tax credit**
- **Expires at the end of 2016**

- Wind LCOEs from Wiser et al. 2011
- Solar LCOEs calculated in SAM using CFs ranging from 20-25%

- **Wind has lower LCOEs than PV until wind incentives expire in 2013**
- ***Incentivized* PV LCOEs could be lower than *un-incentivized* wind LCOEs from 2013-2017**
- **Current policy trajectory could lead to significant utility-scale PV deployment to meet RPS targets**

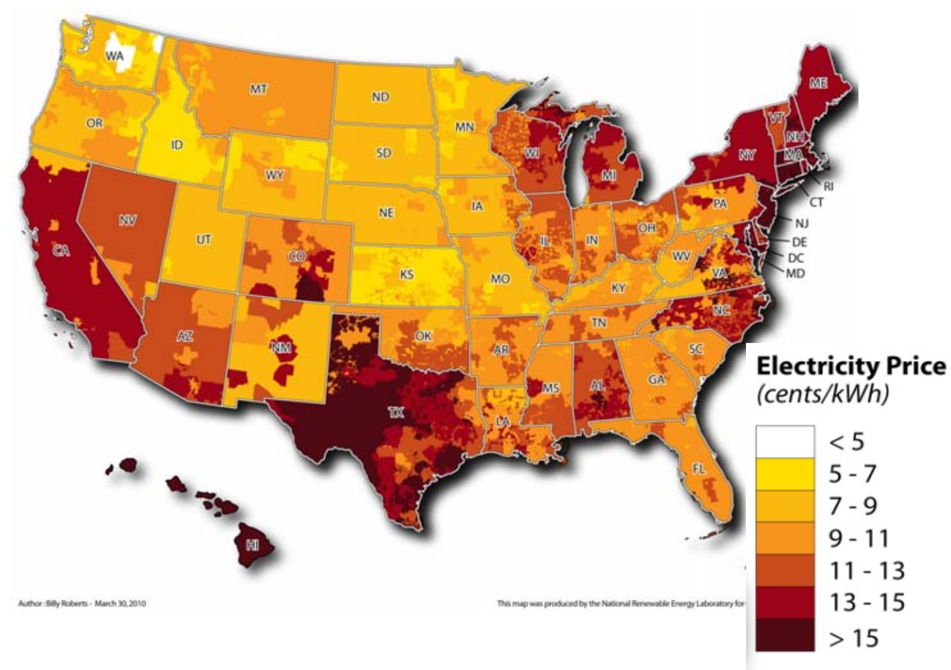
What about Distributed PV Markets?

Savings-to-Investment Ratio for $7/W PV
with incentives



Source: Denholm et al. 2010

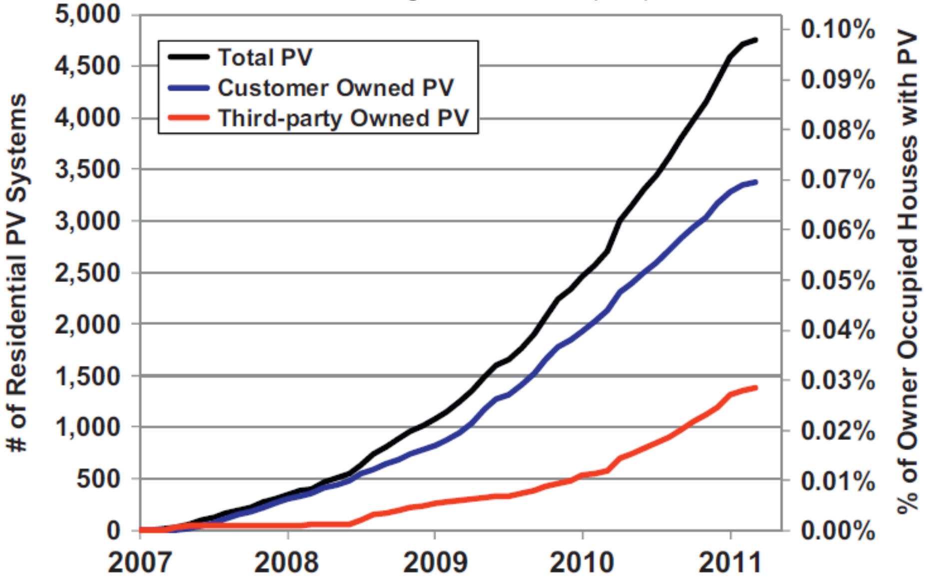
Residential Retail Electricity Rates



- With incentives, DG PV can represent a profitable investment in several states
- Unclear what economic thresholds are required to entice adoption
- What are the barriers to customer adoption after 'breakeven' reached?

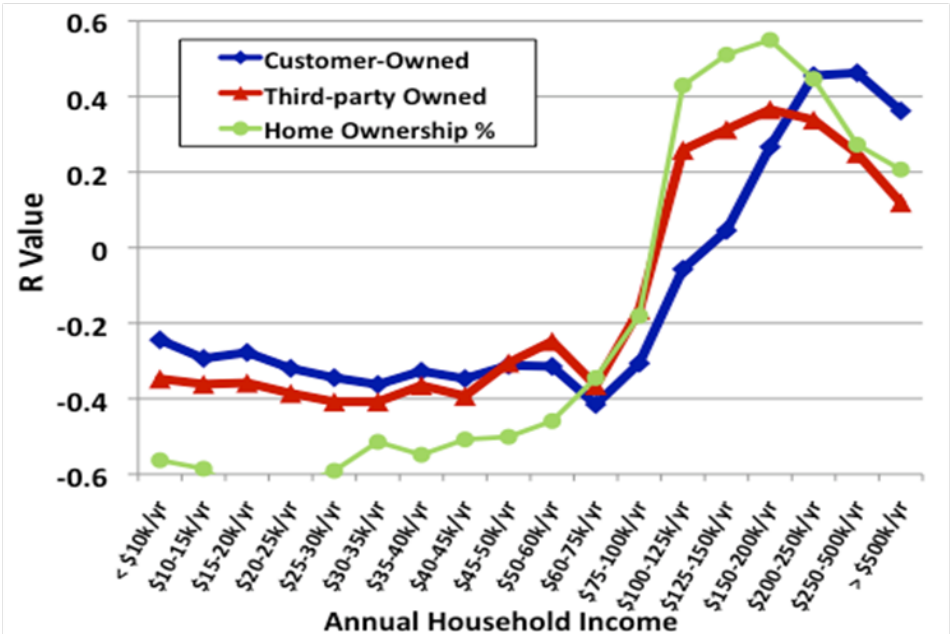
New PV products can change adoption trends

Third-party owned PV gaining market share in LA and Orange counties (CA)



Residential PV adoption in LA and Orange counties served by SCE

Correlation between PV adoption and regional household income

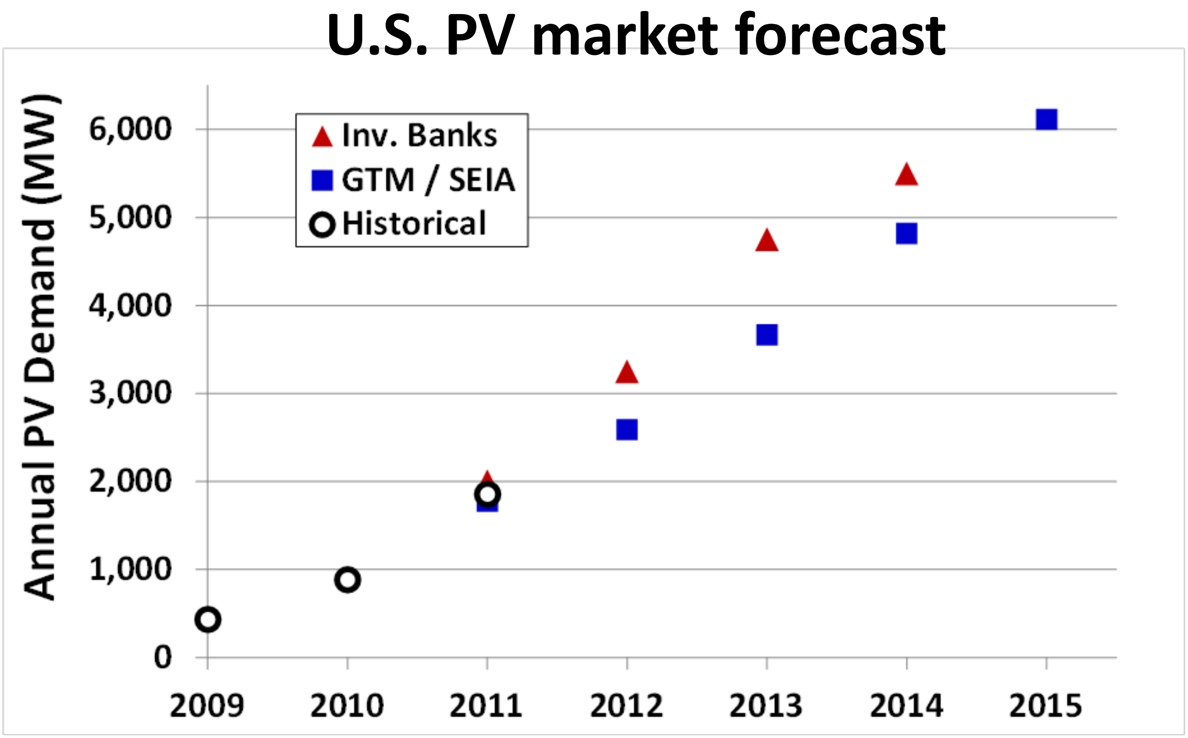


- **Third party residential PV markets growing rapidly, > 60% market share in CA in 2012**
- **PV leasing products appear to be enticing new demographics to adopt PV in LA**
- **Third-party adoption trends likely to extend to other states**

- **However, DG PV economics based on: (1) incentives, and (2) retail rates and rate design (net metering)**

Source: Drury et al. 2012

Near-Term PV Forecasts



Inv. Banks: Barclays Capital (2/14/11), Citigroup Global Markets (5/11/11), Goldman Sachs Group (5/16/11), Jefferies & Co. (6/2011), Lazard Capital Markets (4/13/11), Macquarie (4/1/11), Piper Jaffray (1/2011), Stofel Nicolaus & Co. (5/5/11), UBS Securities, LLC (3/31/11), Wedbush Securities (2/8/11)
GTM/SEIA: GTM/SEIA 2011;

- Projections consistent with about a 1 GW/yr increase in U.S. PV demand through 2015
- Several projections dominated by utility PV markets (>55%)
- Could lead to about 20 GW PV by 2015 (~1% of US electricity demand)