



Energy Technologies Area

Lawrence Berkeley National Laboratory

# Trends in the Program Administrator Cost of Saved Electricity 2009-2013

Ian M. Hoffman, Greg Leventis,  
Charles A. Goldman

January 17, 2017

*Supported by the U.S. Department of Energy's Office of Electricity Delivery and Energy Reliability, Transmission Permitting and Technical Analysis Division, and the Office of Energy Policy and Systems Analysis*

# Roadmap

- ◆ Why track the program administrator cost of saved energy (PA CSE)?
- ◆ Data and analytical approach
- ◆ Time trends
  - National “portfolio”
  - Residential market
    - Lighting
    - Behavioral feedback
    - Whole-home upgrades/retrofits
  - Commercial, industrial and agricultural (C&I) market
- ◆ Discussion and Summary
- ◆ Q&A

# Why trends in the PA CSE matter

- Increasing role of efficiency as an energy resource
- Where are the costs of efficiency headed?
  - Resource planning
  - Business planning for contractors, distributors, retailers
- Can efficiency program administrators meet rising savings targets cost effectively? How?
  - Deeper savings per customer
  - Greater participation (broader savings)
  - New technologies or new applications
- Are there economies of scale for energy efficiency programs?
- How attractive is efficiency as a resource investment? What role is efficiency likely to play?



# The Program Administrator Cost of Saved Electricity Defined

**Levelized Program Administrator Cost of Electricity Savings (PA CSE)**

The cost to the program administrator of acquiring energy savings that accrue over the economic lifetime of the actions taken, discounted back to the year in which the costs are paid and the actions are taken.

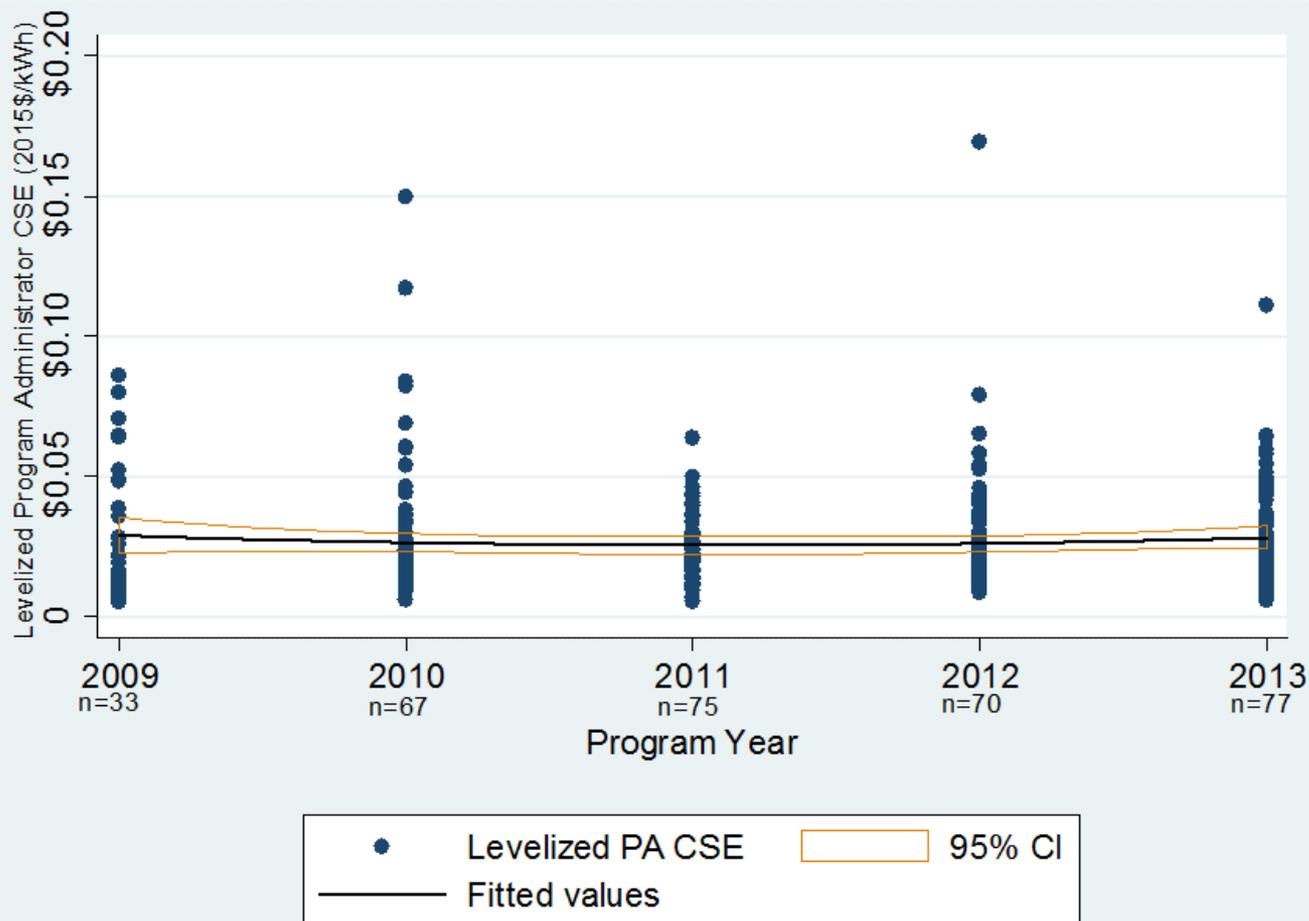
To calculate the levelized PA CSE we need:

- The discount rate (LBNL uses 6% in this analysis)
- Estimated program average measure lifetime
- Total program cost, inc. incentives, in 2015 dollars
- Gross annual kWh saved that year by the energy efficiency program

# Analysis

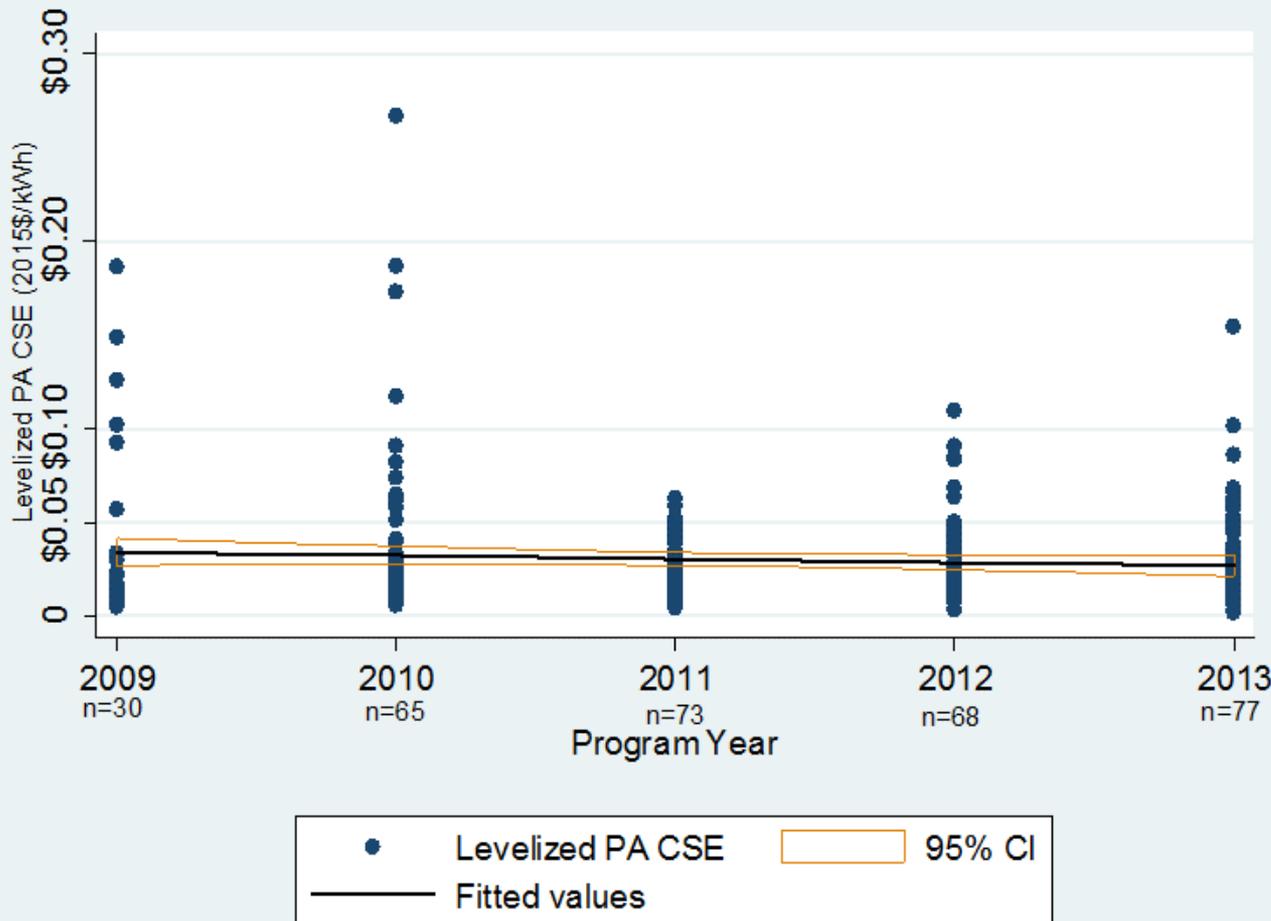
- Fixed-effects panel regressions of time trends in the PA CSE between 2009 and 2013
  - National: Each data point is a portfolio of EE programs offered by a PA in a single program year
  - Market sectors: Residential & Commercial/Industrial
  - Select programs
- Testing the functional form of PA CSE vs. time; looking for statistical “best fit”
  - Linear
  - Quadratic

# National Portfolio-Level Results for PA CSE



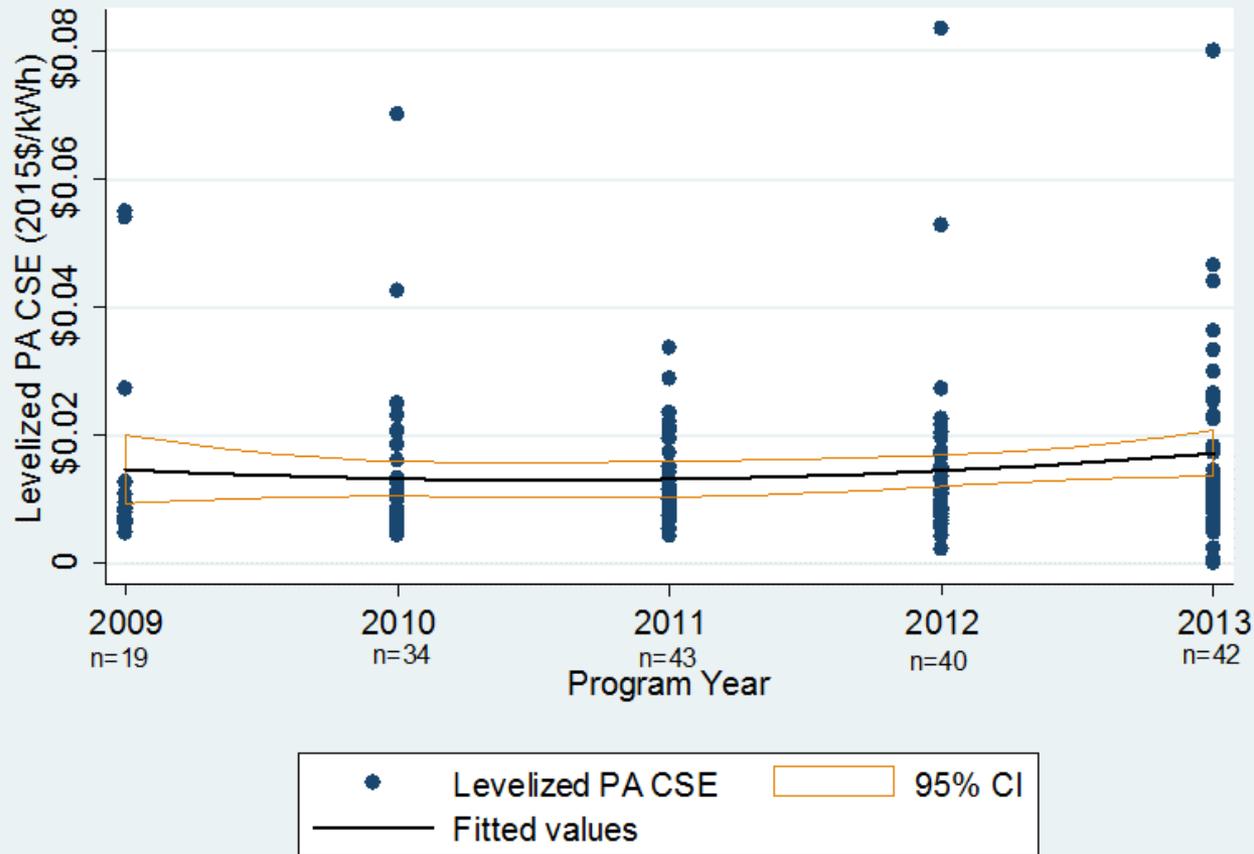
- Average cost of saved electricity to the program administrator declined somewhat between 2009 and 2013
- The PA CSE declined 2009 to 2011 (\$0.044 to \$0.023/kWh), then trended slightly upward to 2013 (\$0.028/kWh)

# Residential Market PA CSE



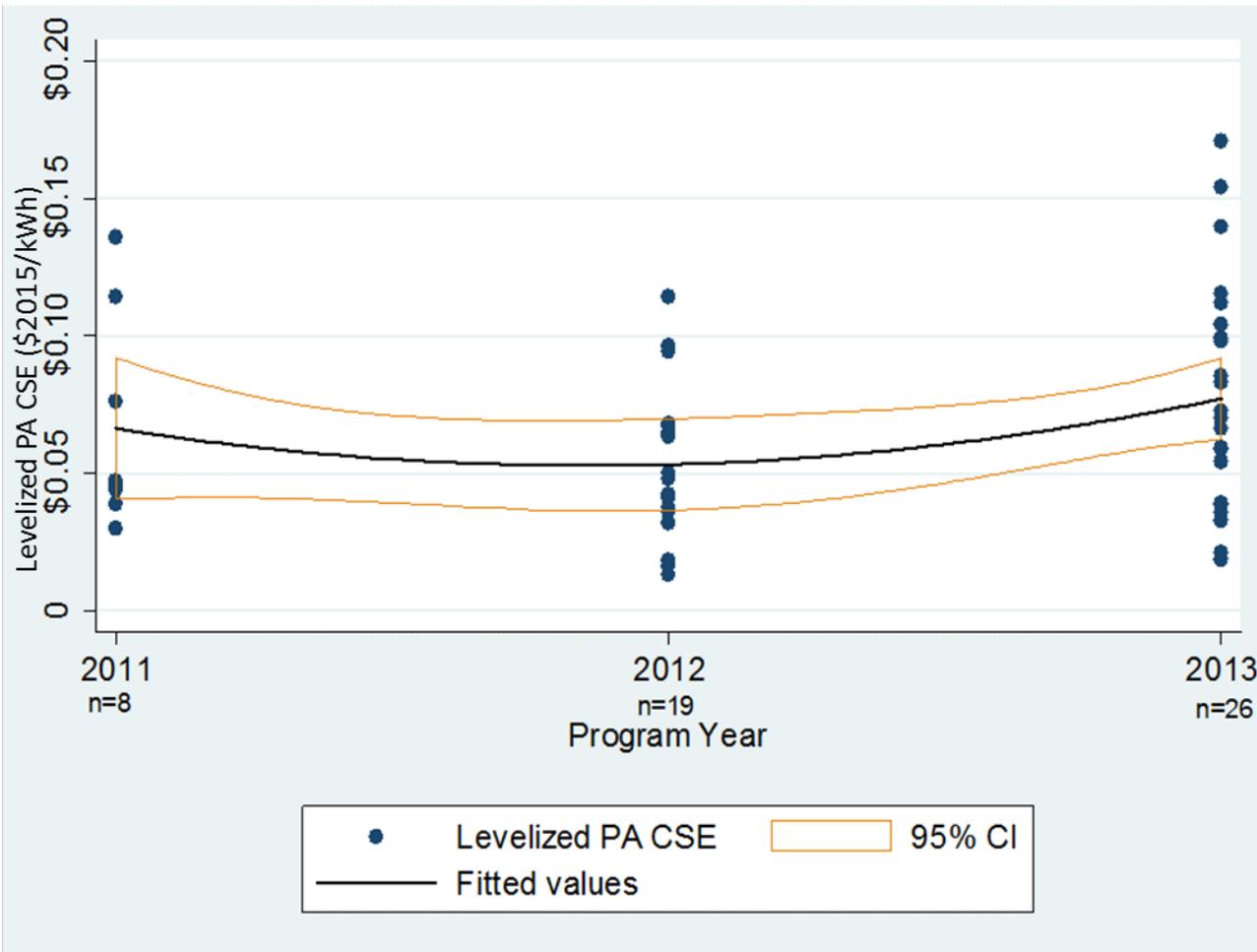
- Averaged \$0.035/kWh
- Declined from \$0.071/kWh in 2009 to \$0.03 in 2013
  - Less “noise”
  - Market maturing

# Residential Lighting Programs



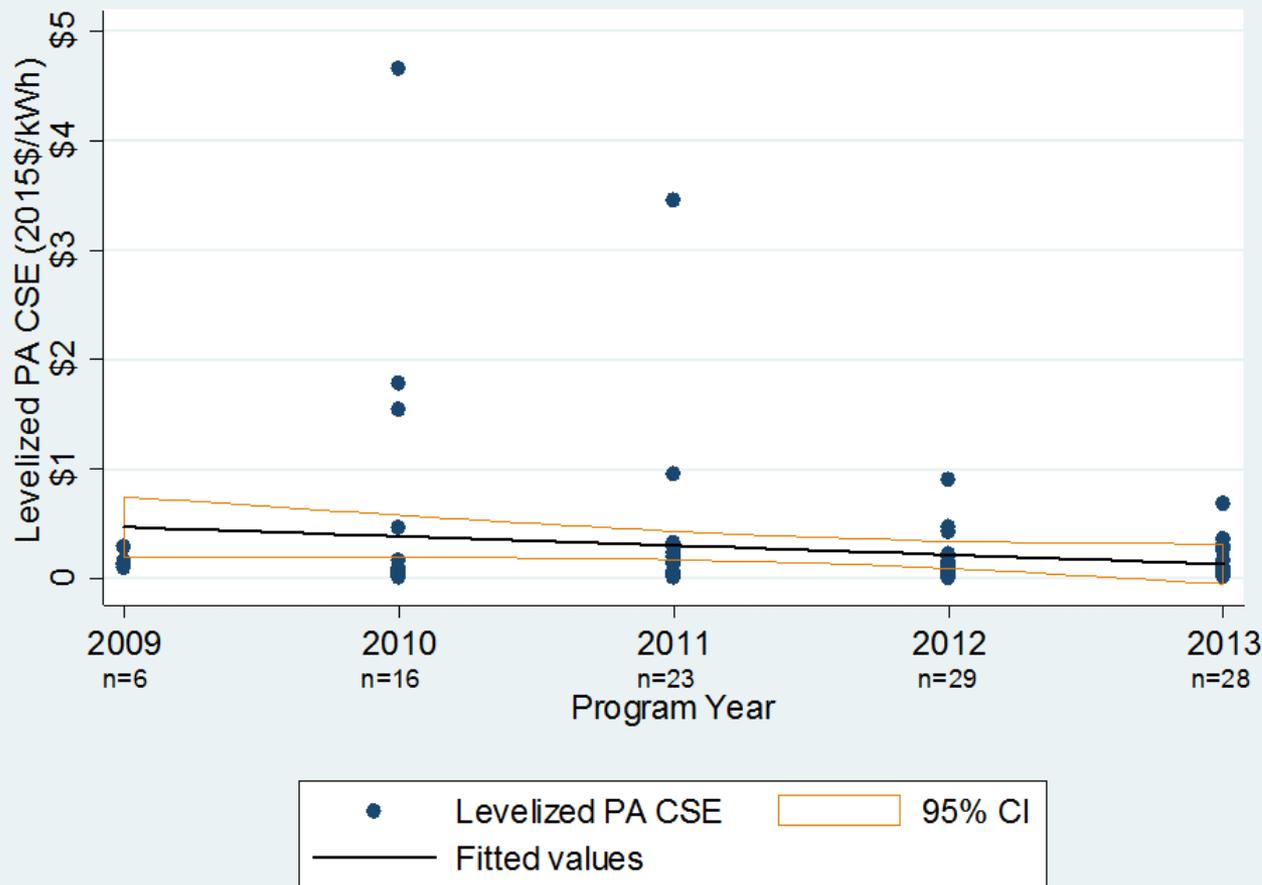
- PA CSE averaged \$0.015/kWh
- Slight decrease in early years and slight increase in later years to \$0.017/kWh in 2013
  - Consistent with anticipated rise in lighting standards in 2012
- Incline may be a product of methodology
  - Measure lifetime assumed static at 2009-2013 average (6.3 years)

# Behavioral Feedback Programs



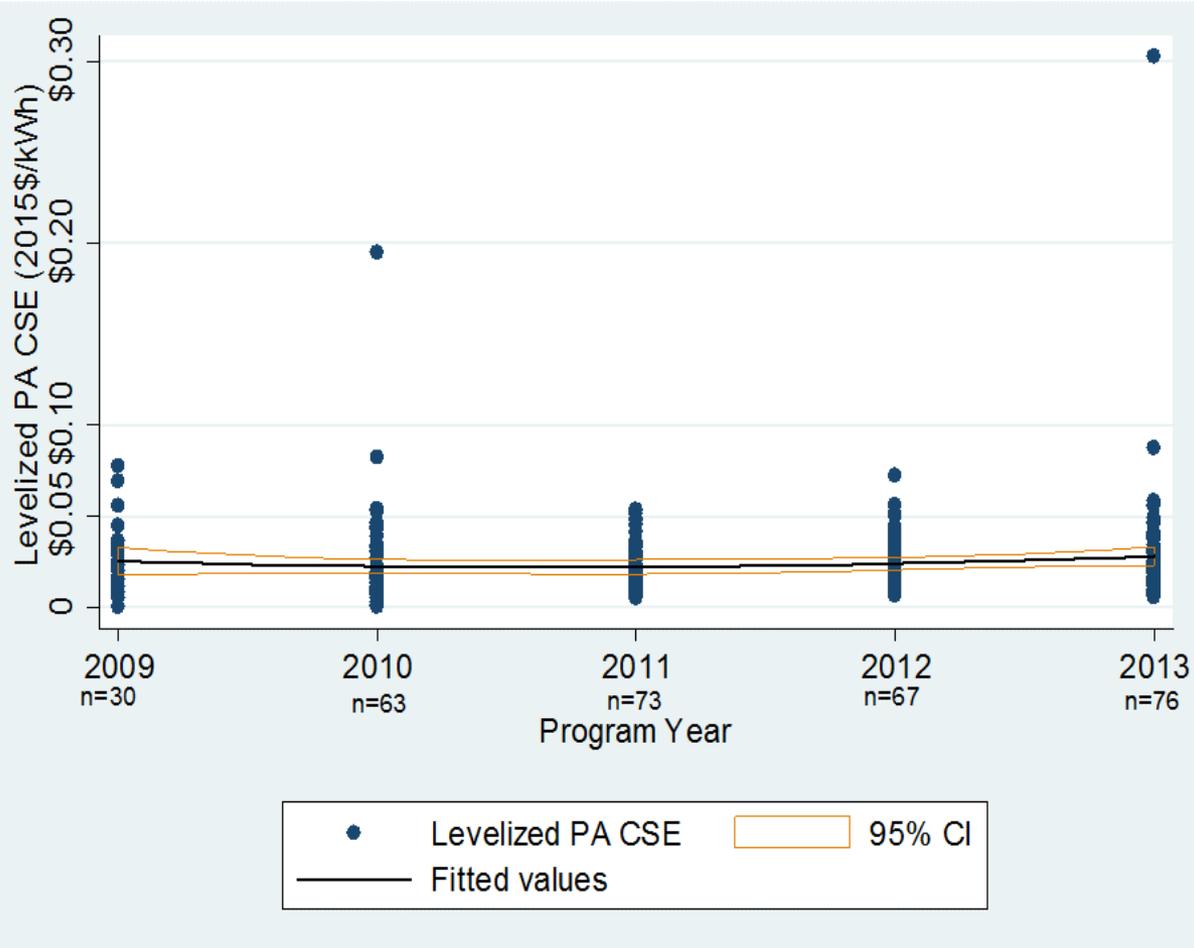
- PA CSE averaged \$0.068/kWh
- Declined then moderately increased to \$0.077/kWh in 2013
- Measure lifetime of one year used by PAs and LBNL for all programs. If savings persist more than 1 year, the PA CSE is lower.
  - If we assume a 3-year lifetime, PA CSE decreases to \$0.02/kWh, rivaling lighting

# Whole-Home Retrofit Programs



- PA CSE averaged \$0.15/kWh
- Includes full “home performance” retrofits and more limited direct-install programs
- Sample initially included many first-year or pilot programs – high startup costs and modest savings.
- Excluding pilots (<\$1M spending), average PA CSE declined moderately but steadily through 2013
- Savings-weighted average was \$0.066/kWh

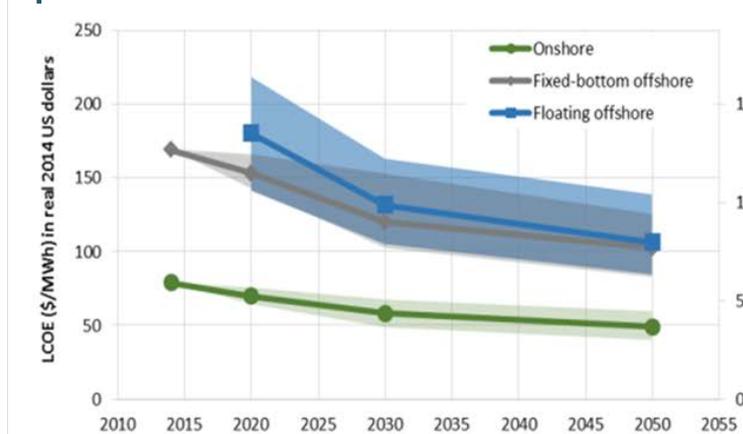
# Commercial, Industrial and Agricultural Market



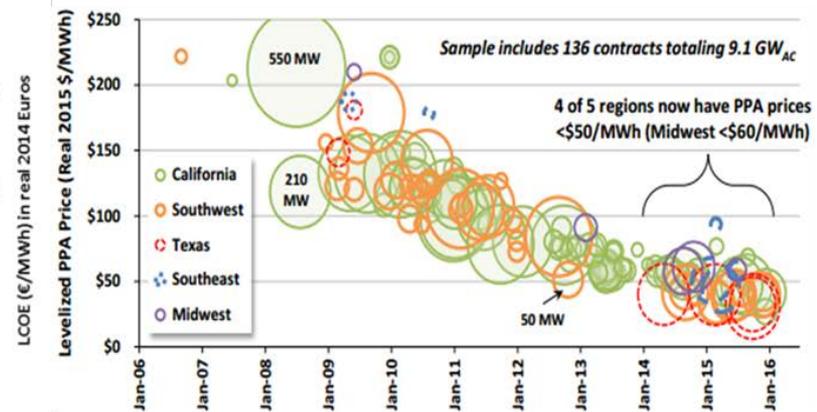
- PA CSE averaged \$0.027/kWh
- C&I trend was fairly stable and flat
  - Very slight CSE decline 2009-2011, then slight increase to \$0.028 in 2013
- Two-thirds of sector savings came from two broad program types
  - Custom rebates (\$0.029/kWh)
  - Prescriptive rebates (\$0.021/kWh)

# Discussion

- ◆ Increasing reliance on efficiency as an energy resource yet national trends for all markets in aggregate and for both residential and C&I sectors declined or showed modest change
- ◆ Many possible explanations
  - Economies of scale
  - Learning
  - Market development (trade networks, etc.)
  - All or none of the above
- ◆ Causality is challenging to parse when PAs moving along different stages of development in disparate market conditions
- ◆ Implications for future resource mix as renewables decline in cost



Expert projections of wind LCOE (Wiser et al. 2016)



Utility-scale solar @ \$0.05/kWh (Bolinger & Seel 2016)

# Summary

- ◆ Regression analysis shows primarily non-linear trends in the cost of saved electricity 2009 – 2013 at the national level, the sector level and for some common program types
- ◆ The national average cost of electricity savings was relatively flat, declining from \$0.044 in 2009 to \$0.023/kWh in 2011, then rising slightly in 2012-2013 to \$0.028/kWh
- ◆ The residential sector PA CSE averaged \$0.035/kWh, declining from an average of \$0.071/kWh in 2009 to \$0.03/kWh in 2013. The C&I sector PA CSE was fairly flat, reaching \$0.028/kWh in 2013
- ◆ Future work includes assessing trends through 2015 and examining potential influences on the cost of electricity savings

# Contacts



Ian M. Hoffman  
(510) 495-2990  
[IHoffman@lbl.gov](mailto:IHoffman@lbl.gov)

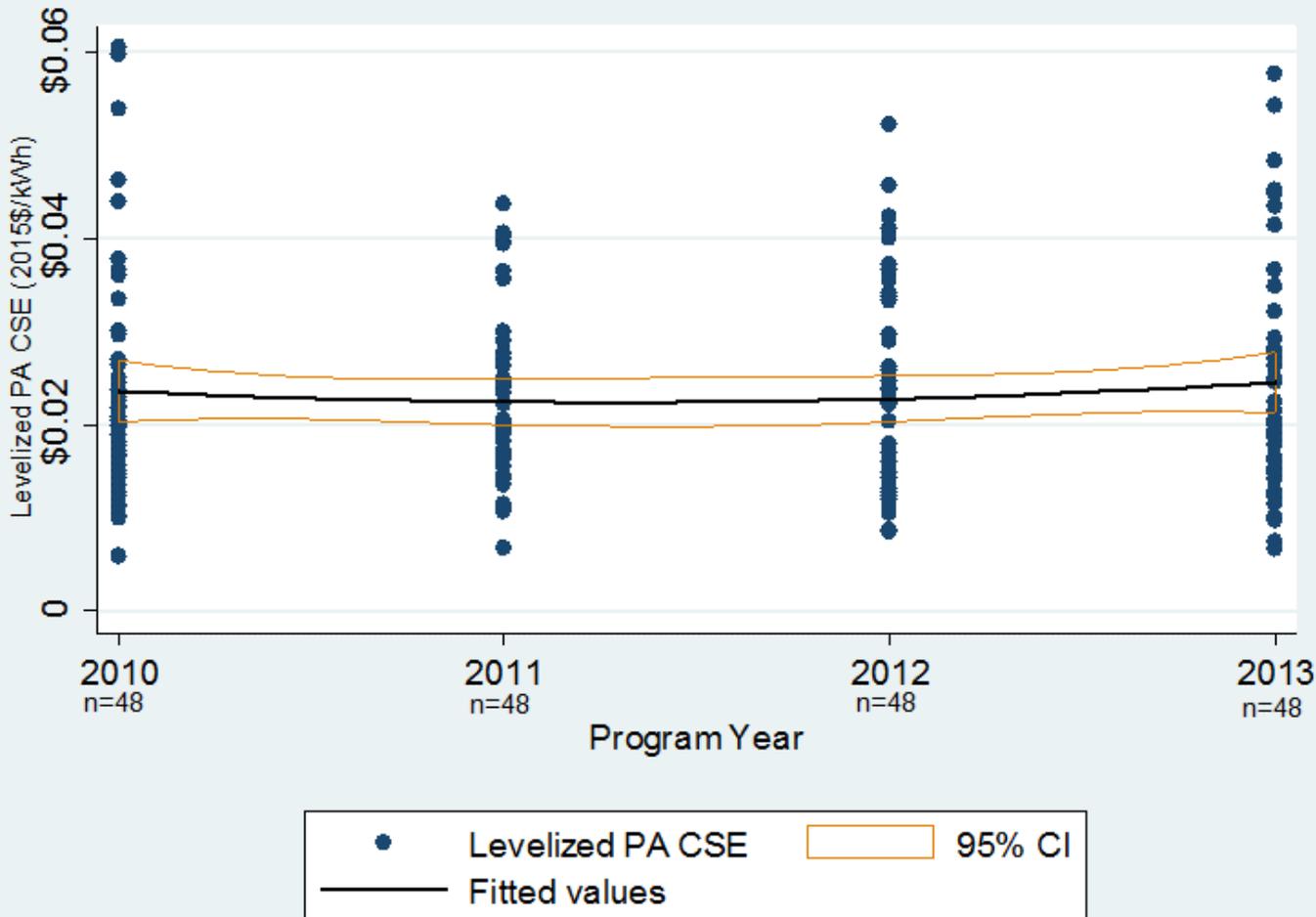


Chuck Goldman  
(510) 486-4637  
[CAGoldman@lbl.gov](mailto:CAGoldman@lbl.gov)

<http://emp.lbl.gov/>

# Additional Slides

# PA CSE: Portfolio-Level Results



## Balanced Panel

- 48 PAs with continuous data for at least four years
- Same concave shape
  - Declining in early years
  - Plateau in 2011
  - Slight increase in latter years