

Economic Impacts of the Property Assessed Clean Energy (PACE) Programs - California

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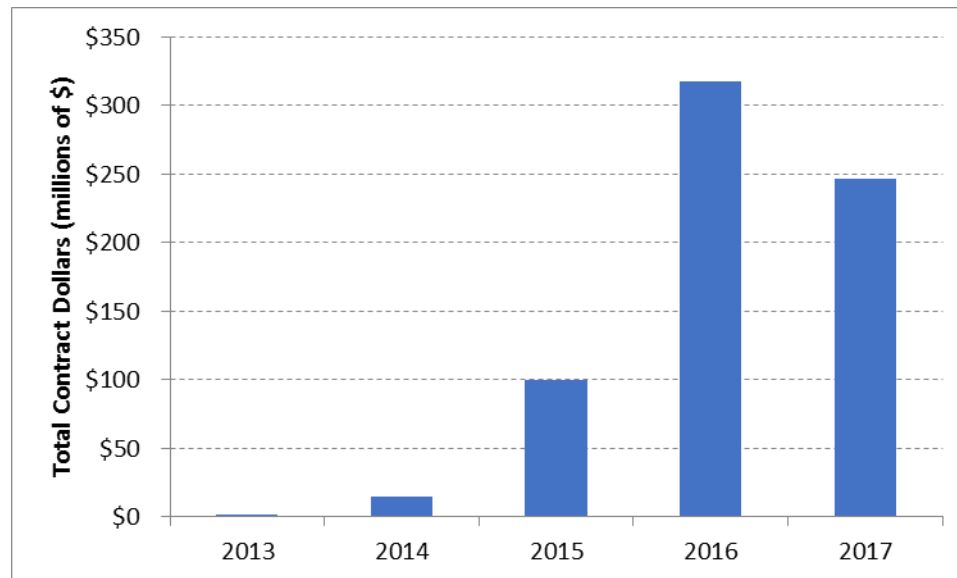
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PACE Financing

- **Property Assessed Clean Energy (PACE)**
 - an innovative mechanism to provide affordable financing for energy and water efficiency upgrades, renewable generation, and hazard resiliency improvements to residential and commercial properties, which is repaid through the property owner’s property tax bill
- **Unique characteristics of PACE financing compared to traditional financing**

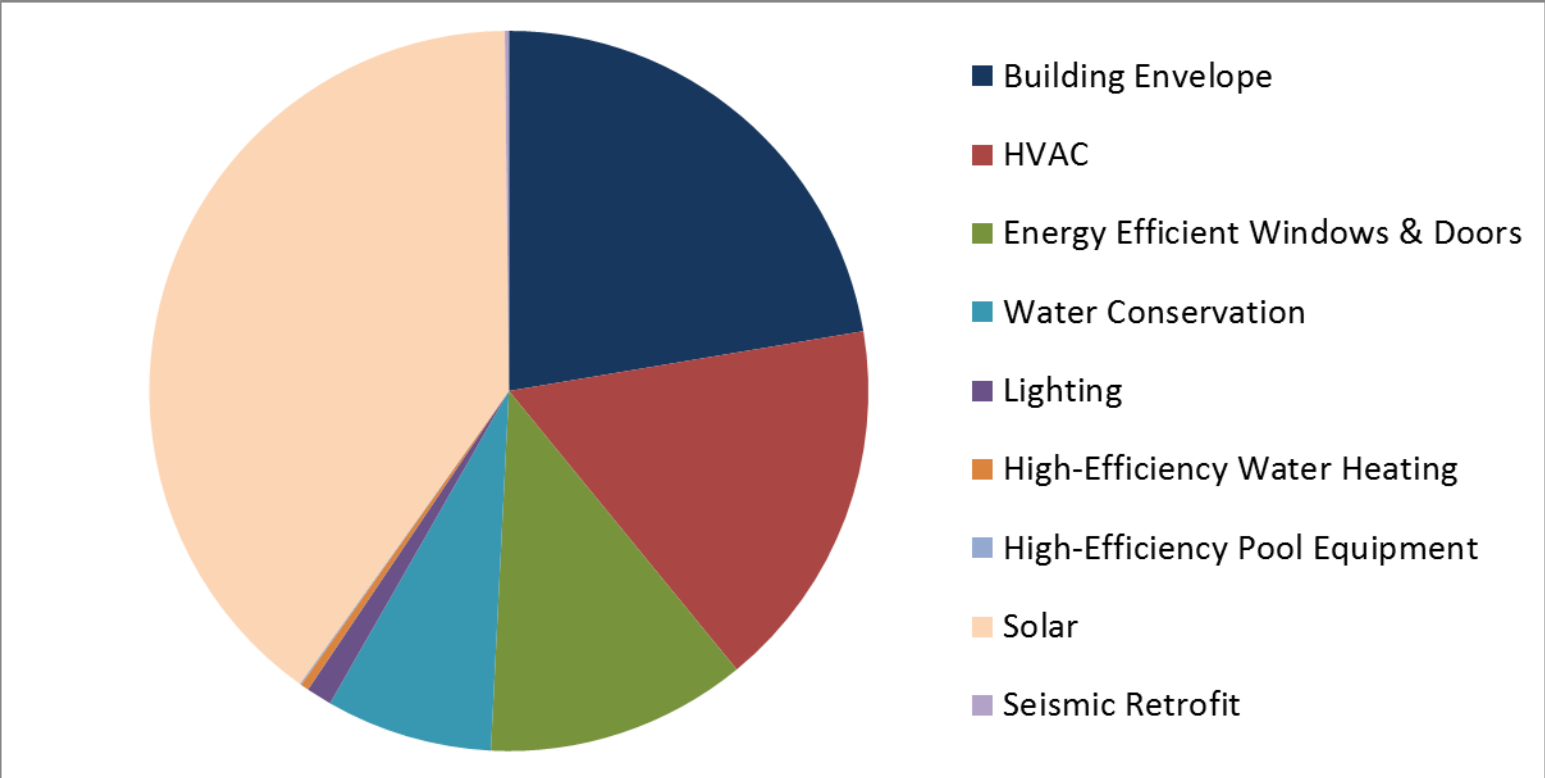
PACE Financing Data From A Leading PACE Administrator

- Data represents > \$800 million in PACE funded projects from 2013 to July 2018
- Represents over 30,000 residential and commercial property improvement projects in CA



PACE Financing Data From A Leading PACE Administrator

- Distribution of contract \$ of PACE financing among various improvement categories



Contributions of PACE Financing

- Direct benefits:
 - Reduction in electricity, gas and water use; Increase in renewable electricity generation
 - Reduction in GHG emissions
 - Reduction in vulnerability to fire & earthquakes
- Co-benefits:
 - Increases in business sales revenue, GDP, personal income, and employment
 - Increases in taxes to various levels of government
 - Reduction in insurance premiums
 - Decreases in ordinary air pollutants

Data

- PACE Administrator Data
 - Major PACE assessment characteristics (improvement type, useful life, contract amount, type of property, settlement date, etc.)
 - Financing characteristics (interest rates, amortization period, annual coupon, fees, etc.)
 - Characteristics of property (location, building area, owner type, etc.)
 - Modeled impact estimates on energy and water savings
- Supplemental data on how to divide contract dollars between construction sector and various materials/equipment manufacturing sectors

Linkages between Direct Costs/Savings of the PACE Program and REMI Inputs

Linkage	Direct Costs/Savings of the PACE Program		Policy Variable Selection in REMI	Positive or Negative Stimulus to the Economy
1	Upfront Investment		Output and Demand Block → Exogenous Final Demand (amount) for Construction sector and various relevant manufacturing sectors → Increase	Positive
2	Expenditure on PACE Administrator Fees		Output and Demand Block → Exogenous Final Demand (amount) for Monetary Authorities, Credit Intermediation sector → Increase	Positive
3	Expenditure on Program Fees		Output and Demand Block → State and Local Government Spending → Increase	Positive
4	Interest Payment of PACE Assessments		Output and Demand Block → Exogenous Final Demand (amount) for Monetary Authorities, Credit Intermediation sector → Increase	Positive
5	Energy (Electricity & NG) and Water Savings	Commercial Sectors	Compensation, Prices, and Costs Block → Production Cost of Individual Commercial Sectors → Decrease	Positive
		Residential Sector	Output and Demand Block → Consumption Reallocation (amount) → All Consumption Sectors → Increase	
6	Solar Investment Tax Credit	Commercial Sectors	Compensation, Prices, and Costs Block → Production Cost of Individual Commercial Sectors → Decrease	Positive
		Residential Sector	Output and Demand Block → Consumption Reallocation (amount) → All Consumption Sectors → Increase	

Linkages between Direct Costs/Savings of the PACE Programs and REMI Inputs

Linkage	Direct Costs/Savings of the PACE Program		Policy Variable Selection in REMI	Positive or Negative Stimulus to the Economy
7	Annual Amortized Payment	Commercial Sectors	Compensation, Prices, and Costs Block →Capital Cost (amount) of Individual Commercial Sectors→Increase	Negative
		Residential Sector	Output and Demand Block →Consumption Reallocation (amount)→All Consumption →Decrease	
8	Decrease Demand of Electricity		Output and Demand Block →Exogenous Final Demand (amount) for Electric Power Generation, Transmission, and Distribution sector →Decrease	Negative
9	Decreased Demand of NG		Output and Demand Block →Exogenous Final Demand (amount) for Oil and Gas Extraction sector → Decrease	Negative
10	Water Demand Decrease from the Water Supply Sector		Output and Demand Block →Exogenous Final Demand (amount) for Water, Sewage and Other Systems sector → Decrease	Negative

Analysis of Results

Energy & Environmental Impacts (entire lifetime)

Based on > \$800 million of project financing

California Energy and Water PACE Projects

- 2.8 billion gallons water savings
- 3.37 billion kWh electricity savings
- 3.6 billion cf natural gas savings
- \$1 billion utility bill savings
- 1.1 million metric tons of GHG emissions reductions

Analysis of Results (cont'd)

Macroeconomic Impacts

California Energy and Water PACE Projects

- \$122.3 million average annual increase of GDP and 1,222 person-year jobs per year during up-front investment period (2013-18)
- NPV (2013-2067) of GDP impacts is \$298 million
- 5,025 total cumulative person-year jobs generated
- NPVs of gross output and personal income impacts are \$654 million and \$301 million
- NPV of non-market value of electricity generation of \$363 million

Analysis of Results (cont'd)

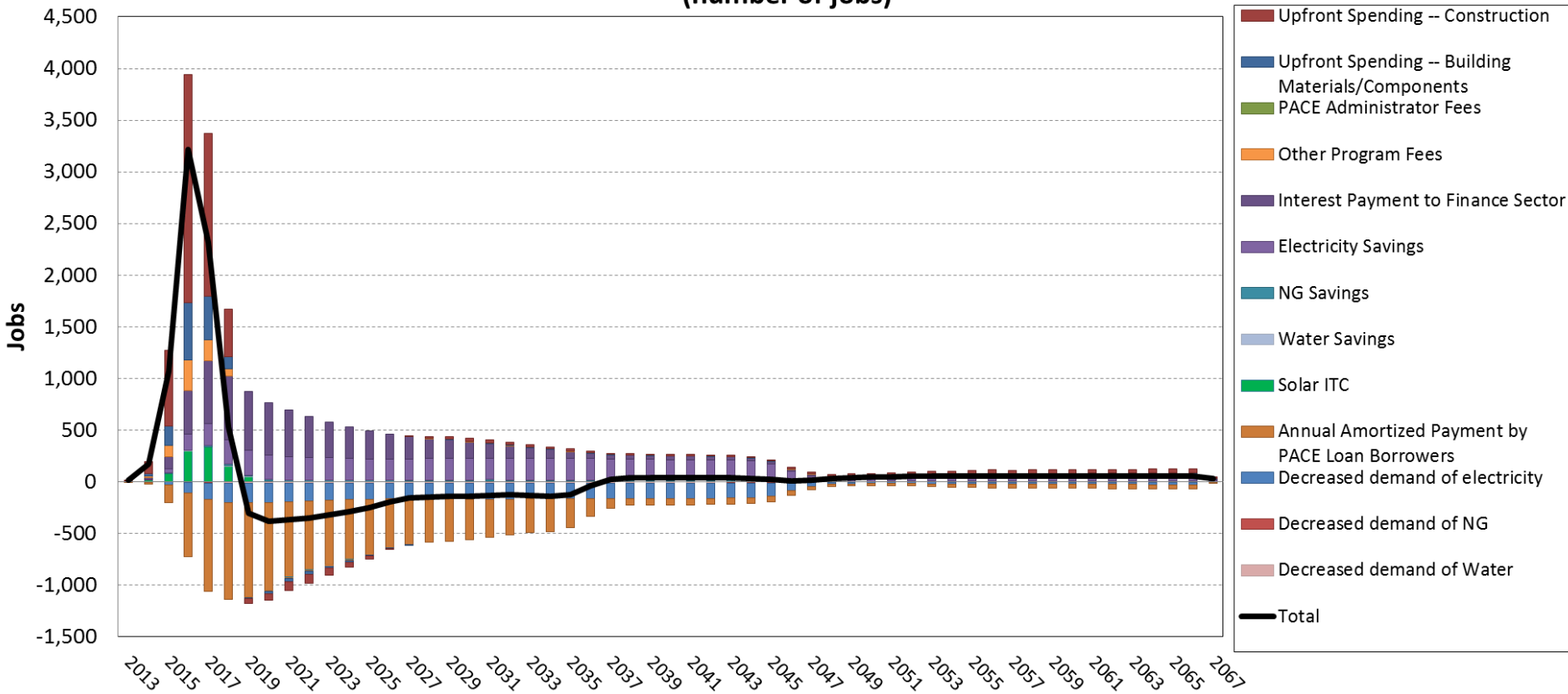
Decomposition Analysis

- Evaluate how the various factors affect the aggregate macroeconomic impact results
- Help identify major factors that affect the bottom-line results
- Conducted by running REMI simulations for each individual factor one at a time
- Use as a basis to identify influential factors to run sensitivity analysis

Analysis of Results (cont'd)

Decomposition Analysis

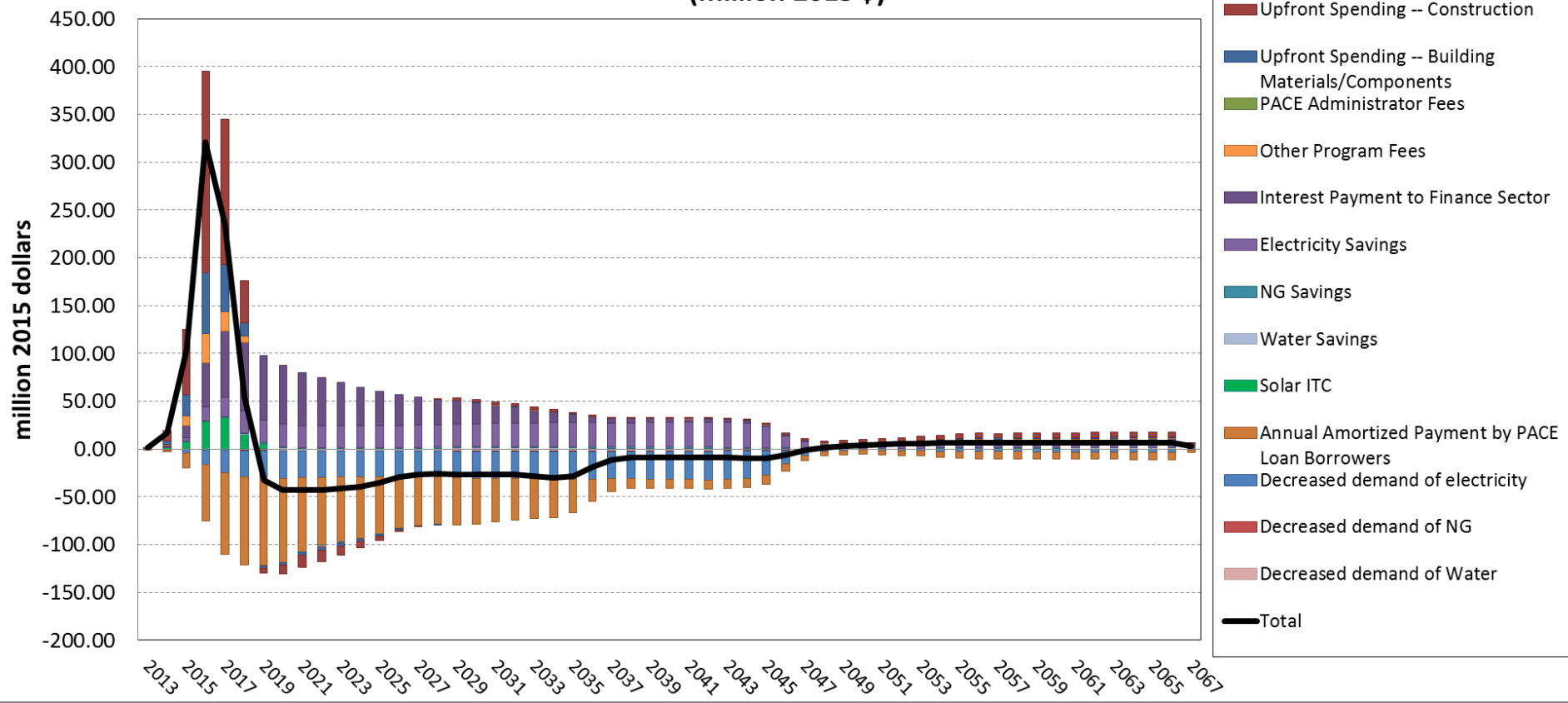
**Figure 1. Employment Impacts of California PACE (excluding disaster resiliency projects)
(number of jobs)**



Analysis of Results (cont'd)

Decomposition Analysis

**Figure 2. GSP Impacts of California PACE (excluding disaster resiliency projects)
(million 2015 \$)**



Analysis of Results (cont'd)

Sensitivity Analysis

- Sensitivity test on the assumption of dollar-for-dollar displacement of other purchases to repay PACE financing
- Alternative assumption reduces the direct offset by 10%
- Employment impacts: 6,299 person-year jobs
- NPV of GSP impacts: \$374 million
- NPV of output impacts: \$793 million
- NPV of personal income impacts: \$357 million
- NPV of non-market value of electricity generation remains the same at \$363 million

Next Steps of Analysis

- Resiliency savings – losses avoided by disaster resiliency enhancement (e.g., reduction in property damages or household/business interruption)
- Insurance savings – reduction in insurance premium for the installation of disaster resilience improvements
- Public policy impacts of PACE financing

Thank you!

Comments and Questions?