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Helping Utilities Make Smart Solar Decisions

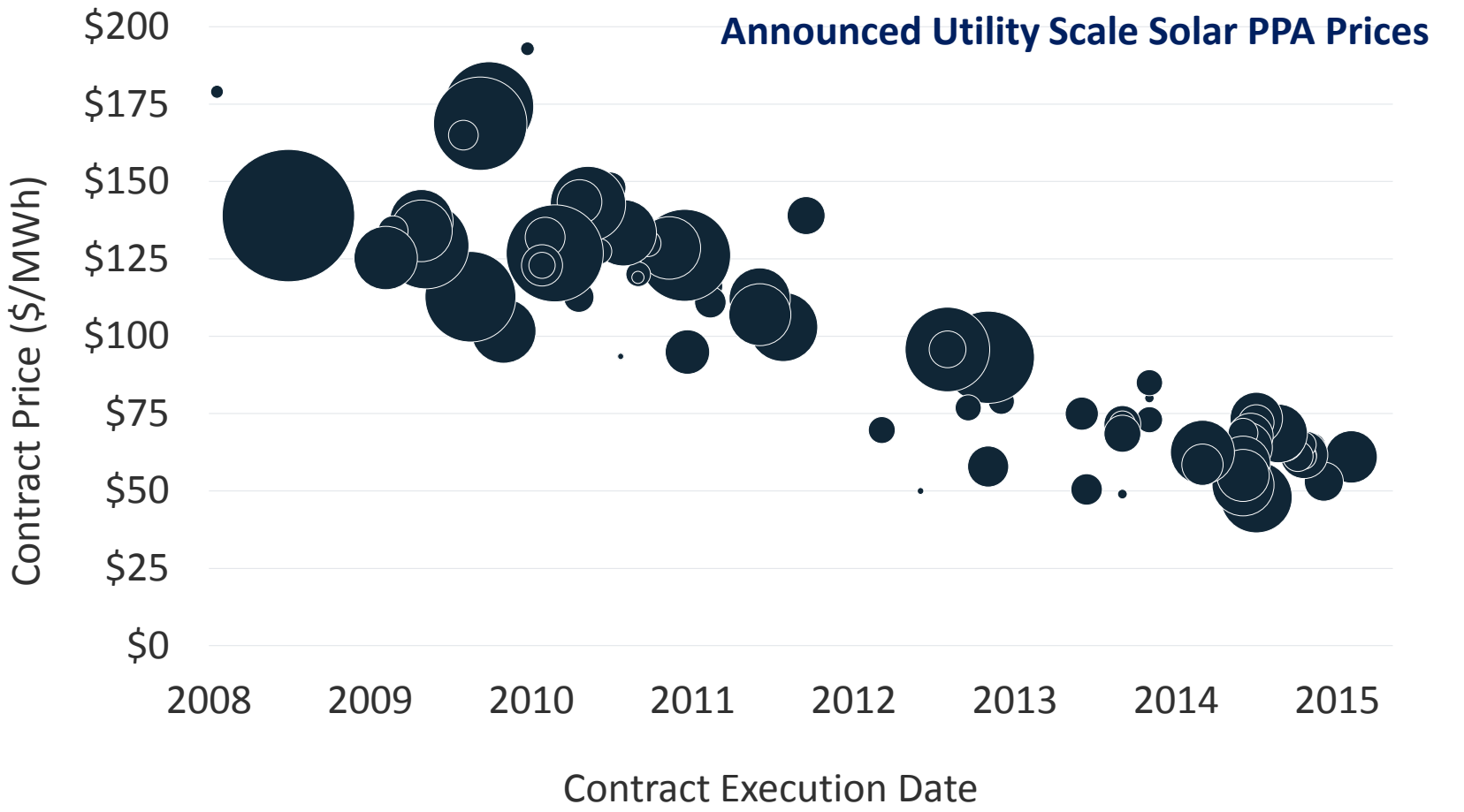
Solar Has Arrived!

ADS National Town Meeting

May 28, 2015

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Solar has Arrived

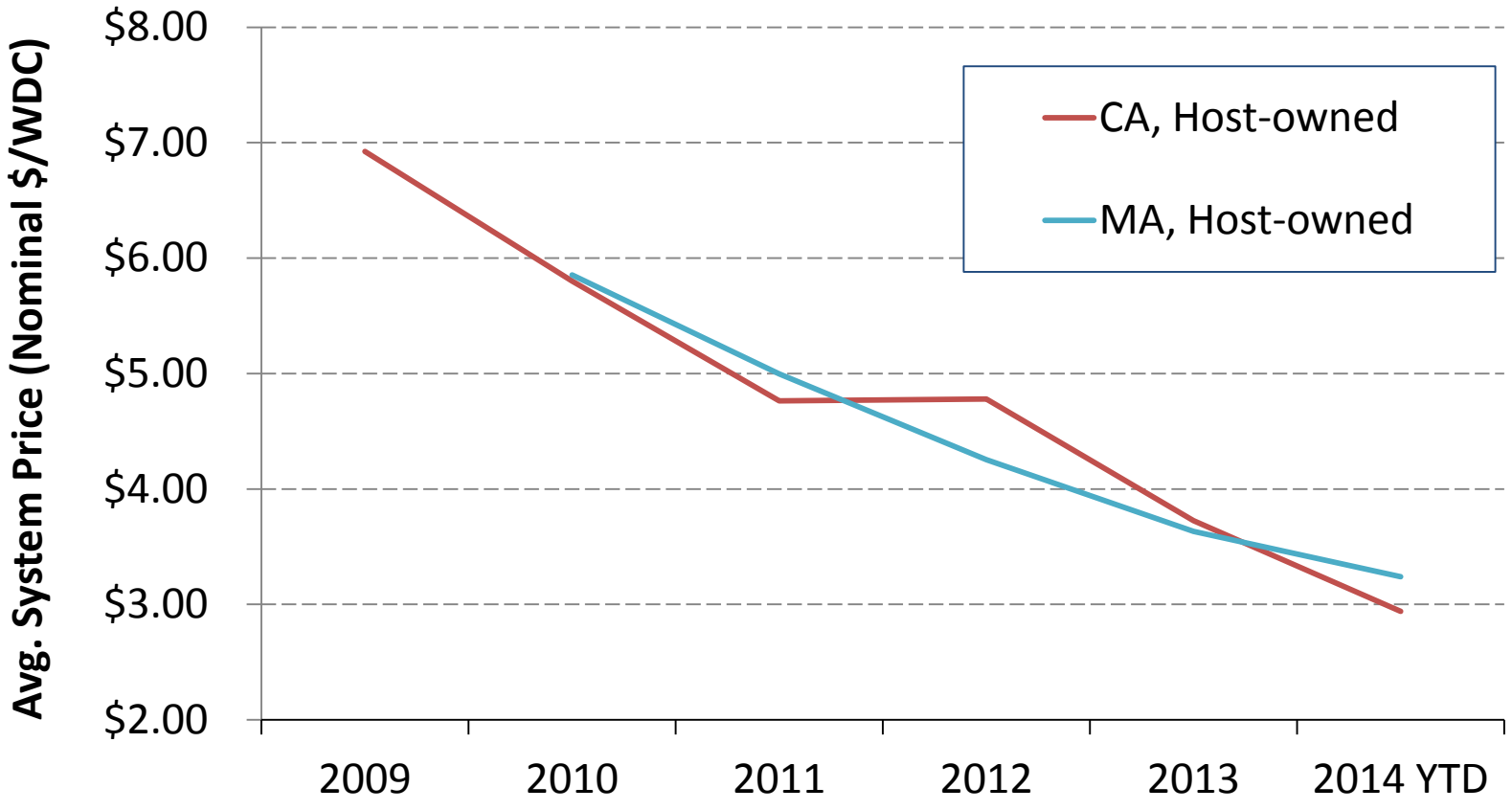


Source: GTM Research

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PV System Pricing

Installed Cost of Large Distributed Solar PV

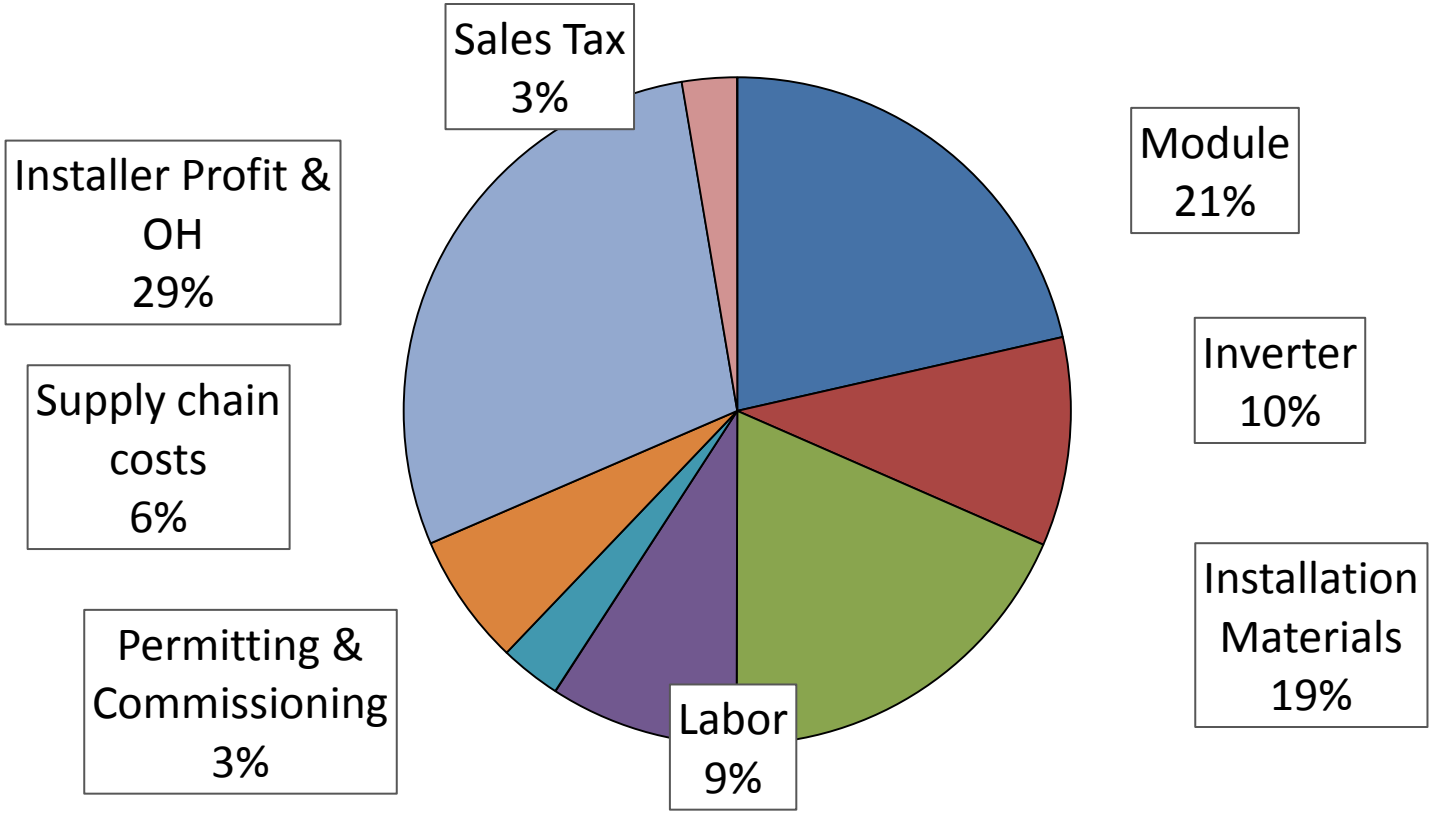


Helping Utilities Make Smart Solar Decisions

NREL/DOE "Q2/Q3 '14 Solar Industry Update" (October 31,2014)

Overnight Cost Breakdown

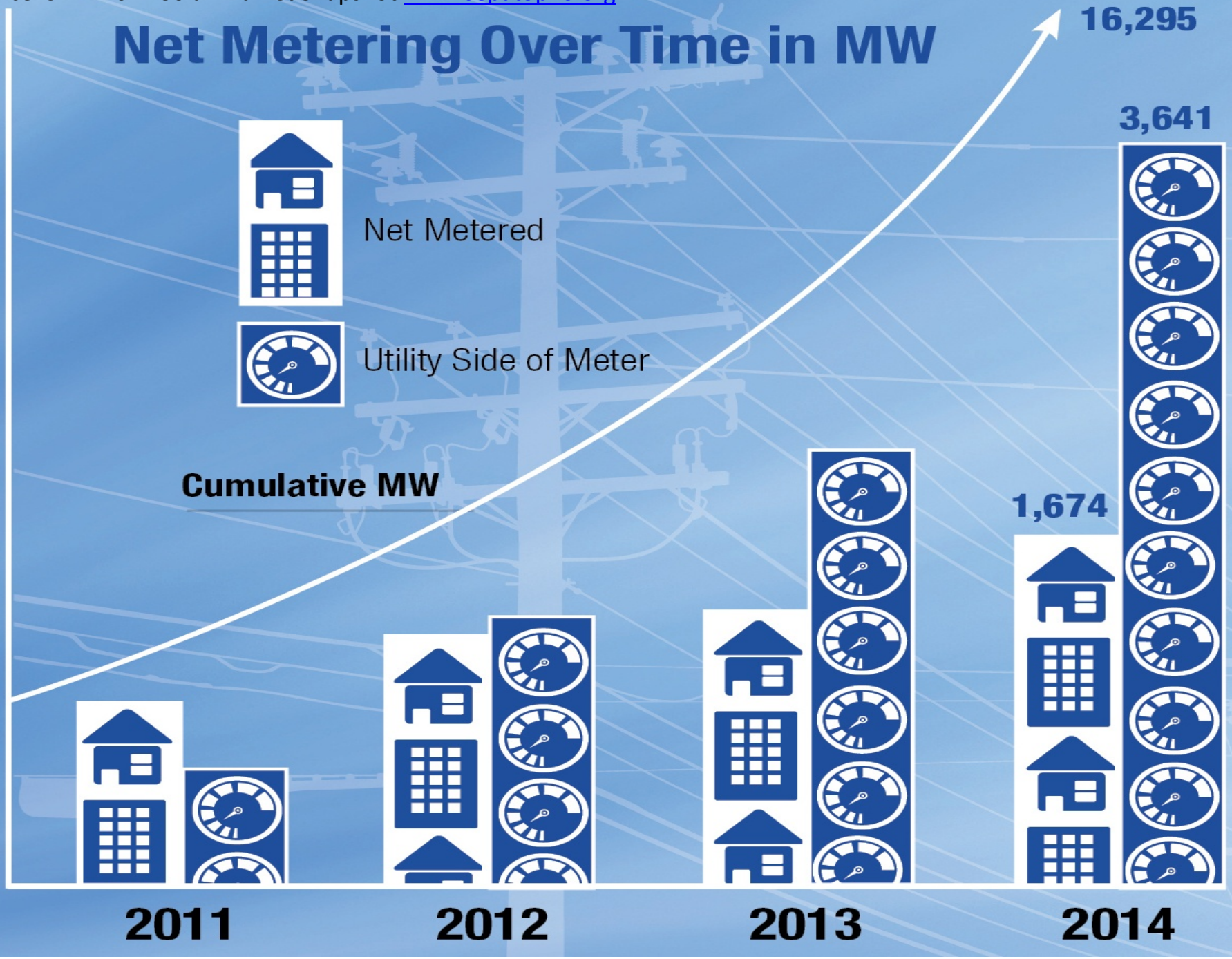
Residential Rooftop in 2014: $3.29/watt



Helping Utilities Make Smart Solar Decisions

NREL/DOE "Q2/Q3 '14 Solar Industry Update" (October 31,2014)

Source: SEPA 2014 Solar Market Snapshot www.sepatop10.org



The Utility Industry is Getting Increasingly Complex

Legacy Expectations

- Safe
- Reliable
- Low Cost
- Enabling Economic Development
- Stable and Predictable Cost

New Demands

- Resilient
- Support for DSM
- Proactive Environmental Stewardship
- Support for Consumer Choice, including Self Generation
- Support for Transportation Infrastructure

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Often Forgotten

- **Obligation to serve**
- **Existing (& Unquestioned) Cross-Subsidization**
- **Impact on Capital Cost & Availability**
- **Data Availability, Security, & Ownership**

Utilities are Responding to the New Expectations & Economics

WELL ESTABLISHED

Utility Scale Generation

- PPAs in the $40s - $60s /MWh in CA, TX, NM, CO, NV, AZ

Consumer Education

- General Information
- Program information
- Solar Rooftop Calculators

Utilities are Responding to the New Expectations & Economics

INNOVATIVE APPROACHES

More information at www.sepatop10.org

Rate Reform	• Fixed Charges • Value of Solar Tariffs
Grid Integration	• Locational Deployment • Advanced Inverters • Solar Production Forecasting • Storage Integration
Rooftop Ownership	• Underserved Markets • Integration tie-ins
Community Solar	• Utility Administered & Third Party

Utilities are Responding to the New Expectations & Economics

LOOKING AHEAD

Distribution System Platforms

- New York's Reforming the Energy Vision (REV)

Integrated Offering

- NRG and Green Mountain Power?
- Fort Collins Utilities?
- Tucson Electric Power Residential Solar Program?
- **Steele-Waseca Cooperative Electric's Sunna Project**

Thank You!

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www.solarelectricpower.org
www.sepatop10.org
www.sepa51.org

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Things to Contemplate

1. How will the solar industry respond to the expiry of the ITC and potential increases in interest rates?

2. How will the introduction of battery storage for the residential market impact utility rate reforms?

3. Can utilities provide a compelling consumer message in response to solar finance companies' success?

4. Which will be more economically compelling - DER or bulk power generation?

5. Will regulators be able to provide the utilities will incentives compelling enough to support transitions to new business models?

2014 UTILITY SOLAR LEADERS

SEPAtop10.org



	ANNUAL MW	ANNUAL W/CUSTOMER	ANNUAL INTERCONNECTIONS	ANNUAL % OF NET METERED PROJECTS PER CUSTOMER	
1	Pacific Gas and Electric Company (CA) 1,504 MW	Pickwick Electric Cooperative (TN) 1,679 W	Pacific Gas and Electric Company (CA) 45,265 projects	Maui Electric Company Ltd (HI) 3%	1
2	Southern California Edison (CA) 1,043 MW	Farmers Electric Coop (IA) 1,158 W	Southern California Edison (CA) 34,588 projects	Hawaii Electric Light Company (HI) 3%	2
3	San Diego Gas & Electric Company (CA) 430 W	City of St. George Energy Services Dept (UT) 751 W	San Diego Gas & Electric Company (CA) 15,750 projects	Hawaiian Electric Company, Inc. (HI) 2%	3
4	Duke Energy Progress (NC, SC) 161 W	Kauai Island Utility Cooperative (HI) 503 W	Arizona Public Service (AZ) 7,931 projects	Kauai Island Utility Cooperative (HI) 1.5%	4
5	National Grid (MA) 123 W	San Diego Gas & Electric Company (CA) 307 W	Hawaiian Electric Company, Inc. (HI) 6,841 projects	Electrical District No. 3 (AZ) 1.3%	5
6	Arizona Public Service (AZ) 91 MW	Pacific Gas and Electric Company (CA) 281 W	Xcel CO - Public Service Co. of Colorado (CO) 6,257 projects	San Diego Gas & Electric Company (CA) 1.1%	6
7	Jersey Central Power & Light (NJ) 86 MW	Southern California Edison (CA) 211 W	National Grid (MA) 5,270 projects	Roseville Electric (CA) 0.9%	7
8	Tucson Electric Power Company (AZ) 73 MW	Hawaiian Electric Company, Inc. (HI) 192 W	Long Island Power Authority (NY) 4,741 projects	Pacific Gas and Electric Company (CA) 0.8%	8
9	NV Energy (NV) 71 MW	Maui Electric Company Ltd (HI) 191 W	Salt River Project (AZ) 4,109 projects	Trico Electric Cooperative, Inc. (AZ) 0.7%	9
10	El Paso Electric Co. (NM, TX) 63 MW	Tucson Electric Power Company (AZ) 178 W	Los Angeles Department of Water and Power (CA) 3,280	Southern California Edison (CA) 0.7%	10

The Utility Industry is Getting Increasingly Complex

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Drivers of Change

- Concerns About Climate Change
- Changing Consumer Service Expectations
- Improving Economics of New Technologies
- Concerns About Security & Resiliency

Societal Expectations

Legacy
- **Safe**
- **Reliable**
- **Least Cost**
- Economic Development

Plus, Recent
- **Cost Stability** and Predictability
- Proactive **Environmental** Stewardship
- Support for **DSM**

Plus, Emerging
- Support for **Self Generation**
- Support for **Transportation** Infrastructure
- Enabling **Choice**

Add'l Factors

- Obligation to Service / Universal Access
- Existing (Unquestioned) Cross-Subsidization
- Impact on Capital Availability and Cost
- Limitations on Data Availability & Tools

Regulatory Tools

Cost of Service Business Model

- Restructuring
- Competition
- Performance Trackers
- Decoupling

- Performance Based Ratemaking
- **What's Next?**

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Utilities are Responding to Customer Demand for Solar

Rate Reform	99% systems NEM 73% utilities exploring rate restructuring	• 55 utilities exploring value of solar tariffs • 32 utilities currently offer feed-in-tariffs
Grid Integration	122 exploring; 60 implementing 3 or more strategies	• Locational Deployment • Energy Storage • Advance Inverters • Solar Production Forecasting
Utility Ownership	Underserved markets Grid integration plays (smart inverters, location, etc.)	• IOUs: APS & TEP • Coop: Wright-Hennepin • Muni: CPS
Community Solar	Integration benefits Cost benefits Customer benefits	• At least 93 programs, 75% utility managed • 20% up from 2013
DER Program Integration	Grid benefits Superior customer returns	• One coop (MN) kicking off Water Heater Demand Response with Community Solar

Drivers for DG Market Growth

Core DG growth drivers:

Fundamental Economics

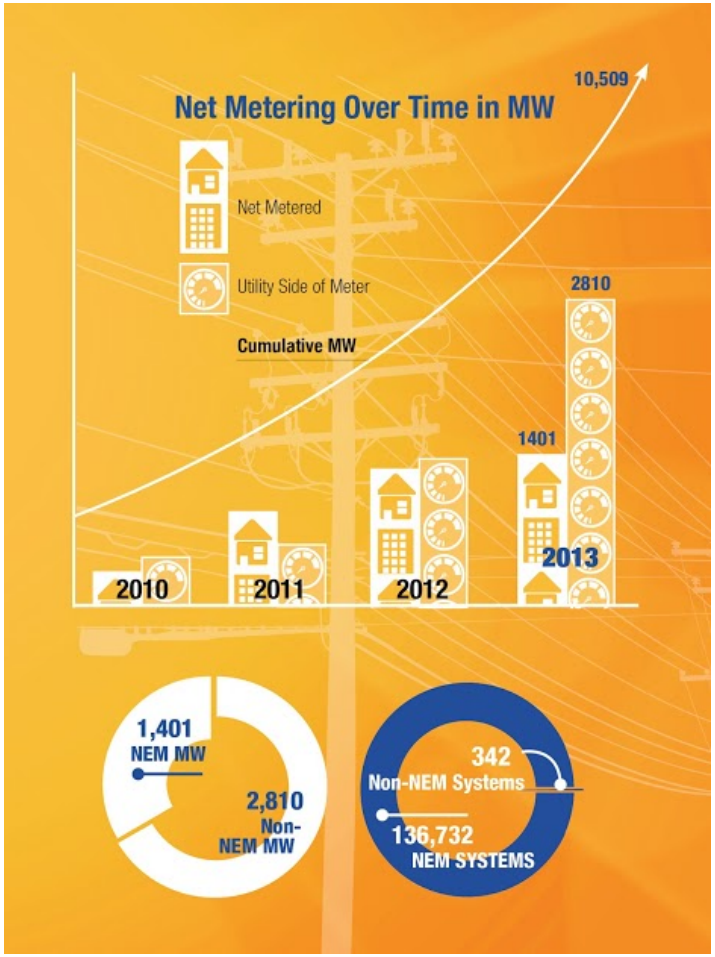
- Upward pressure on utility costs/rates
- Declining PV costs (60%/3 ys)

Policy

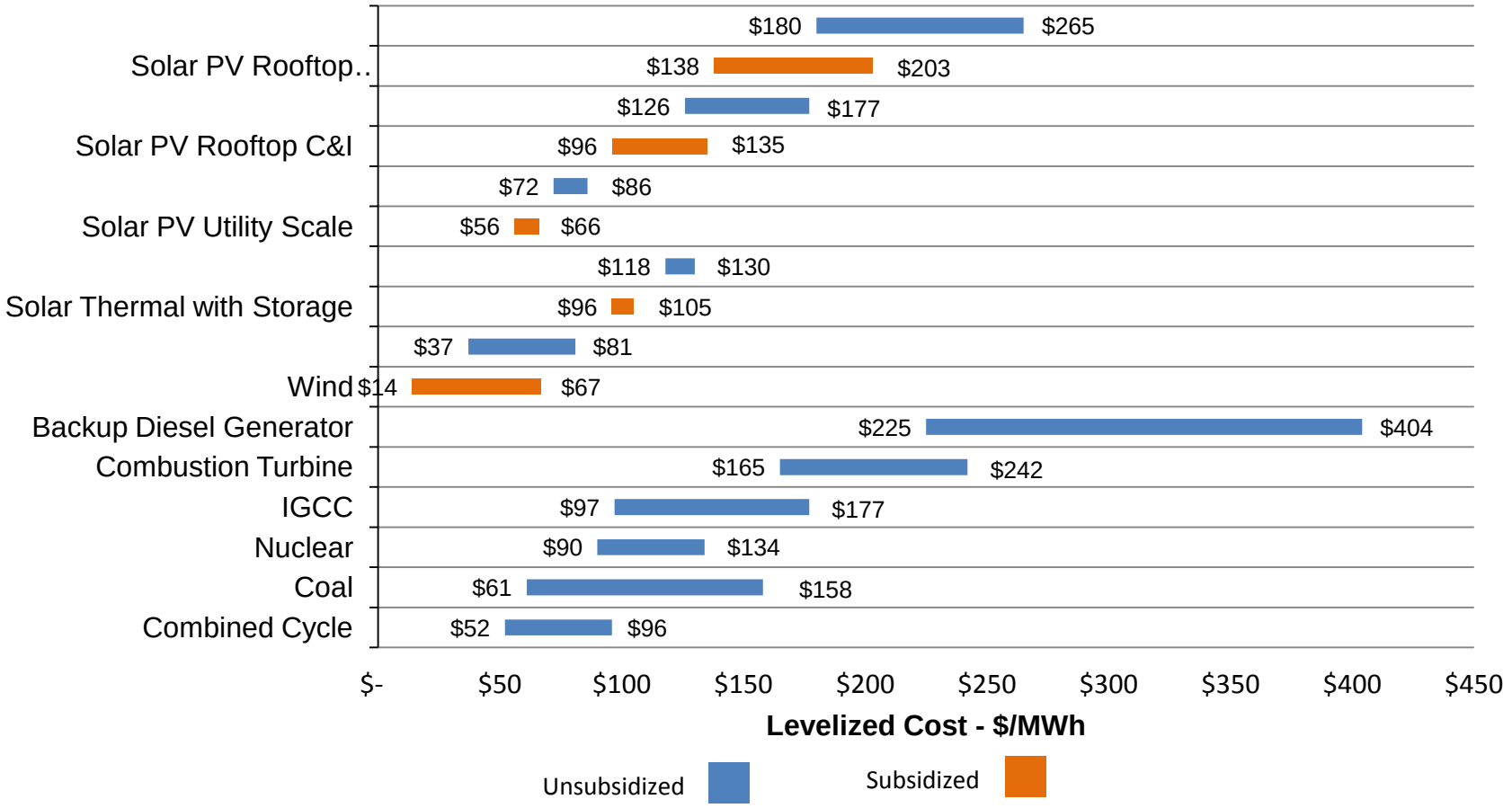
- State Renewable Energy Standards
- Net Metering
- Federal Incentives (ITC/MACRS)

Consumer Preference

- Innovation in customer financing (leases &PPAs)
  - Leveraging cost of capital to turn ROI to cash flow
  - Securitization & public funding
- Increasing demand by customers for choice



Renewable Technology LCOE

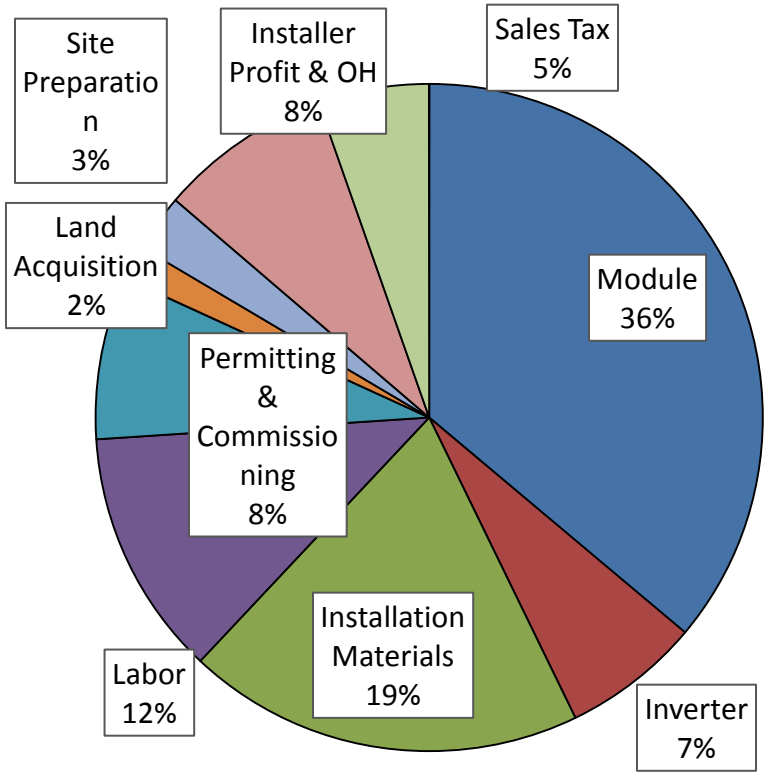


"Lazard's Levelized Cost of Energy Analysis – Version 8.0" (September 2014)

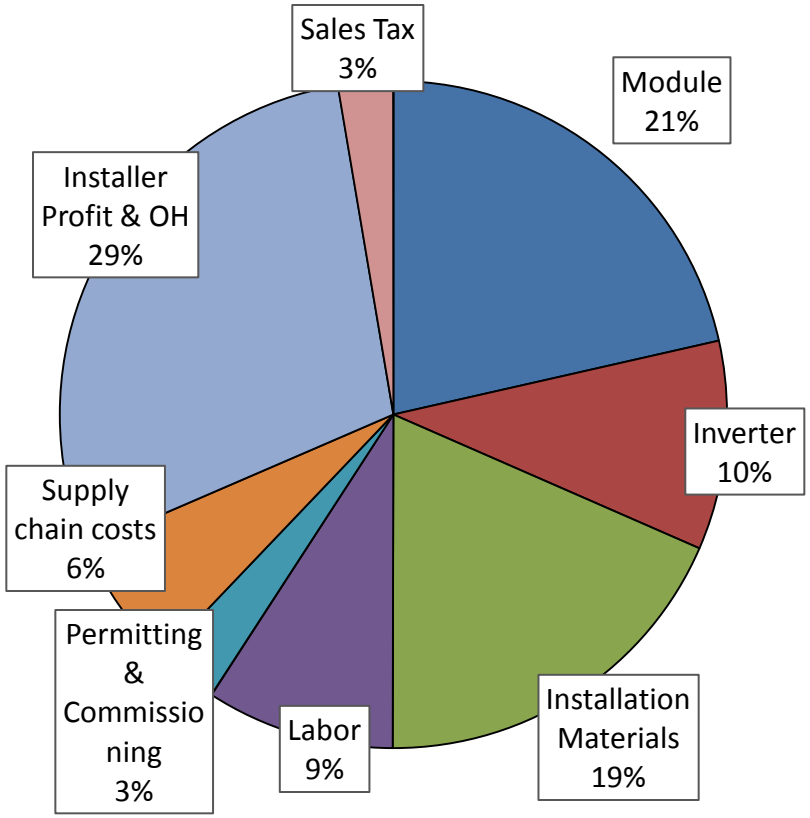
Cost Breakdown

30% of Residential Rooftop installed costs are profit/overhead-related compared to 8% for utility-scale

Utility-Scale Fixed – $1.80/W

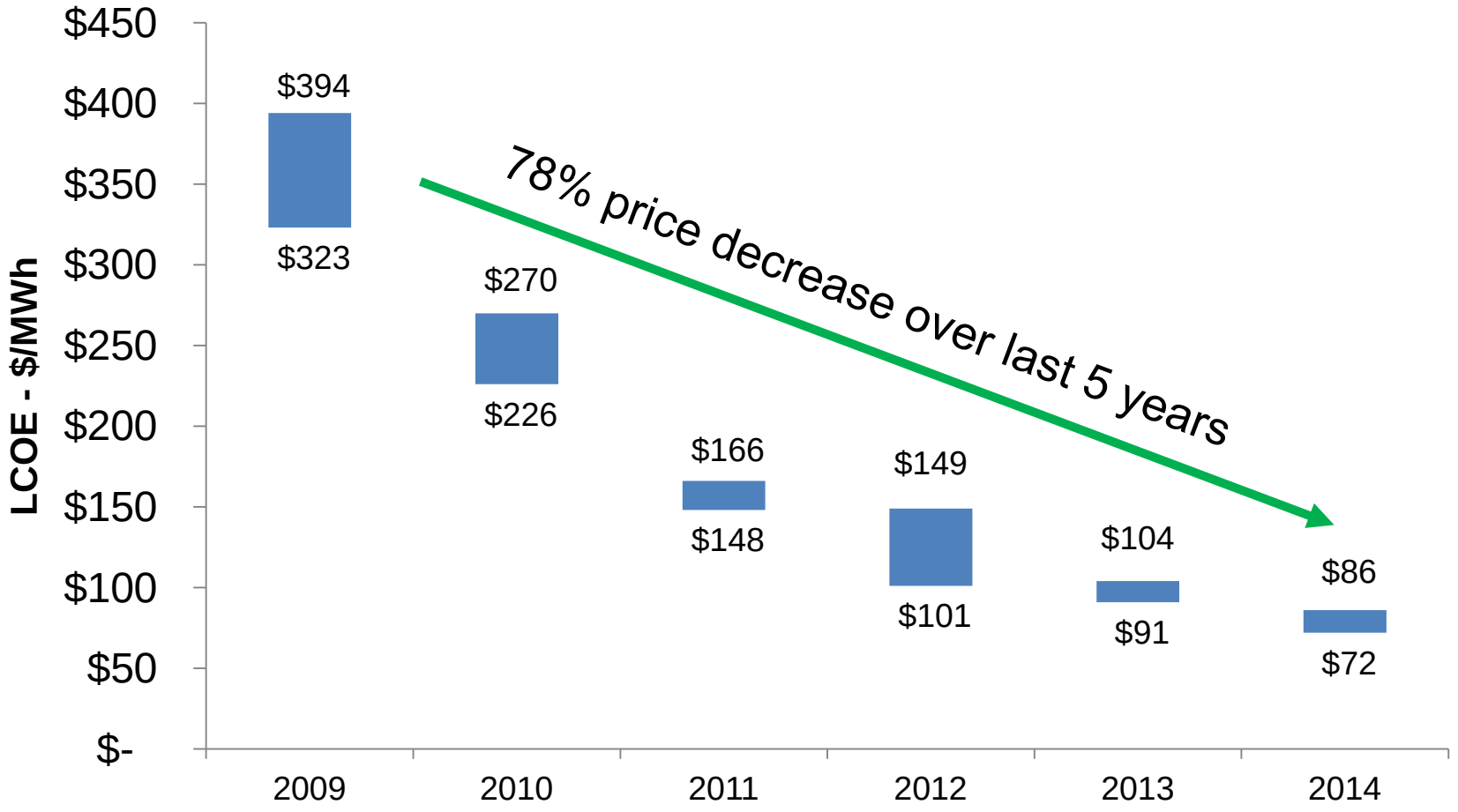


Residential Rooftop - $3.29/W



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Utility-Scale Solar PV LCOE



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