SEPA

solar electric power association

Helping Utilities Make Smart Solar Decisions

Perspectives on Grid-Parity in North America

November 27, 2012

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Solar Electric Power Association

Mission and Structure

SEPA is an educational non-profit (501 c3)

- Celebrating 20 years of service to utilities and solar
- Membership based - 1,000+ members
- Providing unbiased information focused on supporting utilities and their needs as they relate to solar adoption
- Providing exclusive member programming, research, education, collaboration and consulting services

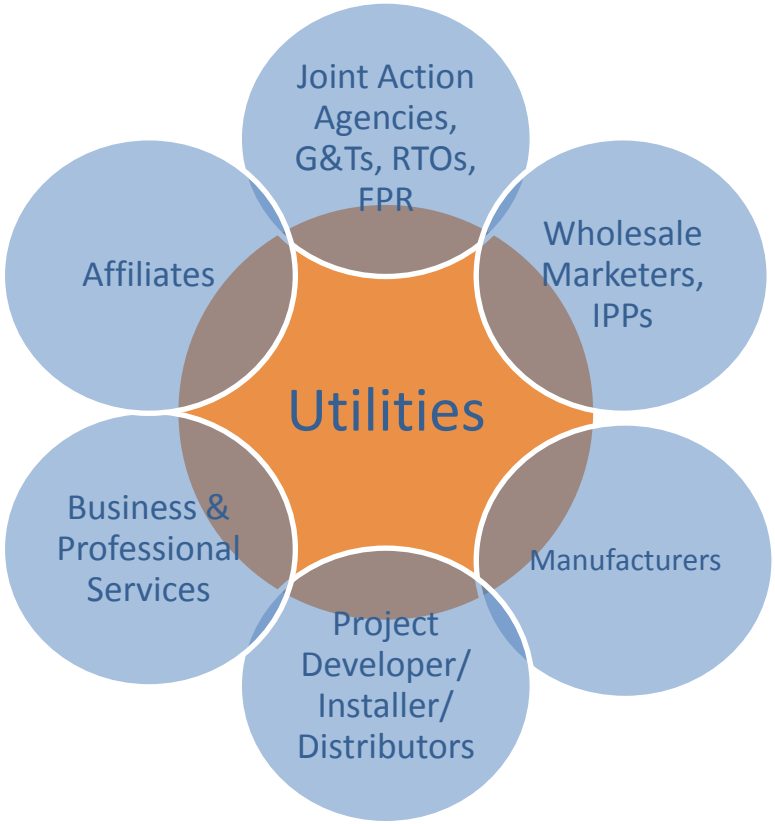
Membership

420+ Utility

500+ solar industry & stakeholder

52% of electricity customers

+90% of installed solar capacity



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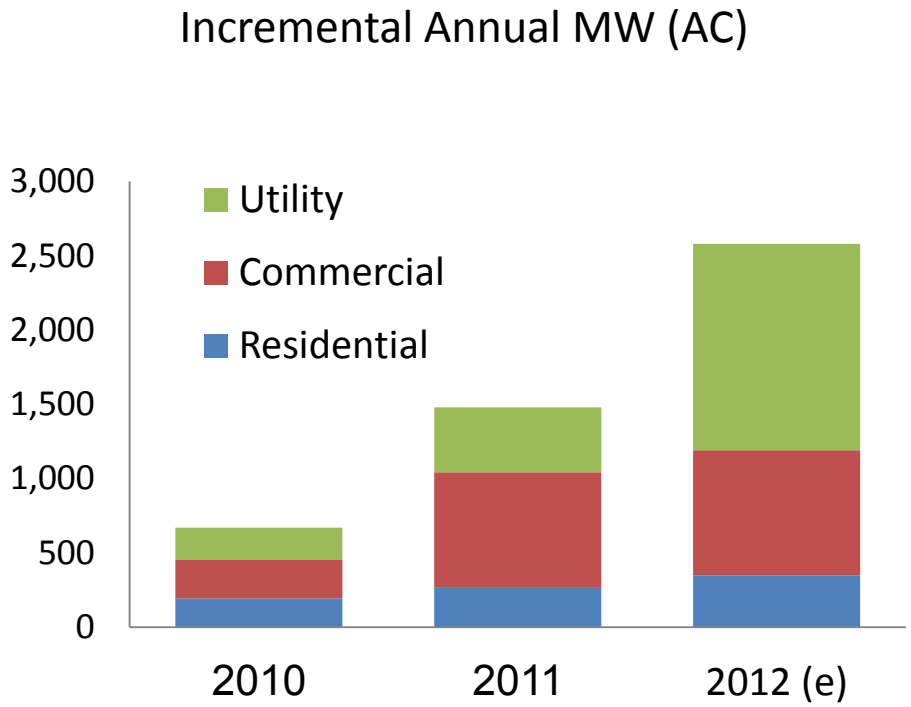
Aligning Solar and Utilities

Sampling of Members

U.S. PV Capacity Growth

Growth in PV Dominated in RPS States



Top Utilities (2011):
PG&E (CA) – 288 MW-ac
PSEG (NJ) – 181 MW-ac
APS (AZ) – 144 MW-ac
SCE (CA) – 139 MW-ac
ACE (NJ) – 61 MW-ac

Top States (2012):
California (Utility)
New Jersey (Commercial)
Arizona (Utility)
Nevada (Utility)
Massachusetts (Commercial)

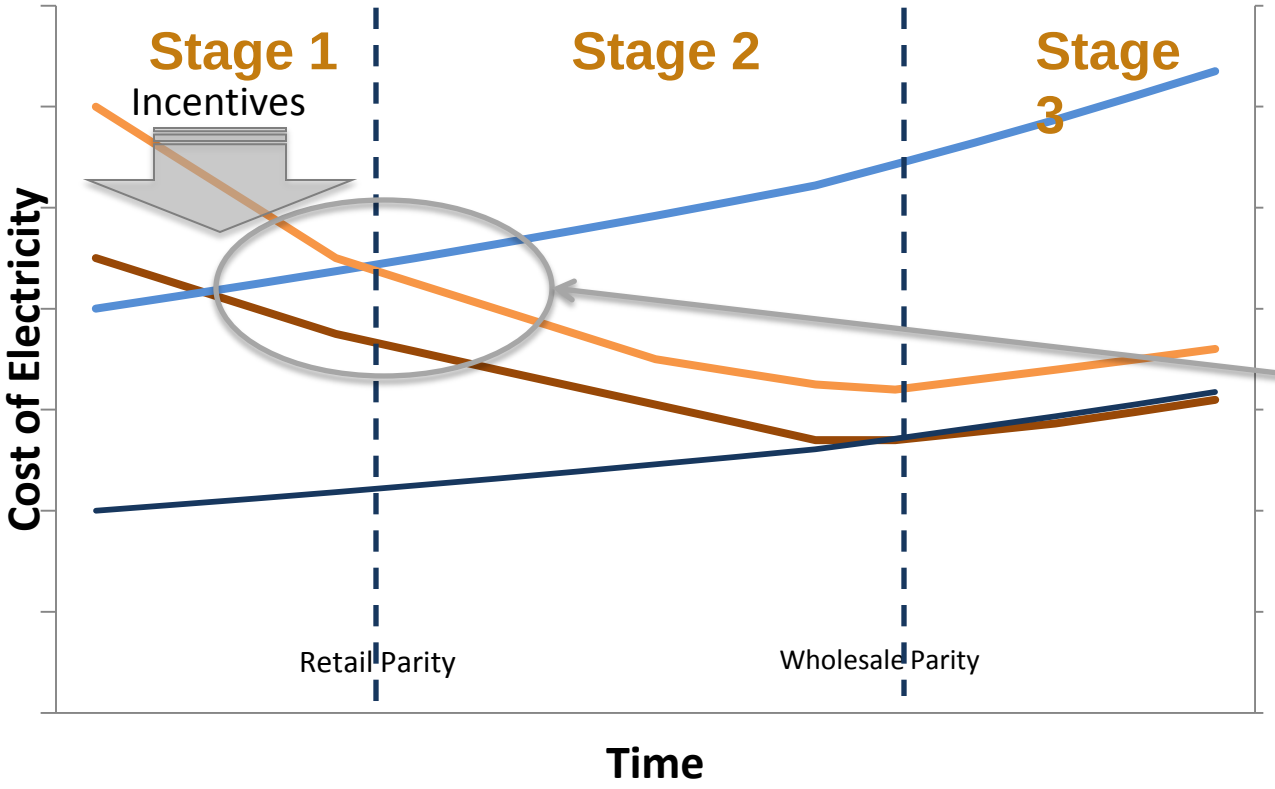
Cumulative 2012 (e):
6200 MW-ac

Utility acquisitions are driven by competitive procurement and consumer financed installations

Source: 2010 & 2011 – SEPA; 2012 estimate – GTM Research

PV Cost Inflection Points

Transitioning from Stage 1 to 2



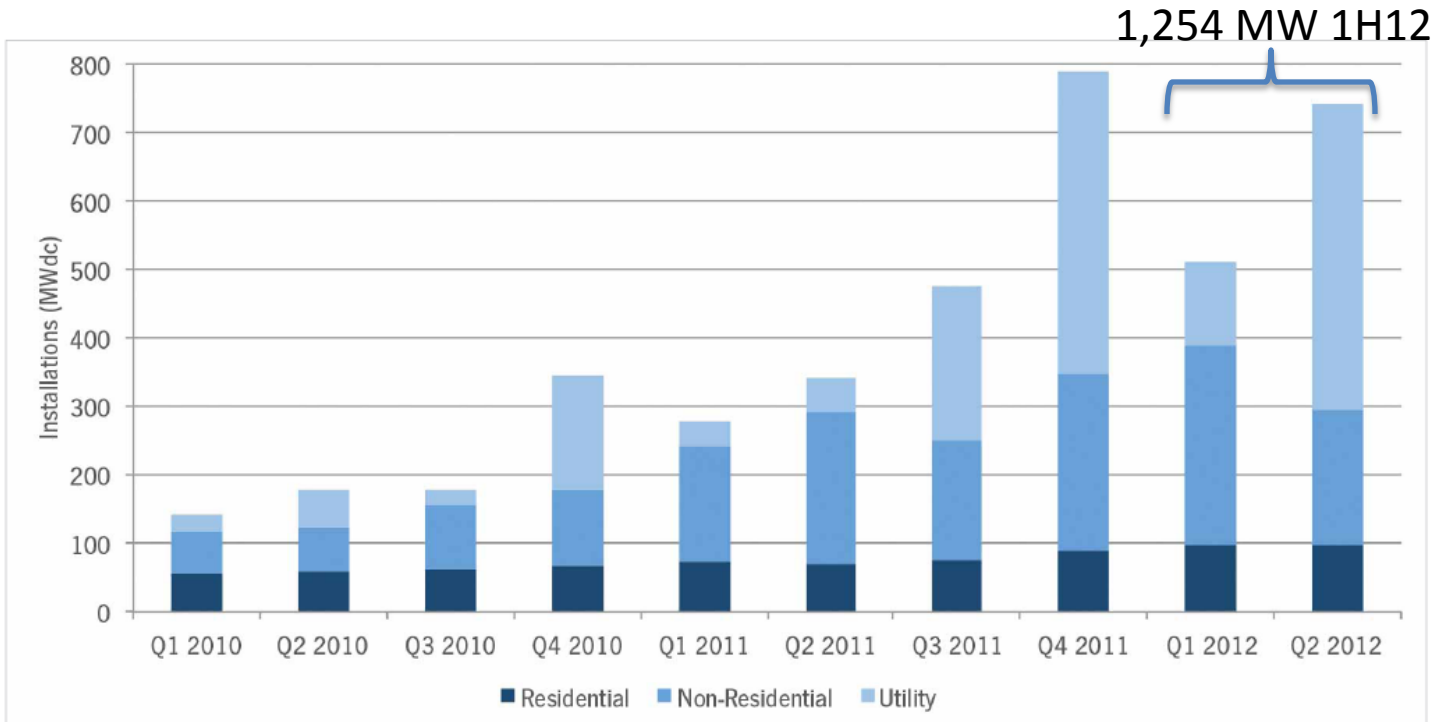
Market Observations

- ✓ Retail customers in select markets obtain **PV pricing below retail**
- ✓ PV pricing **meets peak wholesale rates** in southwestern states

The difference between wholesale and retail pricing is largely a reflection of utility generation, transmsion and distribution infrastructure fixed cost recovery

Installed Capacity by Segment

Customer-sited PV Demonstrates Steady Growth



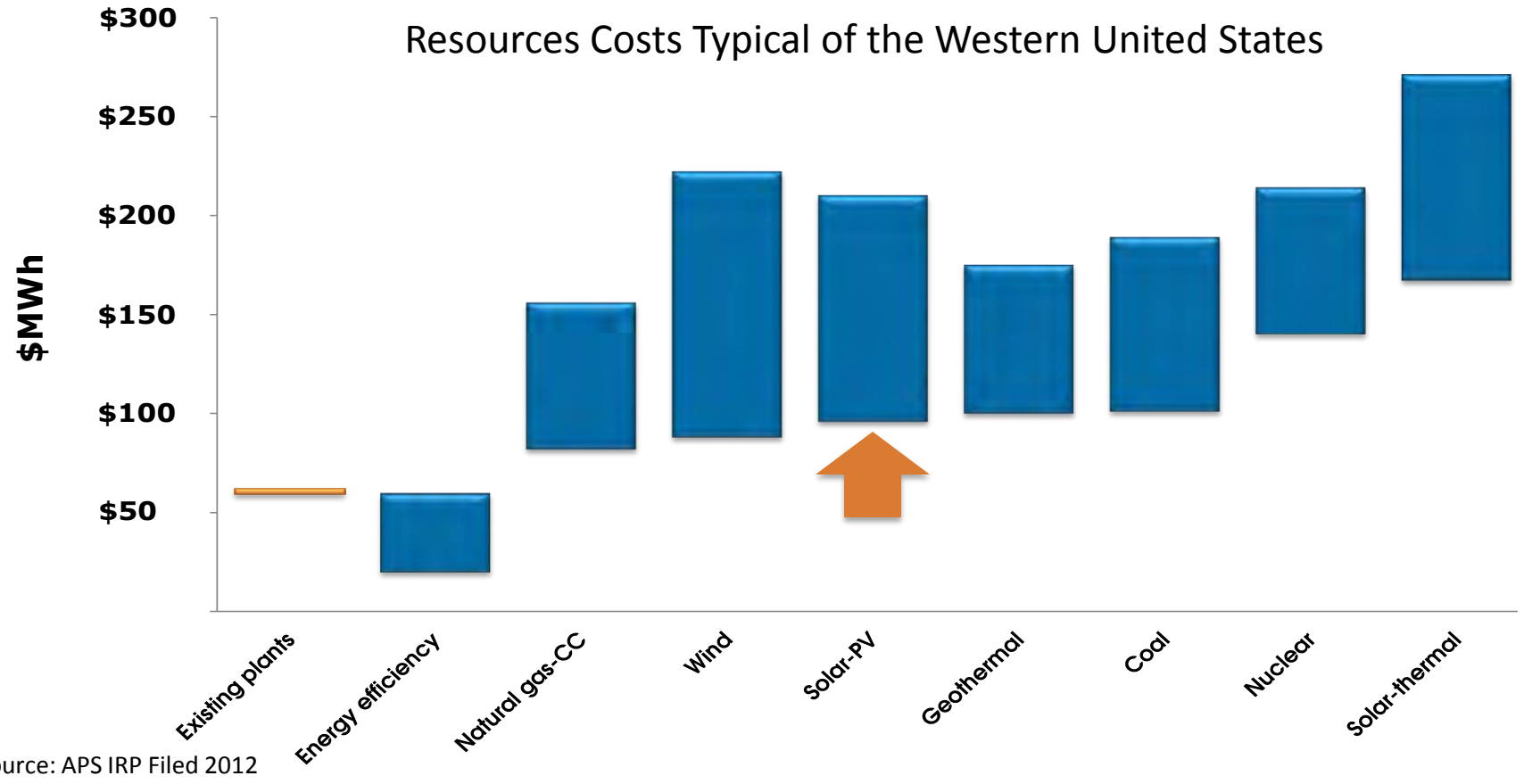
	Q1 2010	Q2 2010	Q3 2010	Q4 2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011	Q1 2012	Q2 2012
Residential	56.2	59.8	62.5	66.6	73.4	69.3	74.9	90.6	97.6	98.2
Non-Residential	62.5	64.4	93.8	112.1	168.1	223.8	174.7	257.4	290.8	196.3
Utility	22.3	55.3	22.0	166.9	38.0	50.1	227.1	443.3	123.6	447.3
Total	141.0	179.5	178.3	345.6	279.5	343.2	476.7	791.3	512.0	741.7

Source: GTM Research

Utility Resource Alternatives

Parity Implies Solar is Evaluated for Resource Fit

Solar producting is highest in regions where utilities observe late afternoon peaks



Source: APS IRP Filed 2012

Utility Resource Procurement

Will Price Declines Support Value-Based Procurement?

Utility procurement drivers:

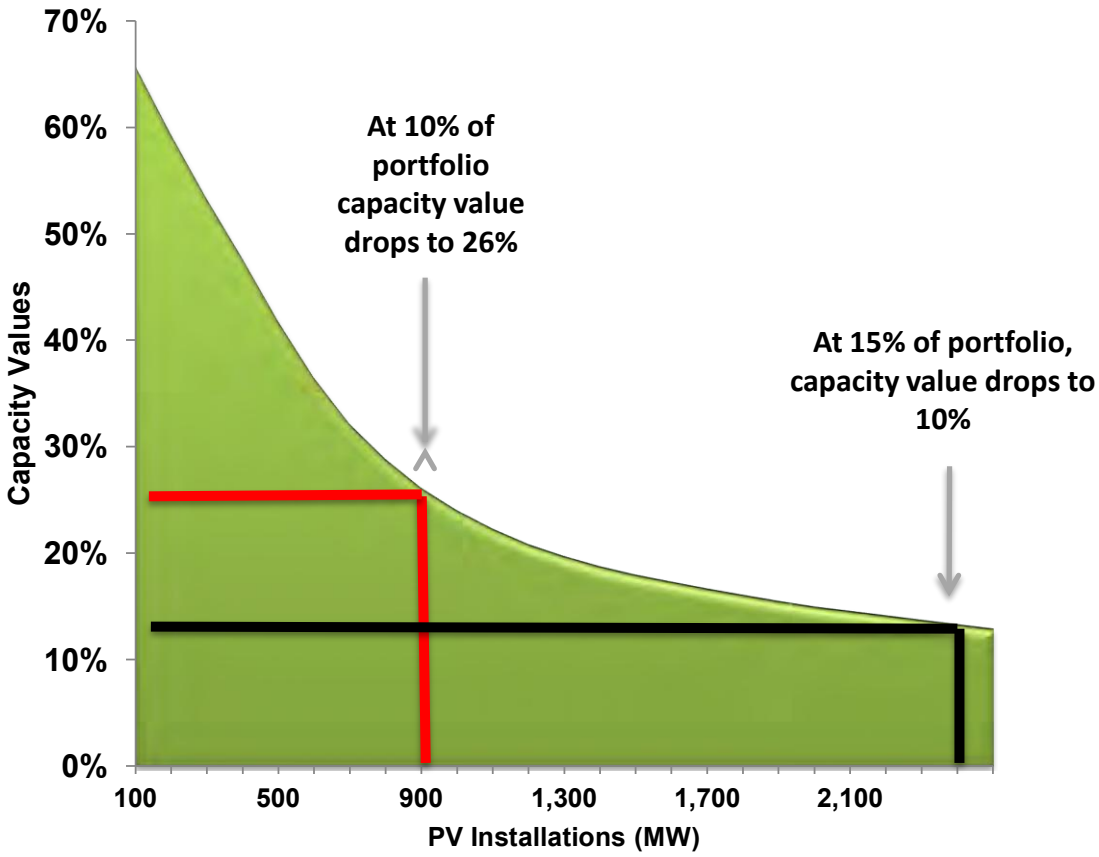
- Capacity needs
- Marginal energy
- Regulatory compliance

Challenges

- Increased penetration drives down capacity value
- Energy only prices may not support deployment
- Balancing resource investment with DG uncertainty, cost recovery and alternatives

Capacity Value Declines with Penetration

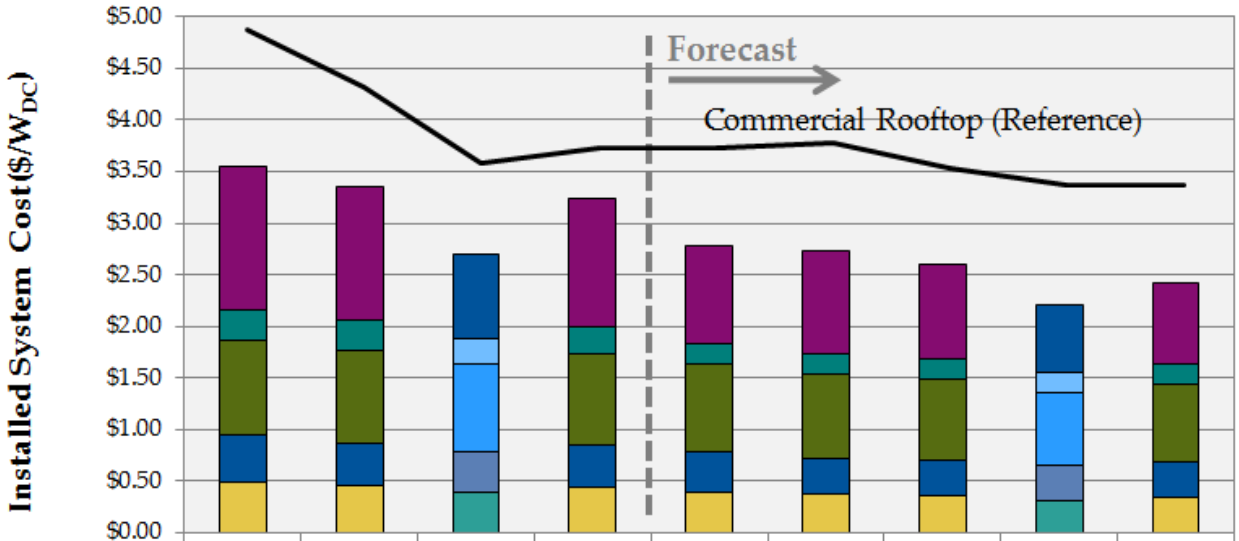
(Sample 9,000 MW Portfolio in the Southwest)



Source: APS IRP Filed 2012

Steady System Cost Declines

Balance of System Costs Remain Largest Opportunity



	2009	2010	Fixed 2011	Tracking 2011	2012	2013	2014	Fixed 2015	Tracking 2015
Total - Commercial	4.88	4.33	3.60	3.75	3.75	3.79	3.55	3.39	3.39
Total - Utility	3.55	3.35	2.70	3.24	2.78	2.73	2.60	2.21	2.42
Module	1.40	1.30	0.82	1.25	0.95	0.99	0.91	0.65	0.79
Inverter	0.29	0.29	0.25	0.25	0.20	0.20	0.20	0.20	0.20
Racking	0.92	0.90	0.85	0.89	0.85	0.81	0.78	0.70	0.75
Labor	0.45	0.40	0.40	0.40	0.40	0.35	0.35	0.35	0.35
Margin	0.49	0.46	0.38	0.45	0.38	0.38	0.36	0.31	0.33

Source: SEPA Pricing Bulletin

Balance of System Cost

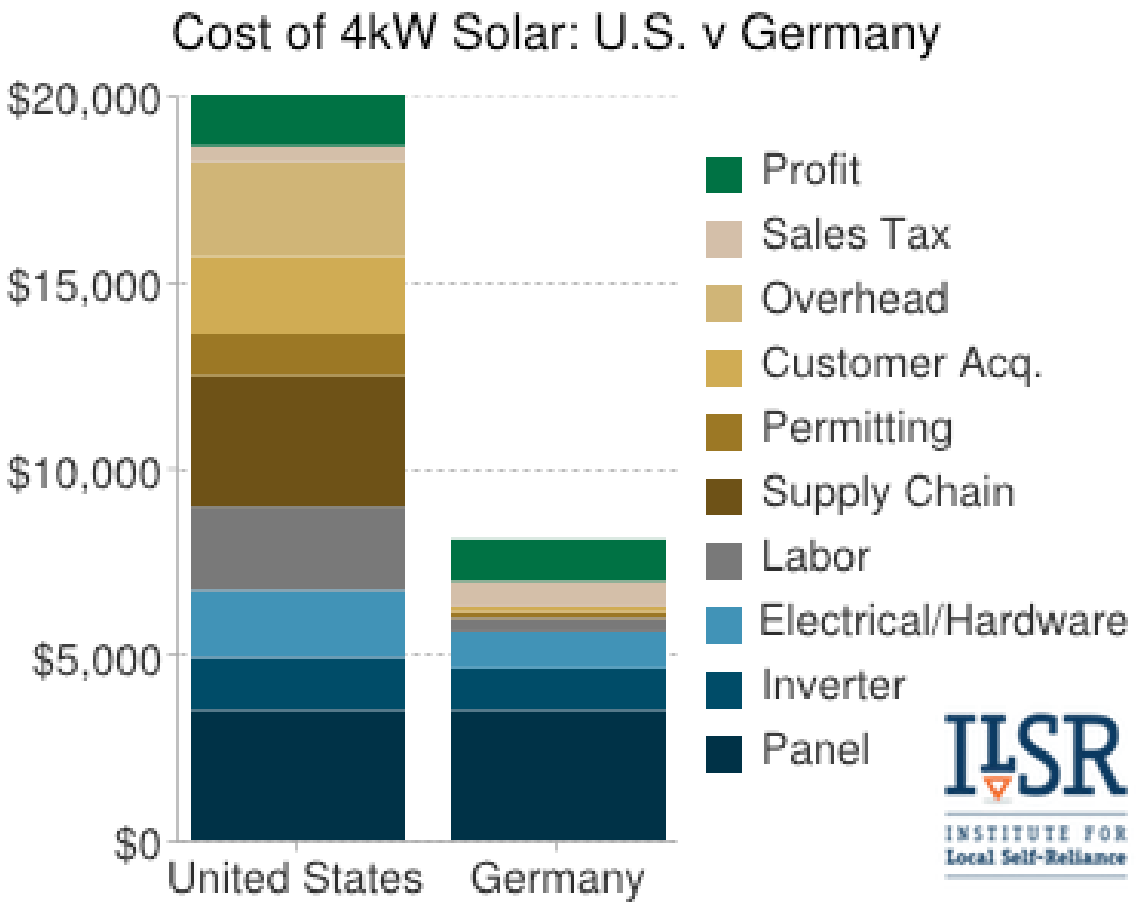
Systematic Changes are Needed to Impact BOS

Balance of system offers greatest opportunity for savings

- Customer acquisition costs are high
- Permitting delays and costs
- Local and state taxes

Inconsistencies between state and local utility markets

Alignment of interests



Closing the PV Price Gap

Incentive Models in North America

Investment Tax Credit

- Federal at 30 percent through 2015 and 10 percent beyond
- State tax-based incentives available in some states
  - Long-term uncertainty; limited tax equity available

Renewable Energy Credits (RECs)

- Bundled environmental attributes
- Compliance instruments for renewable portfolio standards (RPSs)
- Tradable in select markets
  - Regionally defined; limiting trading opportunities

Utility Sponsored Incentives

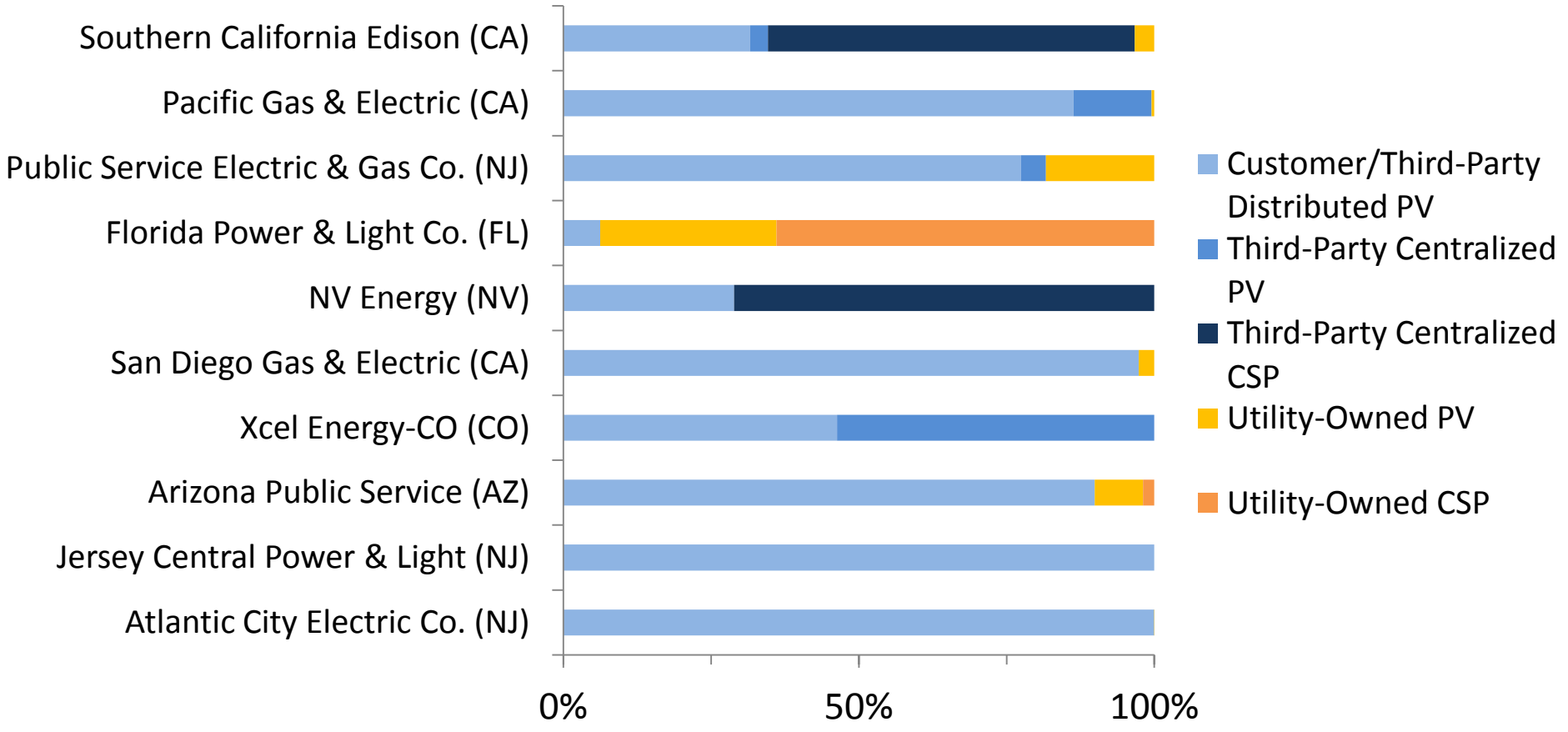
- Production-based incentives
- Capacity-incentives
  - Aimed primary at DG markets; rapidly diminishing; limited budgets – inconsistently available

Net-Energy Metering

- Retail energy credit for “behind-the-meter” PV resources
- Mandated/offered in 43 states
  - Significant tension for the current utility revenue and rate design model; not widely supported by utilities

Utility Portfolios – In Service

Distributed PV Fills Many Utility Portfolios



Source: SEPA Top 10 Annual Report

Utility DG Concerns

Behind-the-meter Generation: Tensions Amplified

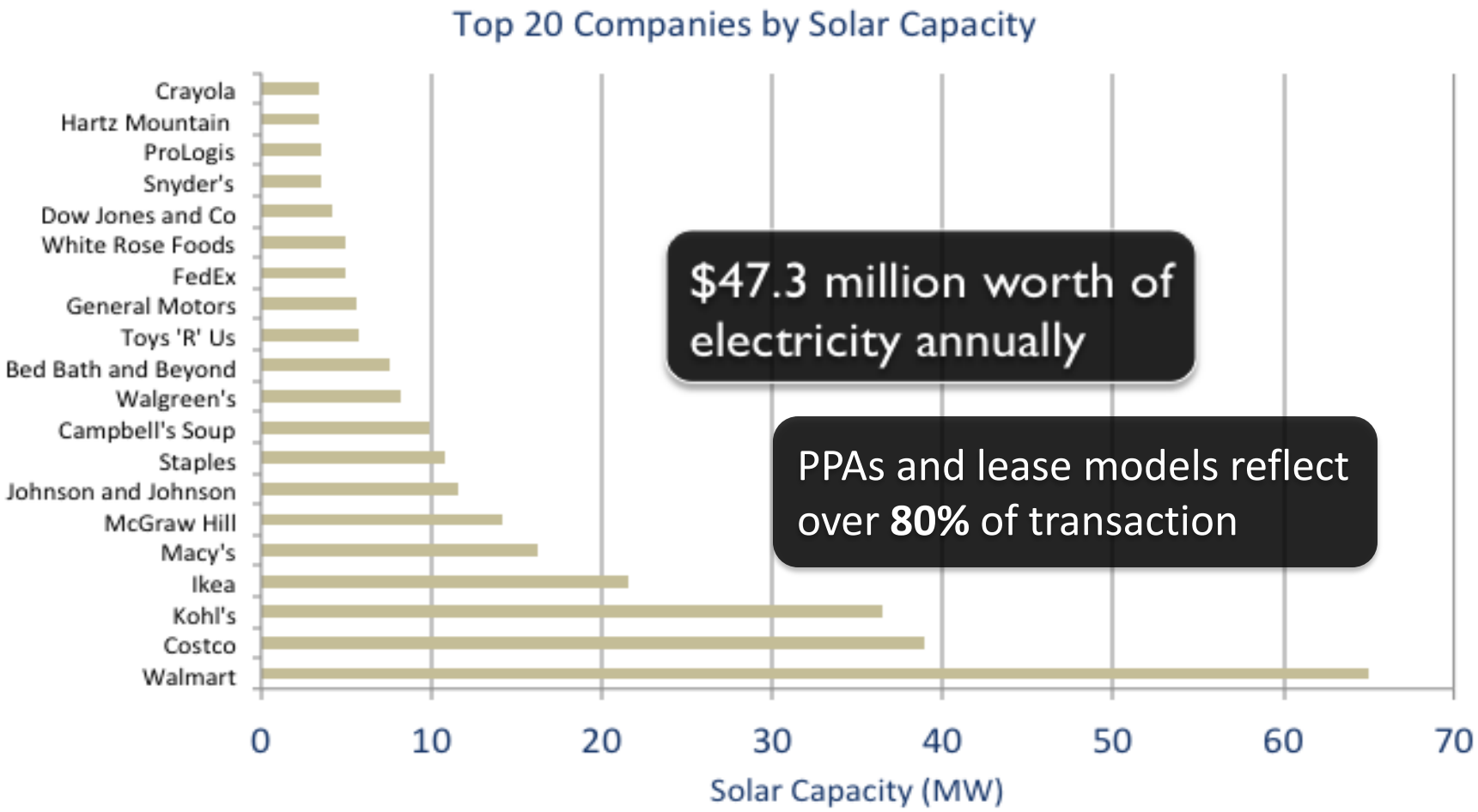
Solar DG presents utilities with dramatic issues and unprecedented opportunity…

- Customer experience management
  - Satisfaction tied to experience of "going solar"
  - Customers now perceive 'choice' in electricity source (including third-party providers offering innovative options)
- Net energy metering
  - Revenue loss
  - Cross-class subsidies and overall upward rate pressure
  - Transactional sustainability
- Distributed high penetration
  - Distribution grid operational concerns and needs
  - Efficient screening and grid management needs

…regulatory models will require adaptation to accommodate rate-making and oversight to reflect DG…regulatory change is slow with limited motivation…

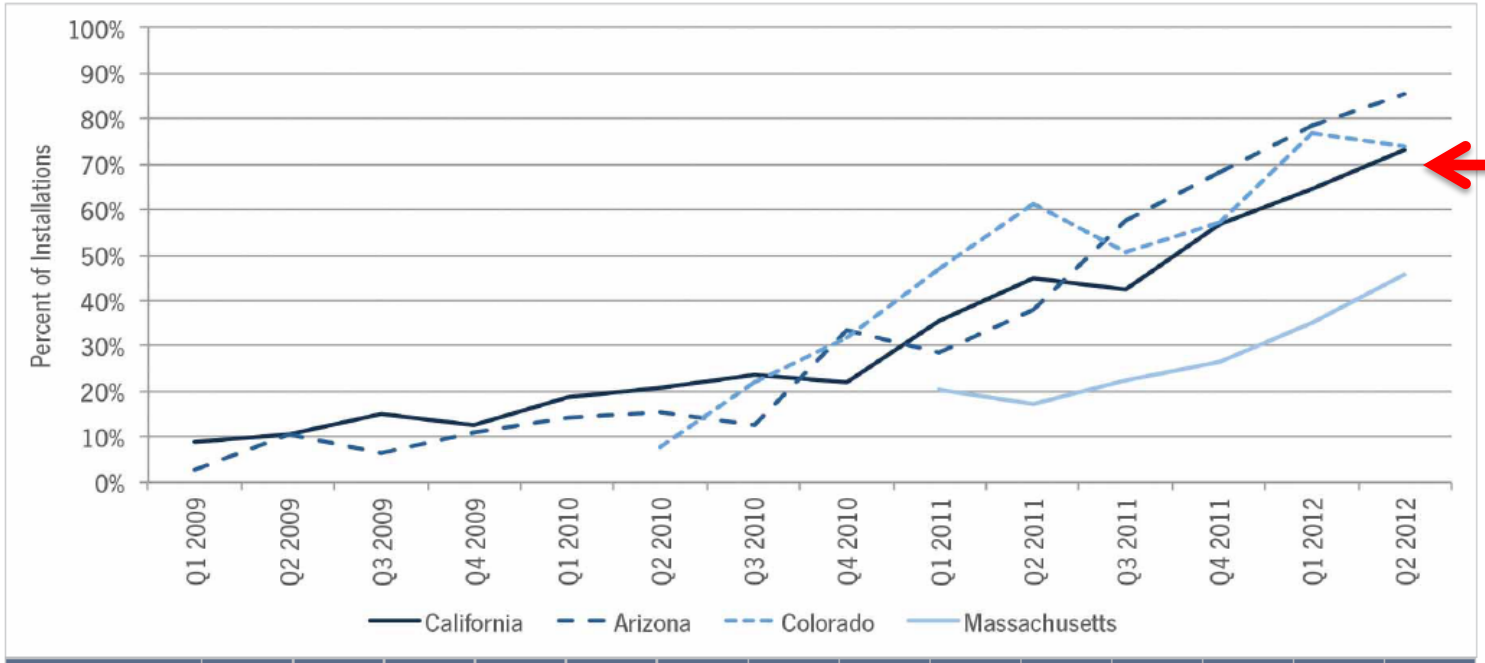
Commercial Deployment

Fueled by Favorable IRRs and Hedge Based-Drivers



Residential Third Party Ownership

Leasing and PPA Models Increase Domination



70%

Res Third-Party Market Share	Q1 2009	Q2 2009	Q3 2009	Q4 2009	Q1 2010	Q2 2010	Q3 2010	Q4 2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011	Q1 2012	Q2 2012
California	8.7%	10.7%	15.2%	12.6%	18.8%	20.7%	23.5%	22.1%	35.7%	44.9%	42.6%	56.7%	64.4%	73.3%
Arizona	2.6%	10.5%	6.3%	10.9%	14.4%	15.4%	12.7%	33.4%	28.5%	38.1%	57.5%	68.4%	78.3%	85.5%
Colorado	--	--	--	--	--	7.8%	21.9%	31.7%	46.9%	61.2%	50.5%	57.1%	76.7%	73.8%
Massachusetts	--	--	--	--	--	--	--	--	20.2%	17.2%	22.4%	26.5%	35.1%	45.9%

Net-Energy Metering

Behind the Meter Energy Transactions

Today 43 states and over 400 utilities offer some form of net energy metering…

Origin of net metering

- Complex utility procurement limited customer access to energy transactions
- Poor alignment around customer interests
- Easy of communication
- Perceived transparency

Why net metering "made sense"

- Easily explained to the customer
- Reasonable "market building" at low penetration
- Clear alignment between regulators and customers

Signals for reconsidering net metering in its current format

- PV cost declines and upward rate pressure sending poor market signals to customers/developers
- Utility cost recovery impacts become significant
- Incentives within net metering are material but not explicitly demonstrated
- Customers and PV market have gained enough sophistication to understand alternatives

…what is the likelihood of every instance offering customers the "right" compensation?

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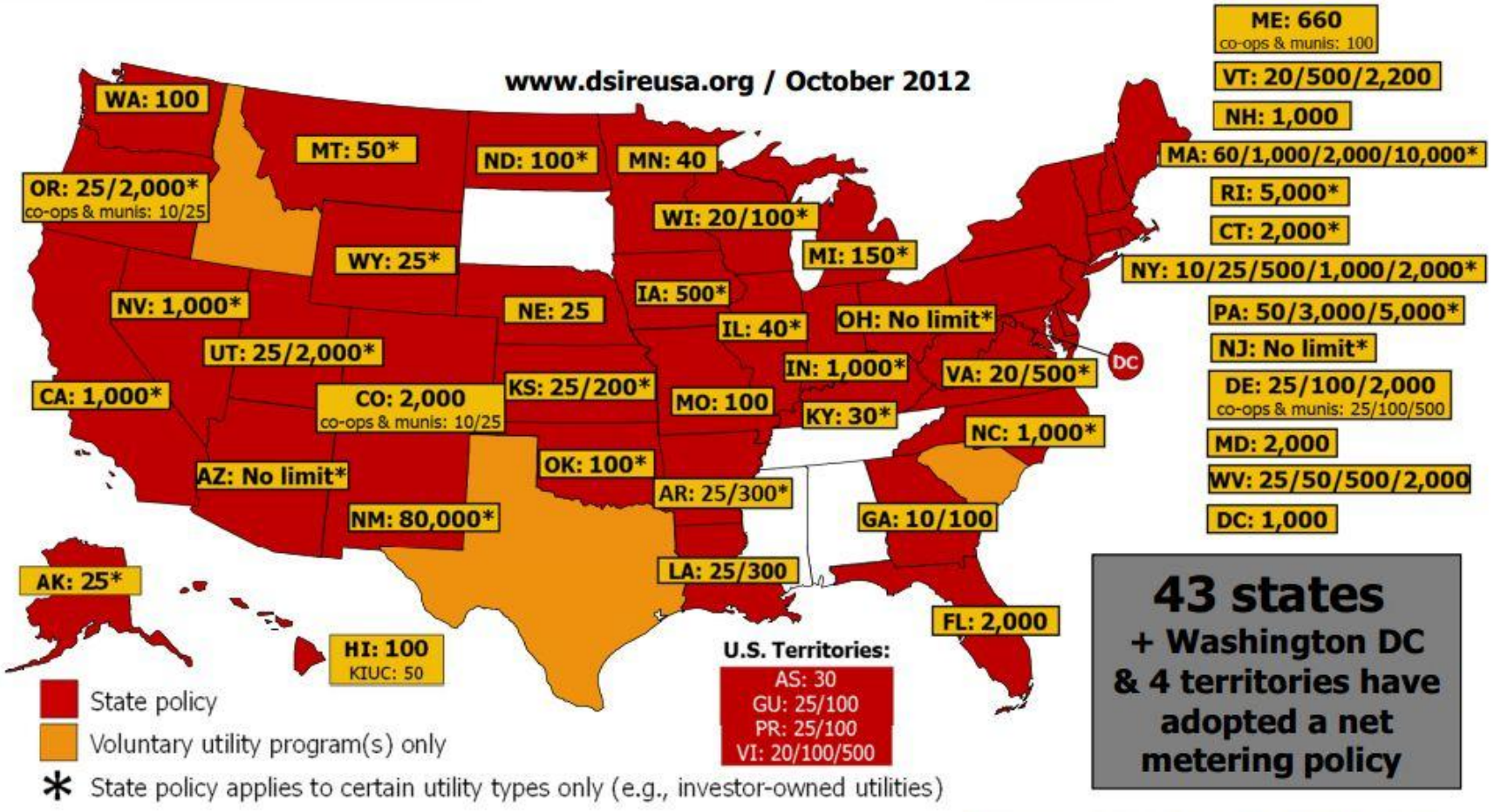
Net-Energy Metering

Models Differ, but Utility Implications are Consistent



Note: Numbers indicate individual system capacity limit in kilowatts. Some limits vary by customer type, technology and/or application. Other limits might also apply. This map generally does not address statutory changes until administrative rules have been adopted to implement such changes.

Beyond Net-Energy Metering

Objectives and Considerations

Objectives in designing NEM alternatives

1. Quantify the system value of the distributed solar resource
2. Establish a transaction model that supports solar and customers
3. Maintain transactional and operation simplicity
4. Build a model that allows for DG development to minimize cross-class subsidies
5. Maintain reliable recovery of utility infrastructure costs

Considerations in moving forward

- The solar industry has grown dependent on net metering, both economically and from a sales simplicity perspective
- Customer's perceive the right to produce and receive compensation
- Solar is viewed by consumers as a premium resource…perhaps beyond its avoided cost
- System impacts and operational complexity perceived by the market as utility objection to solar and energy "progress"

Value of Solar Transaction

Reinventing the Feed-in Tariff for the US

VOS transaction is based on a rate, established by the utility, reflecting the benefits and costs of distributed PV resources which is offered to customers in exchange for PV energy produced at their homes and/or businesses – a value-based FiT

Attributes of the VOS transaction model

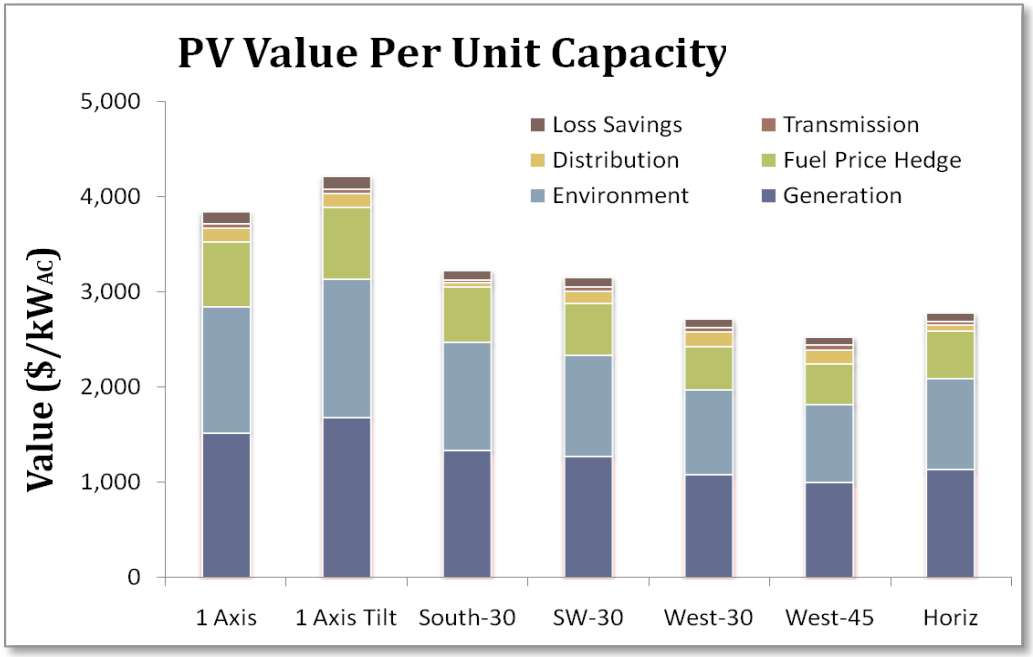
- Rate is established through **transparent repeatable analysis**, potentially annually
- Customer continues to **pay full retail rate** based on consumption
- PV systems are interconnected on the "**utility-side" of the meter**
- PV system **production** individually **monitored** by the utility
- Customers are **compensated** based on system product and the **VOS rate**
- **Market** analysis is used to **establish incentives** to facilitate PV market by filling the economic gap, if necessary
- **Incentive** program design demonstrates support and **designed declines**, if necessary
- VOS sends appropriate market signals
- VOS can be established for the system as a whole, or it **can be designed** to send **specific locational signals**
- **Maintain simplicity** for both communications and transaction administration

Establishing the VOS

Utility Specific Analytics and Valuation

Utility value components

- Loss savings
- Energy
- Generation capacity
- Fuel price hedge
- T&D capacity and deferral
- Environmental



Locational high resolution solar data and system specific characteristics are necessary to fully capture the VOS, these are not easily obtained or ecomonically repeated in-house without leveragin new planning models

Closing Thoughts

Maintaining Parity and Delivering Solar

- PV deployment in the US will demonstrate continued steady growth even under “parity”
  - Procurement will slow into 2014 if ITC uncertainty is not addressed, or cost declines do not fill the gap
- Distributed generation will drive utility rate and regulatory reform
  - Current net-energy metering models are not sustainable
  - Utilities are struggling to address market pressure and opportunity
- Within utility resource planning, diminishing capacity value may outpace cost declines
  - Collaboration aimed at siting optimization to capture locational benefits may return resource value
  - Models to asses locational value are immature

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Thank You

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