The Impact of Energy and Electricity System Trends on RPS Implementation

Utility Planning for the Future

Tanuj Deora

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Smart Electric Power Alliance

About SEPA

Smart Electric Power Alliance

SEPA's mission is to facilitate the utility industry's smart transition to a clean energy future through education, research, and collaboration.

COMMUNITY

Members, Events, USC, Fact Finding Missions, Partnership Opportunities, Power Player Awards

DATA

USD, Solar Calculators, Mapping Tools, Research Reports, Project and RFP News, Custom Research Solutions

INSIGHTS

Advisory Services, Webinars, Workshops, Case Studies, SEPA Publications, Blog, Expert Commentary

What’s On Utilities’ Minds

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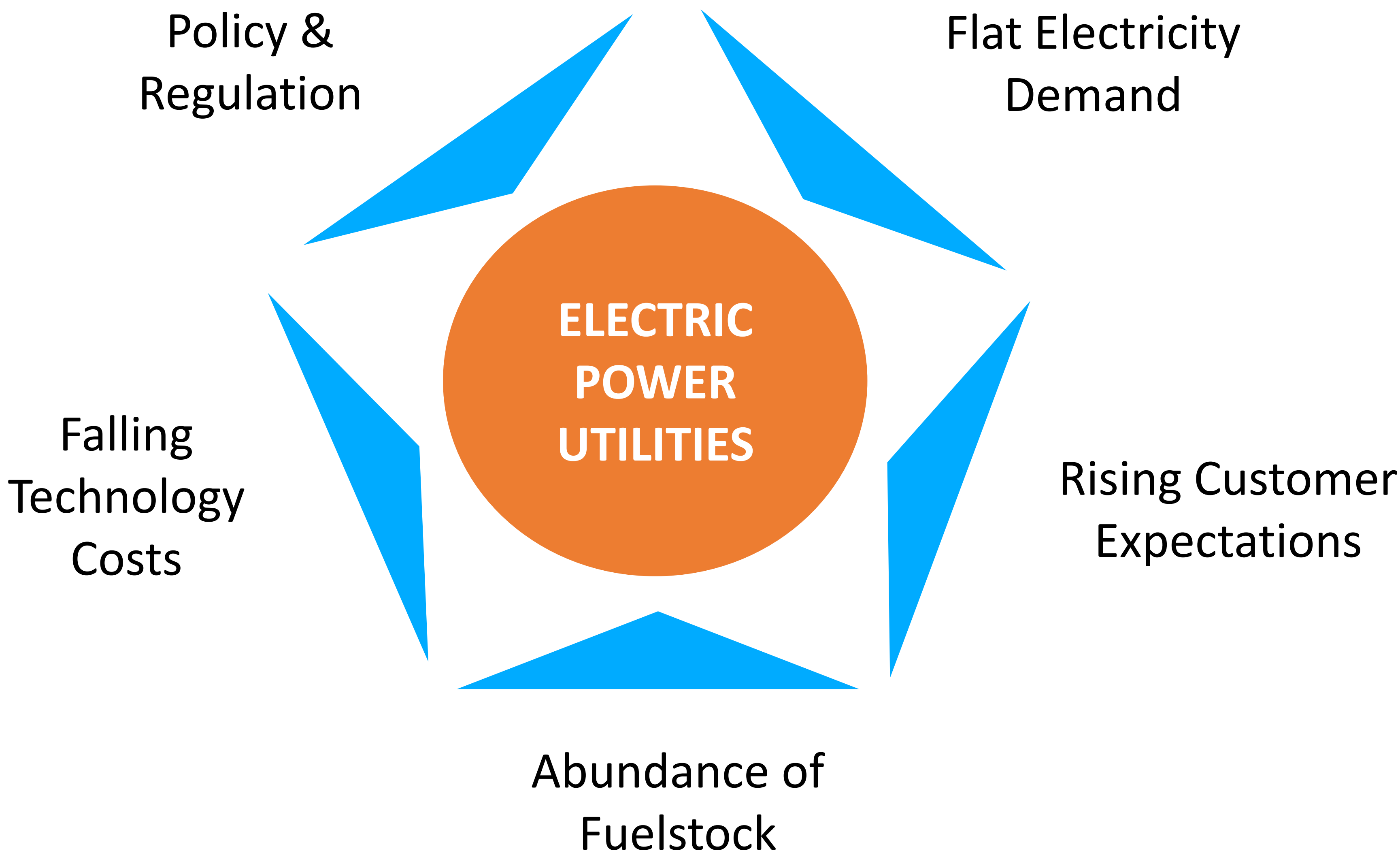

Drivers for rooftop solar market growth

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Falling Cost

- Upward pressure on utility costs (& rates) improves economics
- Declining PV costs

Policy & Regulation

- RPS policies, targets, and solar carve-outs
- Policy- and program-driven incentives

Customer Expectations

- Innovation in customer financing (leases, PPAs)
  - Transforming customer investment drivers from ROI to cash flow-based investments
  - Securitization and public funding
- Increasing demand by customers for choice

All-in turn-key costs for solar PV in the US, 2015

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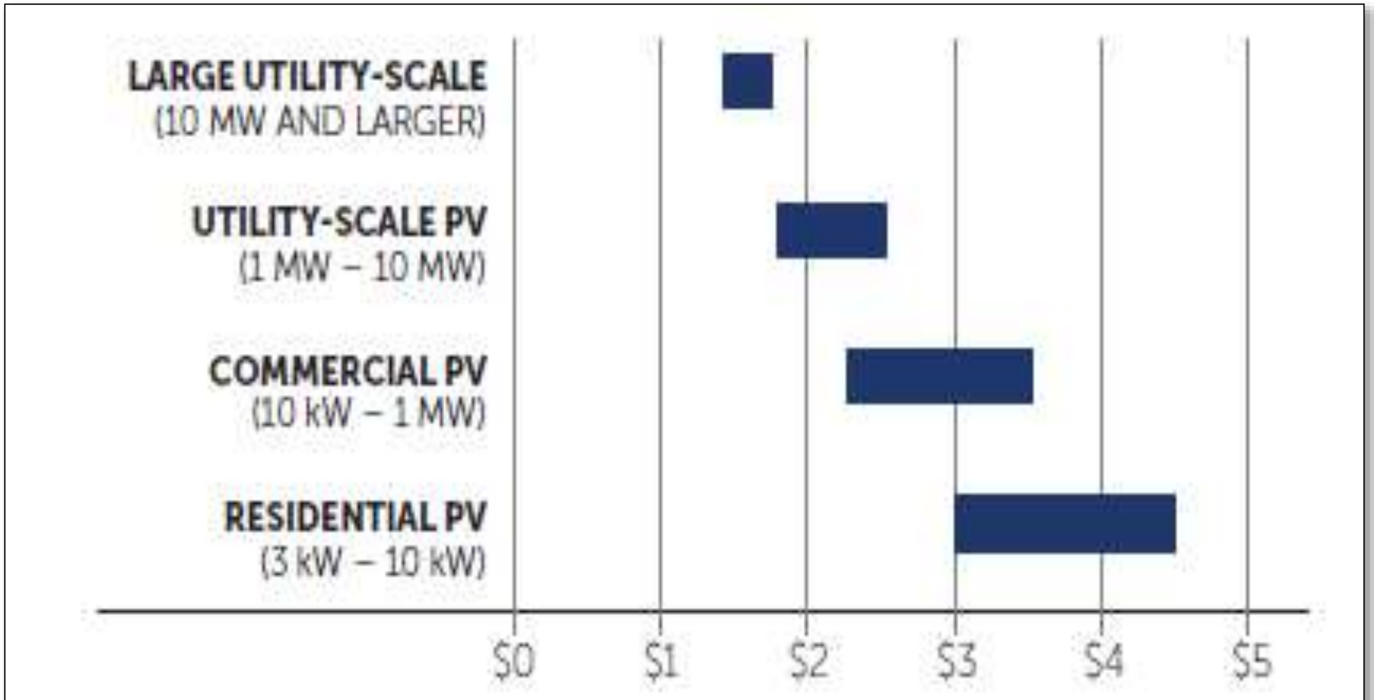

- Residential pricing has been quoted as low as $2.50/W
- FirstSolar expects $1/W for large scale by 2017

US pricing varies significantly by state, and is generally higher than many other countries by as much as 50% in the residential market

Sources: SEPA "2015 Utility Solar Marketplace Snapshot," Data from EnergySage & Mercatus

Solar has grown, and utilities respond

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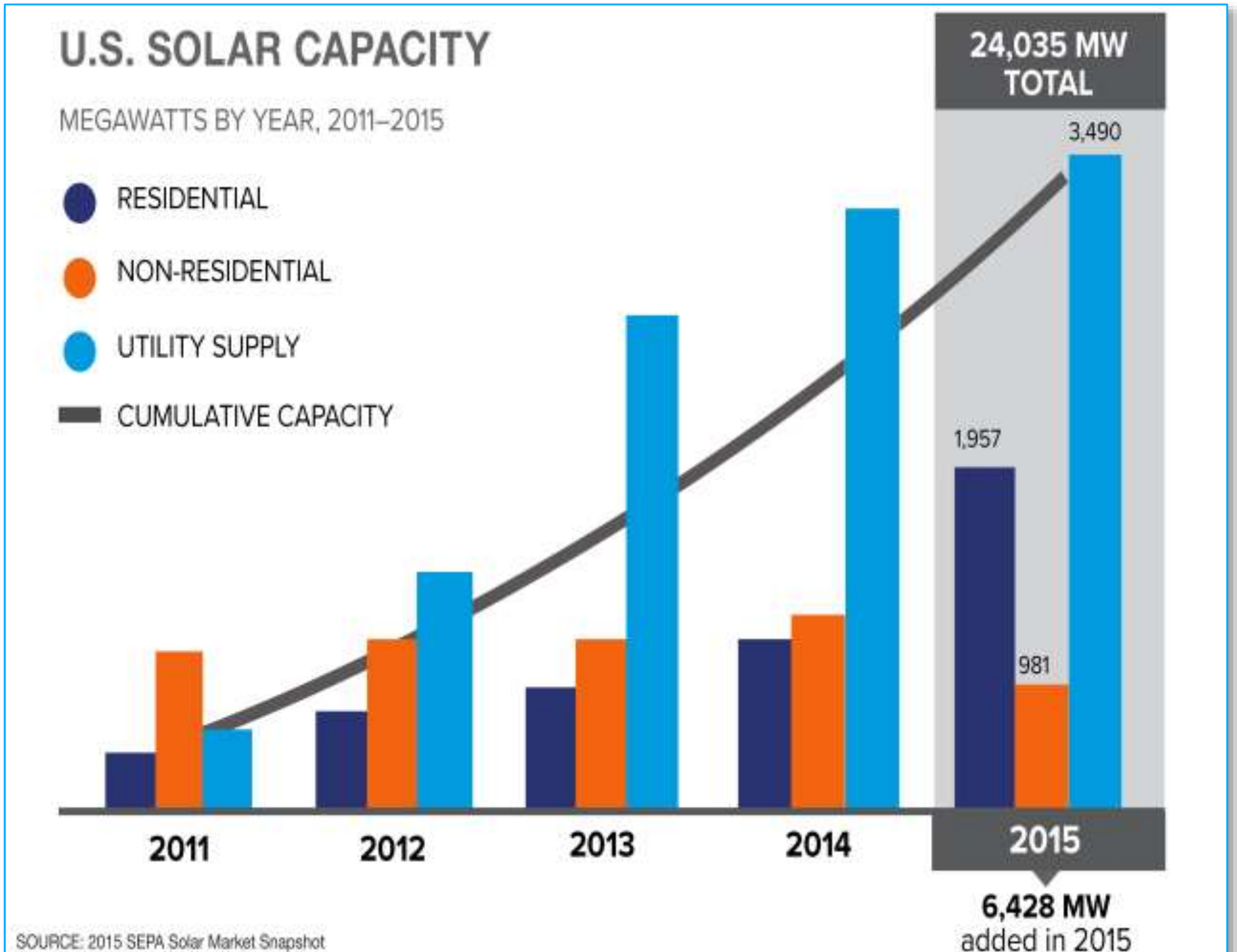
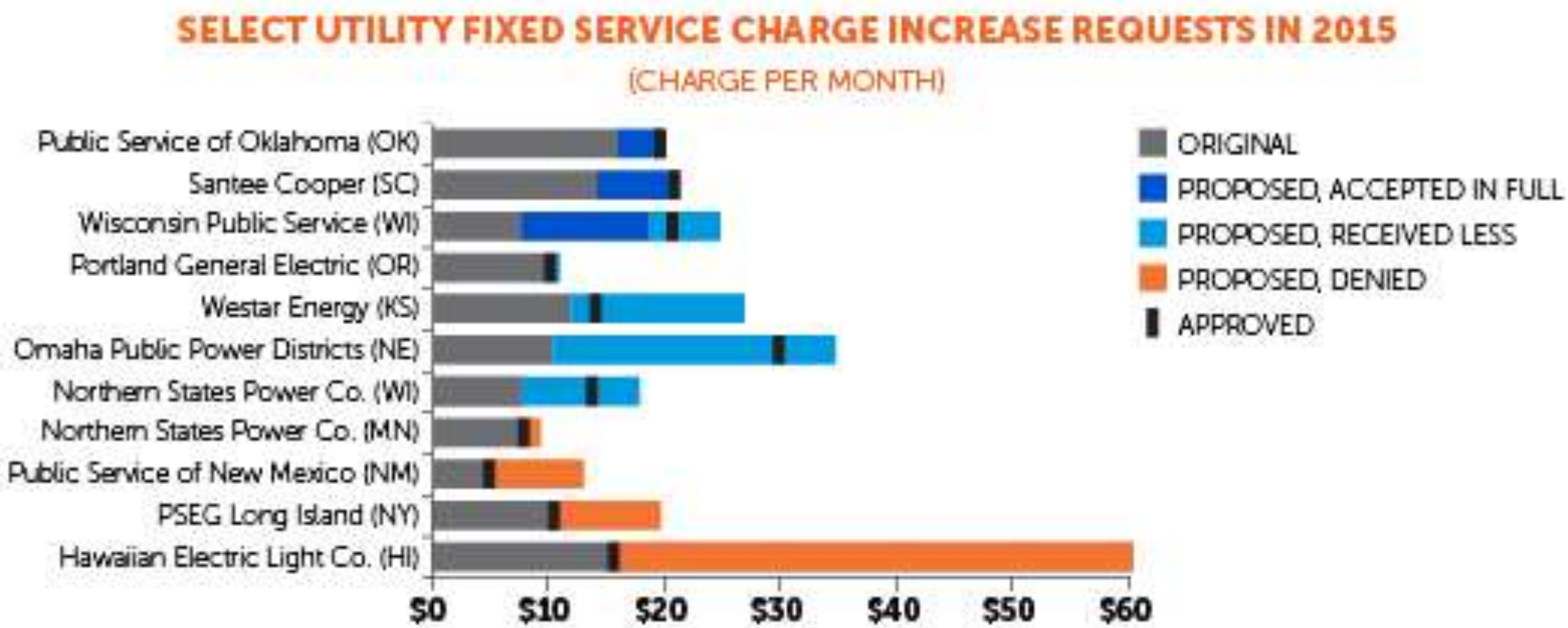


Mainstream Utility Solar Strategies:

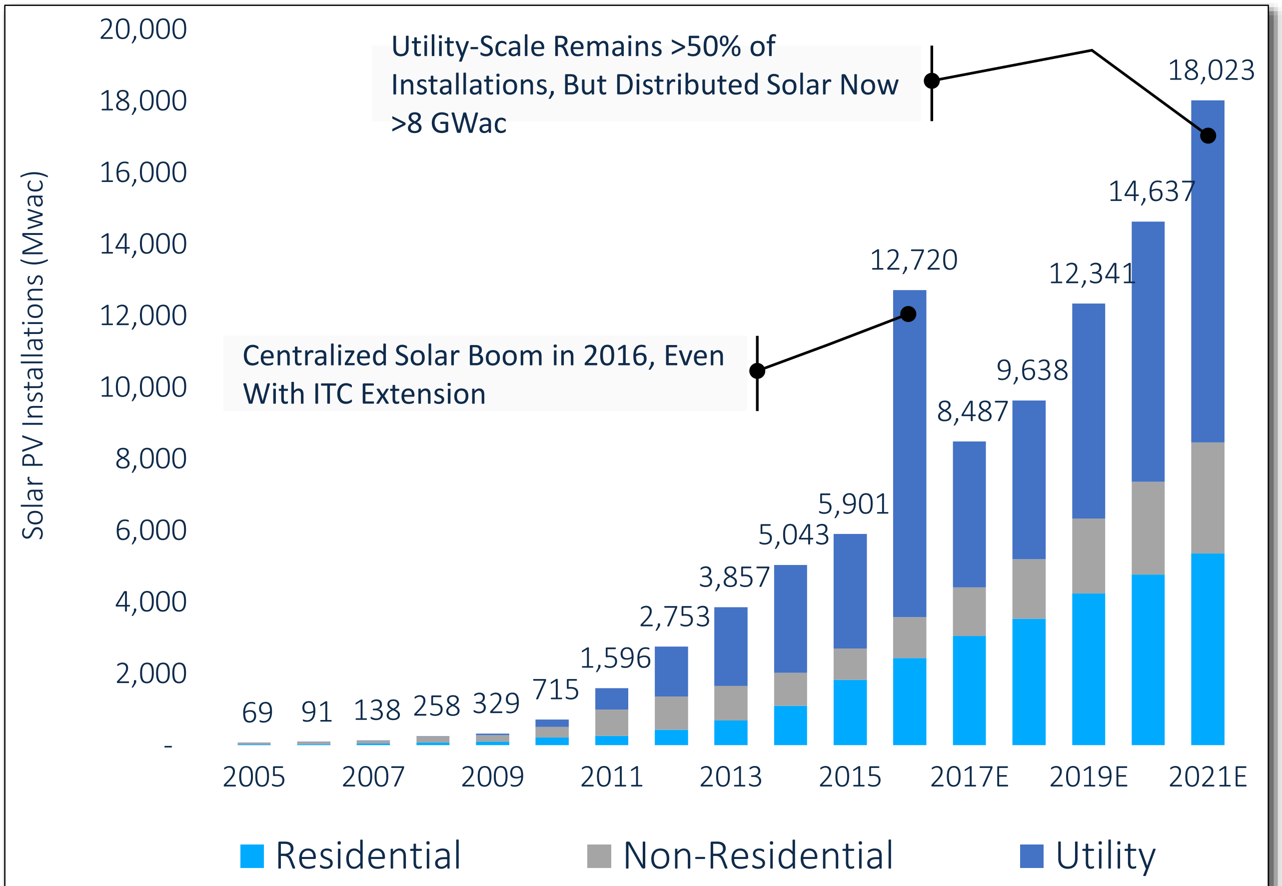
- Large Scale Solar PV in IRPs
- Exploring Community Solar
- Redesigning Rate Structures

Primary utility response to NEM is fixed charges



Source: Smart Electric Power Alliance, 2016; data and information from North Carolina Clean Energy Technology Center *50 States of Solar 2015* Q1, Q2, Q3 and Q4 reports.

Looking forward, new strategies may be needed

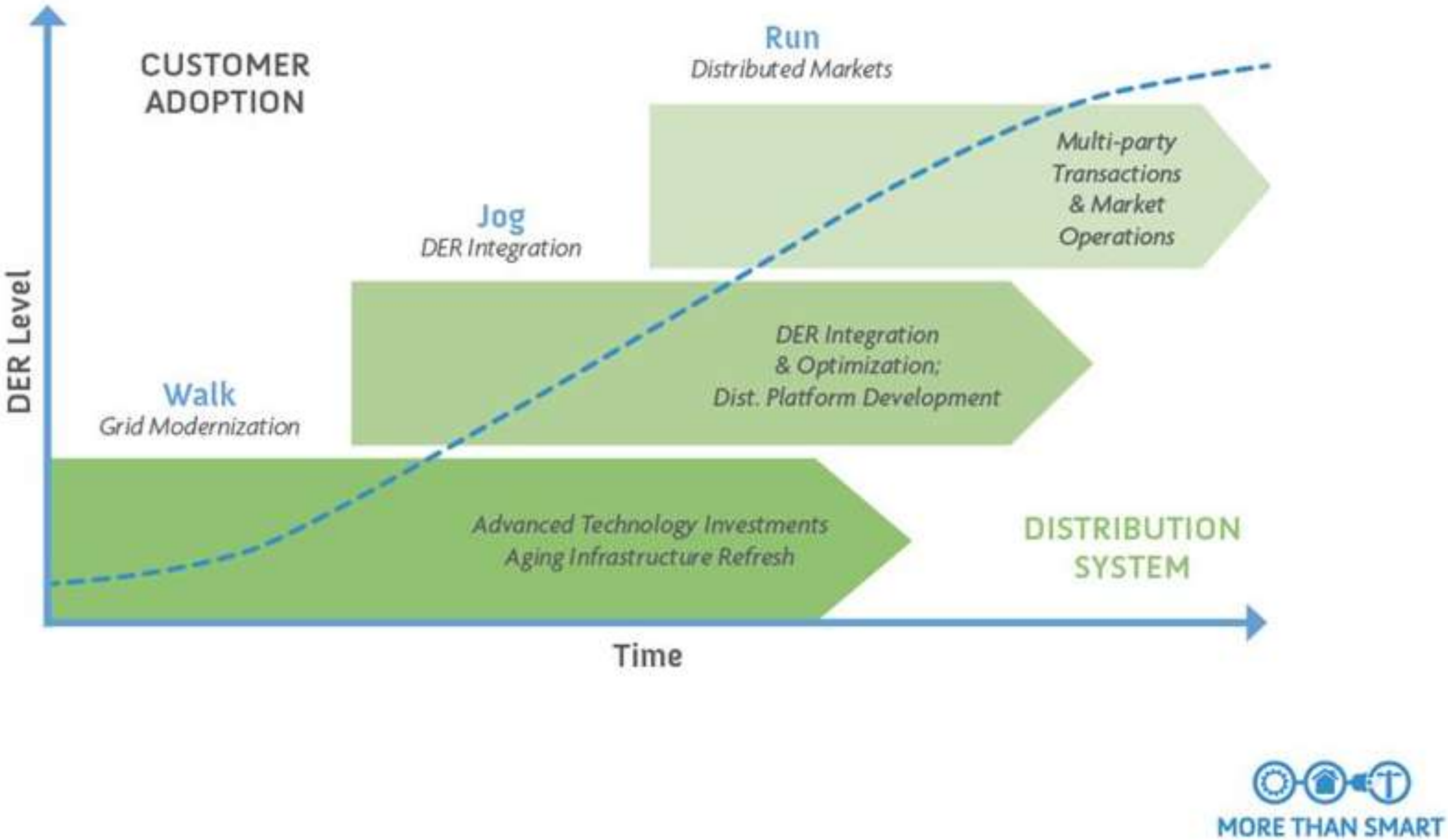


Emerging Utility DER Strategies:

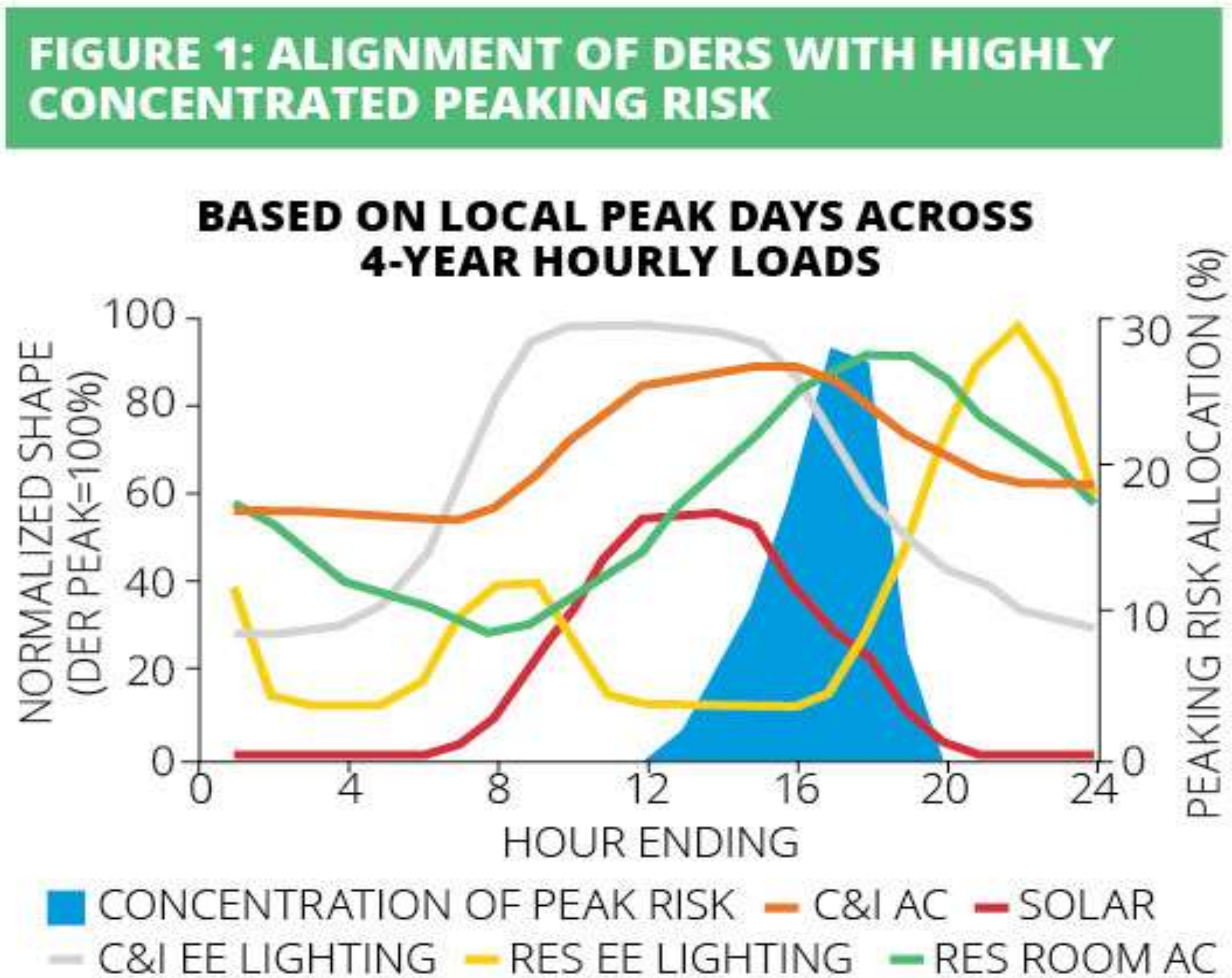
- Next-Level Customer Insight & Engagement
- Evaluating DER as Grid Assets
- Rewiring Utility Operating Practices

Source: GTM Research/SEIA U.S. Solar Market Insight

Potential Model for Utilities' Future:
The Distribution System Operator



Valuation of DER of Distribution Assets



Source: *Addressing the Locational Valuation Challenge for Distributed Energy Resources*, SEPA and Nexant

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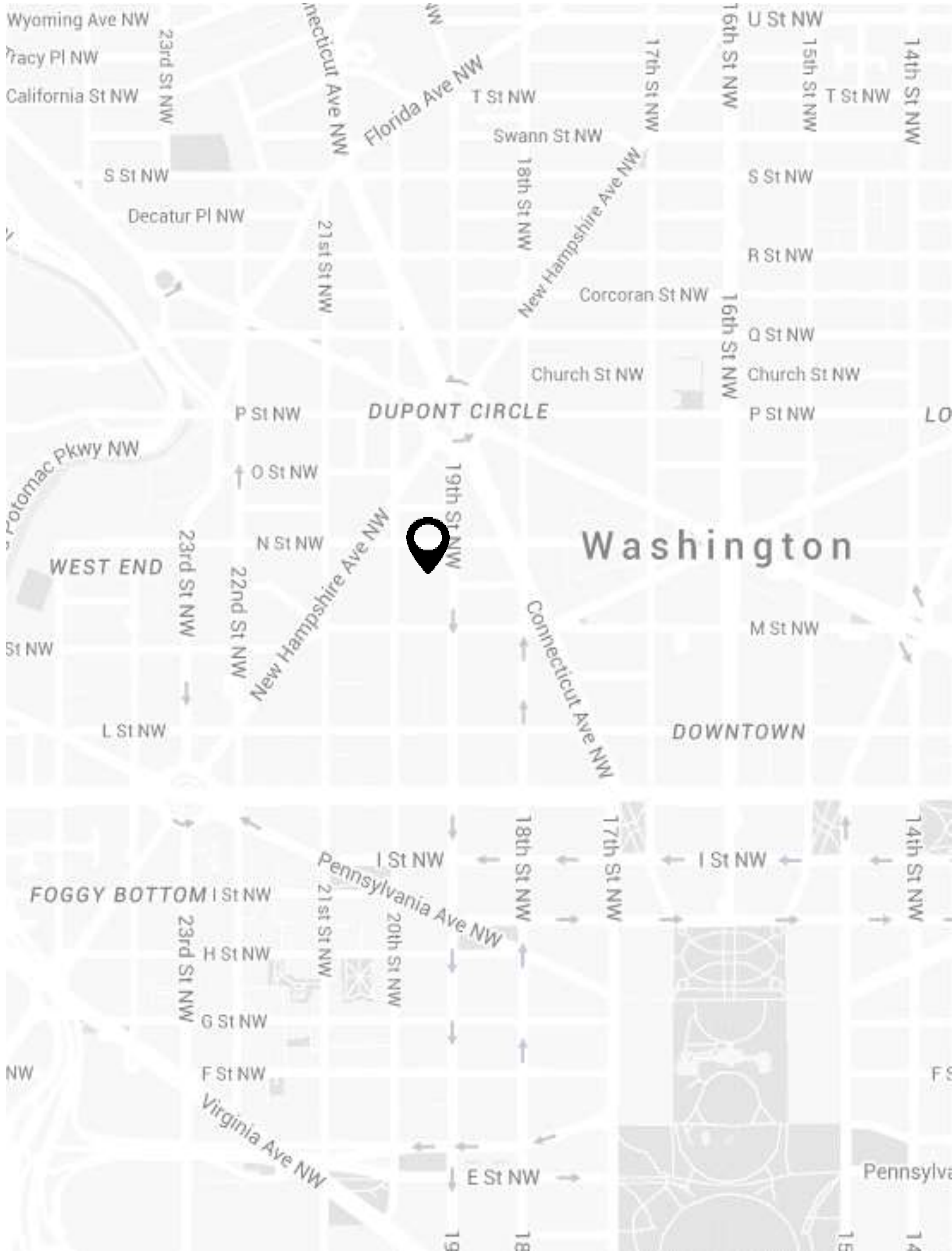

Position statement on net energy metering

August 2013

- Customer-sited solar generation will play an increasingly important role in the energy mix for utilities and consumers.
- Net energy metering (NEM) policies promote the deployment of customer-sited distributed solar generation in many markets.
- However, NEM and rate design, inherently linked, need to evolve to transparently allocate costs and benefits, compensating all parties for their value contribution.
- This transition will only be effective when utilities, the solar industry and customers collaborate to create a sustainable solar distributed generation marketplace.

The Utility's role in DER deployment & integration

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July 2016

- Optimal deployment of DER will require proactive engagement and cooperation.
- Whether in front of or behind the meter, allocation of costs and benefits should be transparent.
- Utilities possess unique technical & operational knowledge of the grid, critical for optimizing the benefits for customers both individually and as a system.
- Utilities bring additional benefits for deployment based on utilities' access to and cost of capital, rate stability, customer relationships, and holistic experience with DER.
- Customer and third party ownership can provide additional including expanded choice, cost stability, additional streams of capital, expanded consumer education, innovative customer acquisition models, and provision of complementary goods and services.
- Safeguards are needed to ensure a competitive DER market evolves ensuring open access to the interconnection processes, clear direction from grid operators on deployment, and transparency.

Where is this going?
HI self supply economics

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POTENTIAL SELF-SUPPLY TECHNOLOGY PACKAGE OPTIONS

Technology	Function	Constraint(s)
Solar	Generate power during day	Decrease size to optimize on-site consumption and battery capacity
Battery Storage	Store excess power during day	Expensive; avoid excess capacity
Smart Electric Water Heater	Shift morning reheating to afternoon; heat to higher temperature	Some homes have solar hot water; usage varies daily
Thermostat	Cool house to a lower temperature than normal during day	Many homes use ductless mini-split AC units, which don't have a central thermostat
Electric Vehicle	Charge during the day	Less common; EV may not be at the home during the day
Other Appliances, e.g. laundry, dishwasher, etc.	Increase or shift usage to daytime	Combination of intermittent use and/or not readily available control integration

SELF-SUPPLY ECONOMIC SCENARIOS ON OAHU (3 KW)

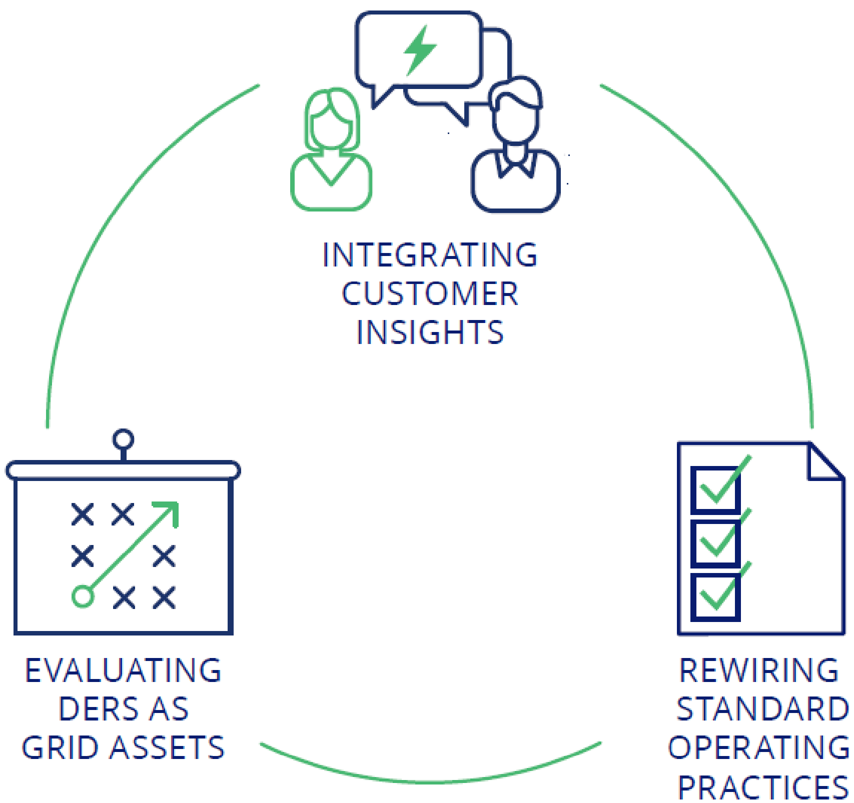
	Solar only		Self-supply	
Price Increment	$0	+$1,500	+$5,000	+$10,000
System Cost	$4.00/watt	$4.50/watt	$5.67/watt	$7.33/watt
Initial Cost	$12,000	$13,500	$17,000	$22,000
Incentivized Cost	$5,460	$6,510	$8,960	$12,460
Simple Payback	4 years	5 years	6 years	9 years

Assumptions: 23% capacity factor; 35% Hawaii solar-only and 30% Federal Solar Tax Credit (less Hawaii tax credit, but including storage costs); $15/kW/yr O&M; 25¢/kWh HECO rates w/ 2% escalation; doesn't include discount rate or tax implications; 10% kwh penalty for charging and excess solar losses

A bundled package – aka "nanogrid" – replacement for grid supplied power may be closer than we think

- Allows customers to avoid both energy & demand charges
- Flips the paradigm – DER as primary, grid as the back-up
- HI program does not leverage DER for any system benefits
- Implications more interesting for microgrids

Utilities thinking “beyond the meter”



Integrated Customer Insights
Increased segmentation of load profiles, propensity to adopt, & behavioral drivers combined to better evaluate economic, & achievable potentials

Incorporating DER as Grid Assets
Increasing sophistication of grid planning & operations tools to account for potential system benefits from DER on a temporal & locational basis

Rewiring Standard Operating Practices
Opening up planning processes across functional areas (system planning, resource planning, marketing, regulatory) to incorporate more robust & holistic deployment strategies

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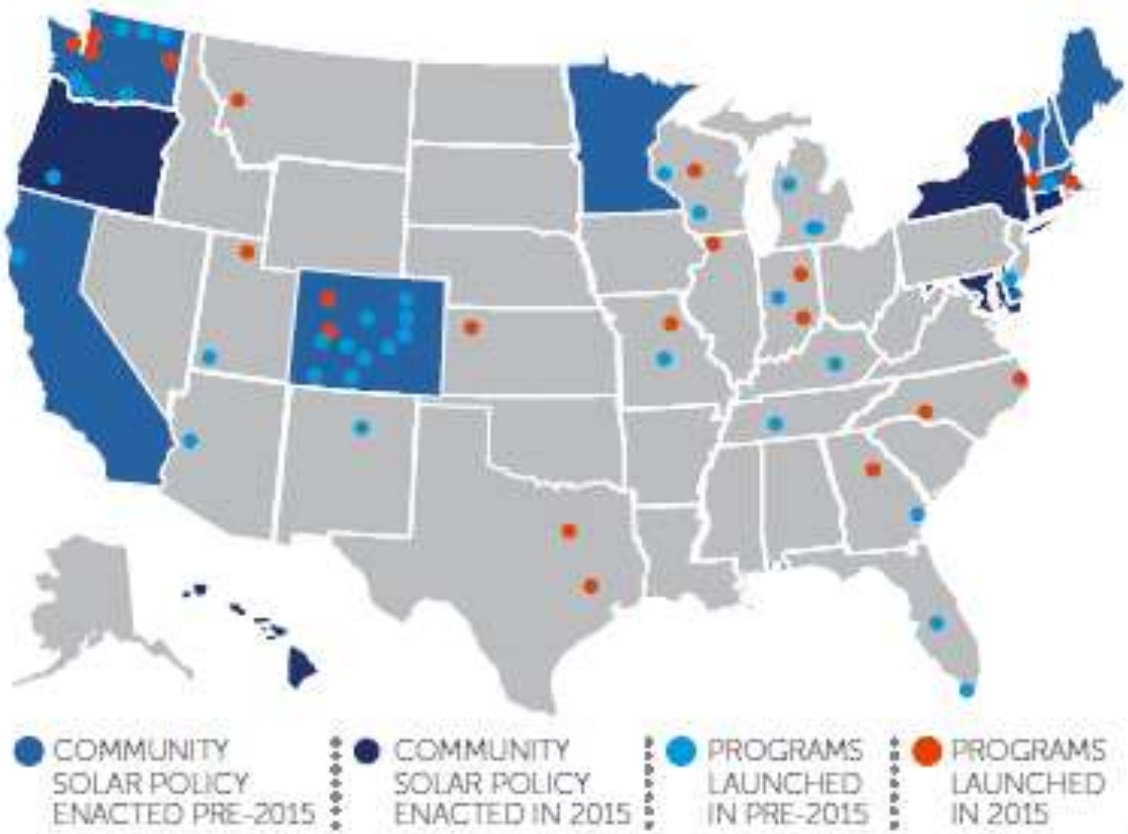
Community solar programs across the US



Source: Smart Electric Power Alliance, 2016

COMMUNITY SOLAR FAST FACTS:

83 ACTIVE PROGRAMS AS OF THE END OF 2015

MORE THAN 100 MW ONLINE

79 PROGRAMS IN DEVELOPMENT

14 STATES AND D.C. ENACTED COMMUNITY SOLAR POLICIES

Designing a Successful Community Solar Program

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Key Considerations

Utility

- Alignment with investment strategy
- Coordination between functional groups

Customer

- Value proposition economics & structure
- Education and outreach
- Brand expectations

Regulator

- Cross subsidization
- Cost-effectiveness
- Consumer protection

Potential Design Features:

- Structure (rate vs. capacity)
- Terms (pricing, contract lengths, penalties)
- Ownership – utility vs. third party vs. customer
- Amortization of administrative costs (billing system, etc.)
- Siting for distribution system benefit
- Inverter functionality
- Cross-program marketing (key accounts, DSM, etc.)
- Cost allocations (subscriber vs. rate base)
- Risk allocation (subscription, O&M, production)

The Fundamental Challenge

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Grid Perspective:	**Consumer Perspective:**
System = Value DGPV = Cost	System = Cost DGPV = Value
Measured Expectation of Change	Rapid Expectation for Change

- Obligations under the regulatory compact
- Dynamic societal expectations
- Requirements to add generation
- Flat demand
- Pace of regulatory processes
- Concerns about portfolio diversity & stranded assets

- Trade between equity and efficiency
- Uncertainties on definitions of fairness
- Inadequate valuation tools (incl markets)
- Rapid technological advances
- Limited consensus about the nature and role of the regulated monopoly
- Lack of clarity on conflicting expectations

51st State's Phased Approach

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CHOOSING THE DESTINATION

Phase I

Hypothetical electricity marketplace

THE DESIGNING THE ROADMAPS

Phase II

Journey from current state to future state

STARTING THE JOURNEY

Phase III

Creation of customized roadmaps & implementation of "no-regrets moves"

Crowdsourced visions for the future, starting from a blank slate

Crowdsourced roadmaps that articulate how we get from "here" to "there"

Stakeholder-guided development of bespoke plans for electric power sector transformation

Phase II Roadmap Lanes

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Retail Market Design	Describe how customers participate (opt-in versus opt-out) of the future state technology enablement provisions, what assets are at their disposal, and how those assets interact with the grid)
Wholesale Market Design	Describe impacts and modifications, if any, to wholesale markets, central station generation, transmission assets and services, etc.
Utility Business Model	Describe how the utility industry needs to evolve from current to future state in order to support the new market while maintaining safe, reliable, and cost-effective service
Asset Deployment	Address any required technologies (e.g., AMI, smart inverters, load tap changers, etc.) that utilities will need to deploy to support the future state, the timing/triggers for those deployments, and how costs would be recovered
IT	Describe the software and communications platforms needed for all parties to enable the grid of the future, including those needed for the utility, the firmware required for devices, etc.
Rates & Regulation	Discuss how regulatory bodies, rules, and regulations must adapt from current to future state, and how retail rates must transform over time to allow for the continued economic health of the system and its participants