U.S. DEPARTMENT OF ENERGY | Office of Electricity Delivery and Energy Reliability

U.S. Smart Grid Development

Panel on Advanced Metering and Demand Response

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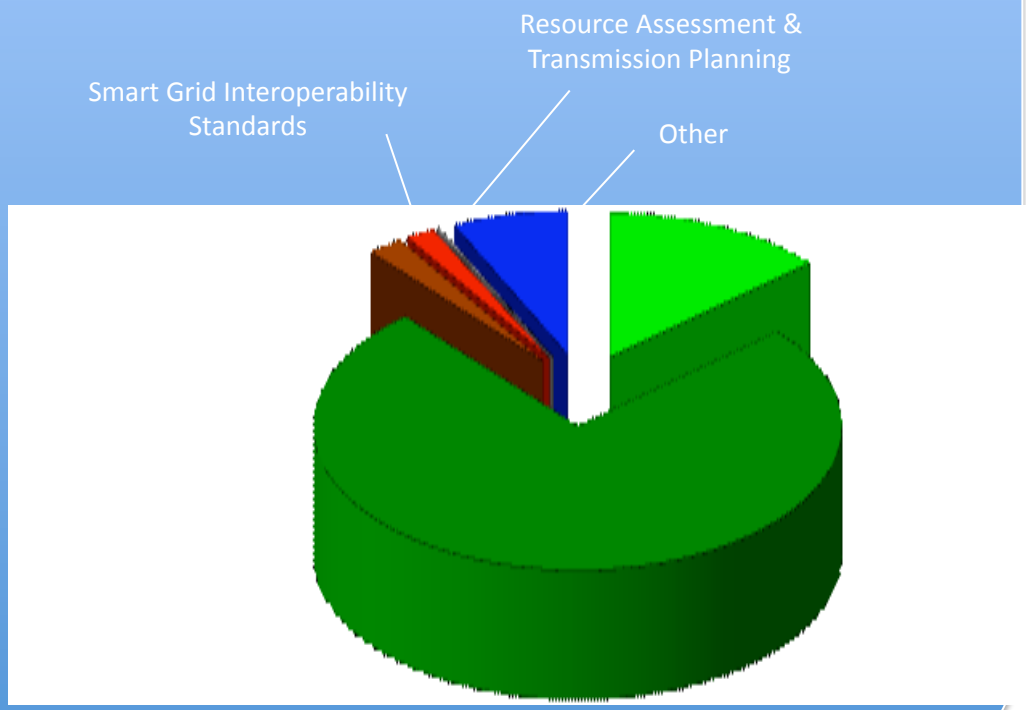
September 4, 2012

American Recovery and Reinvestment Act (supported through the Energy Infrastructure Security Act 2007)

One-time Appropriation, $4.5B in ARRA funds

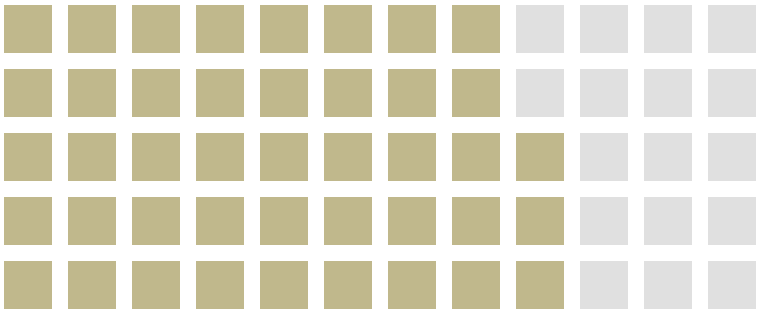
- $620M for demonstration projects
- $3.425B for deployment projects



Maximize Public Investment

SGIG Spending $7.9 billion with cost share to be spent through 2015

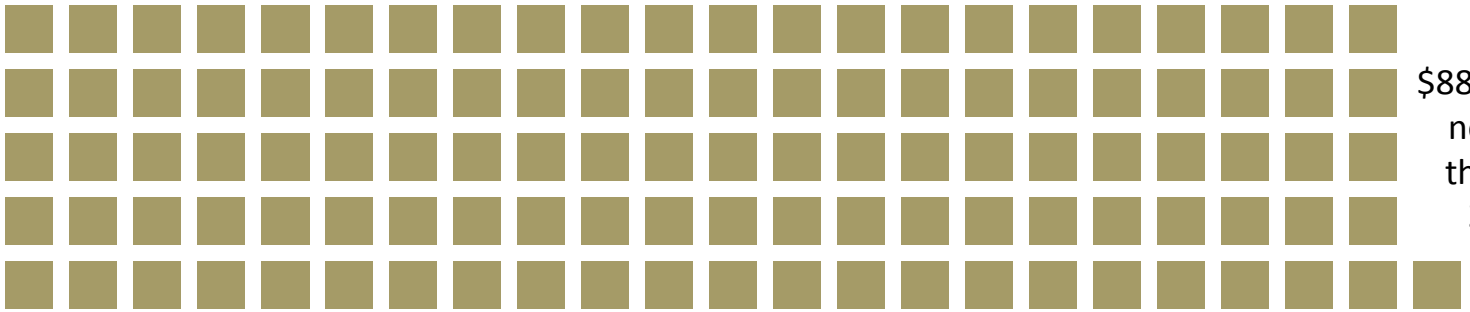
EPRI Estimate



$338 - $476 billion needed through 2030

EPRI. Estimating the costs and benefits of the smart grid: A preliminary estimate of the investment requirements and the resultant benefits of a fully functioning smart grid. EPRI, Palo Alto, CA; 2011.

Brattle Group Estimate



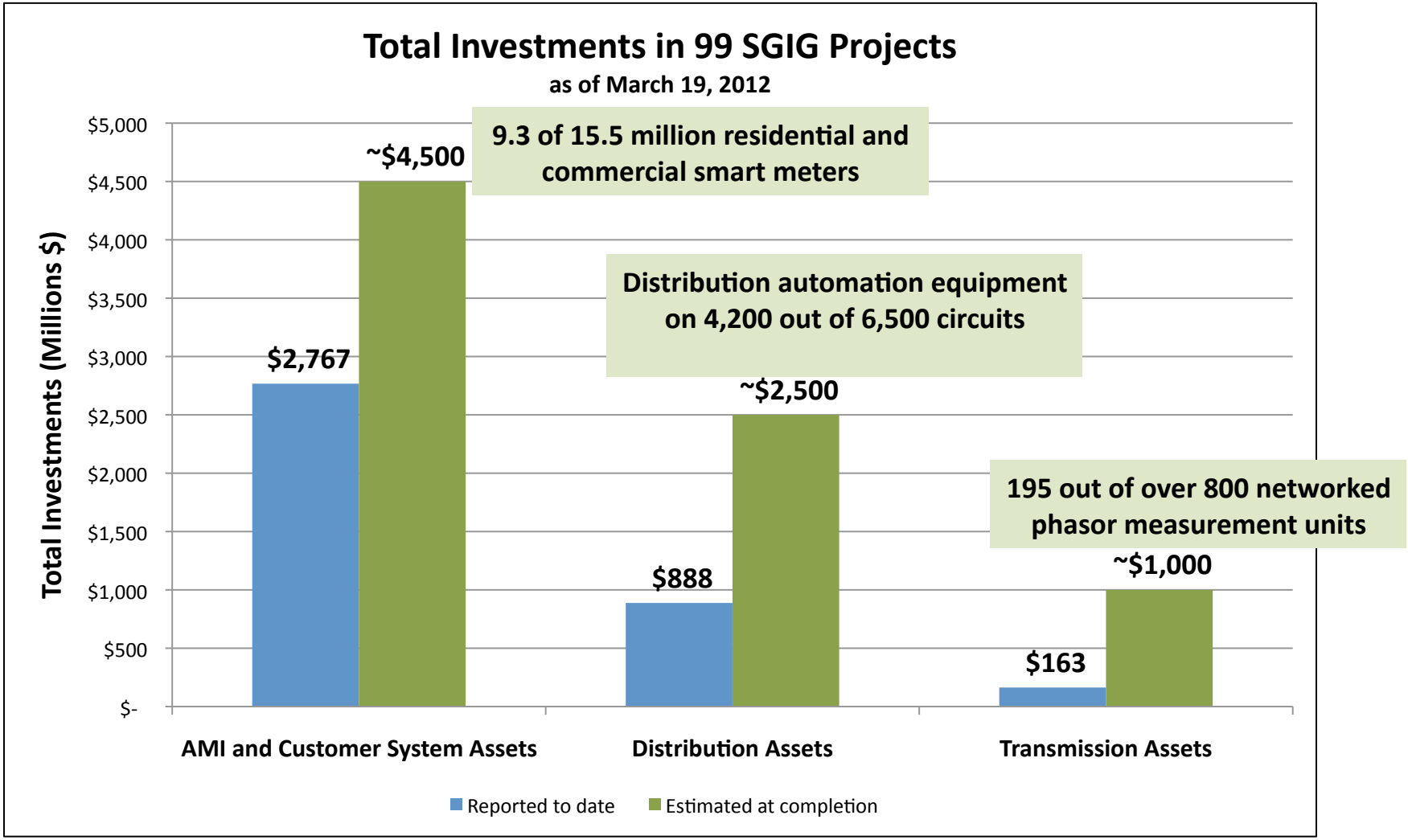
$880 billion needed through 2030

Chupka, M.W. Earle, R., Fox-Penner, P., Hledik, R. Transforming America's power industry: The investment challenge 2010 – 2030. Edison Electric Institute, Washington D.C.,: 2008.

Technology Deployment

SGIG/SGDP Smart Grid Technology Areas Technologies for immediate commercial use supporting manufacturing, purchasing, and installation				
Customer Systems	Advance Metering Infrastructure	Electric Distribution Systems	Electric Transmission Systems	Equipment Manufacturing
• Displays • Portals • Energy management • Direct load controls	• Smart meters • Data management • Back office integration	• Switches • Feeder optimization • Equipment monitoring • Energy Storage	• Wide area monitoring and visualization • Synchrophasor Technology • Energy Storage	• Energy devices • Software • Appliances

SGIG Deployment Status



Application of Advanced Metering Infrastructure

Investments in AMI are being made by 75% of the SGIG projects

Peak and Overall Demand Reduction

62 projects are pursuing ……

- 40 w/ pricing programs
- 25 w/ customer systems
- 21 w/ direct load control devices

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- **Reducing requirements for generation capacity and energy (less fuel)**
- **Improved asset utilization**
- **Lower emissions (CO_2, NOx, SOx)**
- **Lower bills**

Operational Efficiency Improvement

60 projects are pursuing ……

- 60 w/ automated meter reading
- 44 w/ voltage and power quality monitoring
- 51 w/ outage detection and notification
- 50 w/ tamper detection
- 48 w/ remote service switch

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- **Operations and maintenance (O&M) cost reductions**
- **Greater responsiveness to customer**
- **Lower outage duration**
- **Improved energy efficiency**

Consumer Behavior Studies

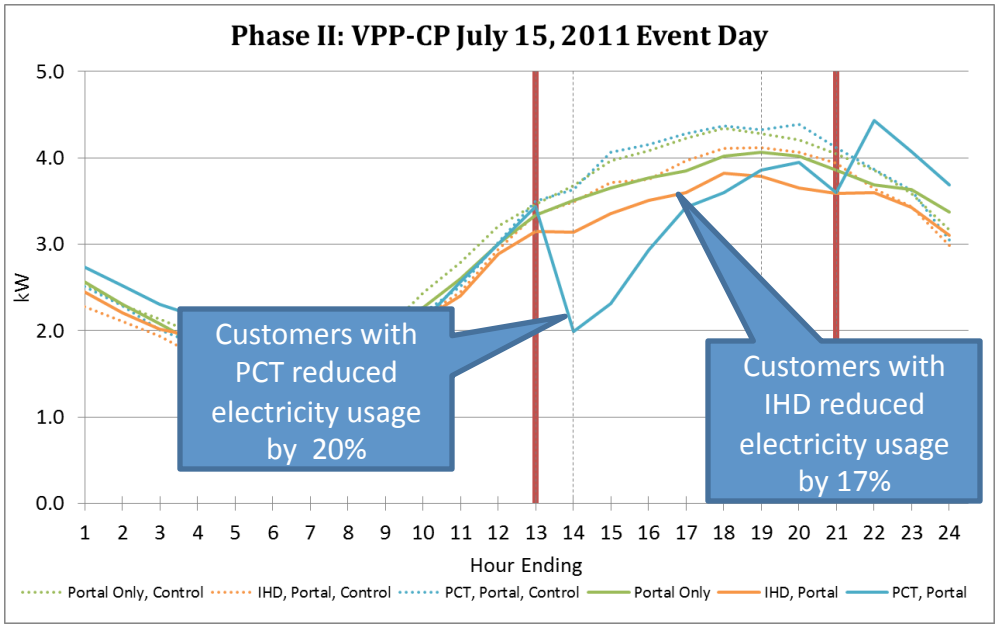
	Sierra Pacific	Nevada Power	OG&E	MMLD	CVPS	VEC	MN Power*	CEIC	SMUD	DECo	Lake land	Total
Rate Treatments												
TOU	●	●							●		●	3
CPP	●	●	●	●	●		●		●	●		8
CPR					●			●				2
VPP			●			●						2
Non-Rate Treatments												
Education	●	●								●		3
Cust. Service						●						1
IHD	●	●	●		●	●	●	●	●	●		9
PCT	●	●	●					●		●		5
DLC								●				1
Features												
Bill Protection	●	●	●	●							●	4
Experimental Design												
Opt In	●	●	●	●	●	●	●		●	●	●	9
Opt Out								●	●	●	●	3
Within									●			1
Number of Participants												
	9,509	6,853	3,196	500	3,735	6,440	4,025	5,000	97,480	5,400	3,000	145,138

●—● Sierra Pacific and Nevada Power are testing the effect of a technology package, including an IHD and a PCT

* MN Power is also testing the difference between hourly energy feedback and daily energy feedback

Pricing Pilot at Oklahoma Gas & Electric

OGE deployed TOU-CP and VPP-CP programs in Summer 2011, VPP-CP is highlighted here.



Price Level	Residential VPP-CP Price	Number of days in summer 2011 at each price level
Low and off-peak	4.5¢ per kWh	63
Standard	11.3¢ per kWh	25
High	23.0¢ per kWh	28
Critical	46.0¢ per kWh	6
Critical Event	46.0¢ per kWh	7 (included in the above)

Potentially Avoid Future Generation:

- Study results show a 1.3 kW reduction per customer is possible
- Hoping for 20% participation by Dec 2014
- Targets: Enroll ~ 40K customers in 2012 with 72MW peak reduction; 150K customers by Dec 2014 with 210 MW peak reduction (offsets a natural-gas fired peaking plant)

Consumer Behavior Studies Initial Findings

- **Focus groups, surveys and other tools are *vital* components for test marketing terms and concepts that will attract and engage consumers (i.e. for such things as TOU pricing, load control)**

- **After initial focus groups, *validate* the messaging with additional test marketing efforts to develop the most effective messaging for your new time-based rate recruitment campaign**

- **Customers have limited opportunity to interact with their utility (you may only have one chance); make sure all the people who will play that role are informed, committed and able to make that experience a positive one for the customer**

- **Make sure sufficient time and resources are allocated between soft launch and hard launch of the recruitment effort to adjust the messaging, if needed, and other details accordingly based on feedback**

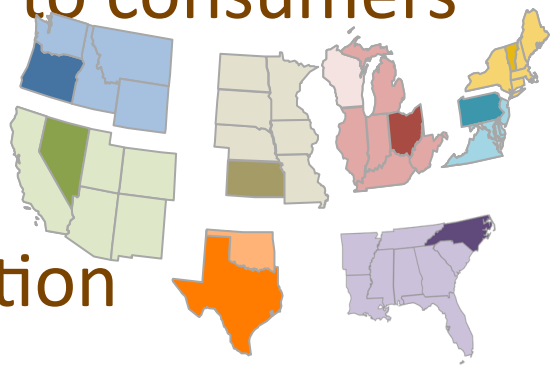
- **To set realistic expectations, utilities could benefit by identifying the available pool of participants who might accept a new technology/product offering prior to development.**

Regional Peer-to-Peer Workshops

Workshops on consumer engagement and technical implementation of smart grid related technologies:

- Co-hosted with an ARRA recipient to focus
- on regional issues
- Typically a two day event (First Day for Utilities only)
- Provide a forum to share lessons learned with non-ARRA utilities
- Foster productive communication among stakeholder groups (consumers, utilities, and the various governing bodies)
- Help keep DOE informed of any ongoing challenges
- 6 regional meetings have taken place; 2 meetings planned

"...there was a consistent theme of community involvement as essential to the success of smart grid deployments," **blog by Assistant Secretary Pat Hoffman on her attendance of the Southeast Workshop**

Peer-To-Peer Workshops Key Findings

- Be prepared to address customer's sensitive issues (i.e. RF, Privacy, etc)
- One size does not fit all
- Set reasonable expectations
- Prepay is showing promise for low income customers
- Strategy needed for change management
- Measure and communicate benefits to consumers
- Opt-out provisions are important
- Invest in staff training
- Customers need actionable information
- Grid modernization is an evolution