HiP-PV Task 3.3 AMI Inverter Communications and Control

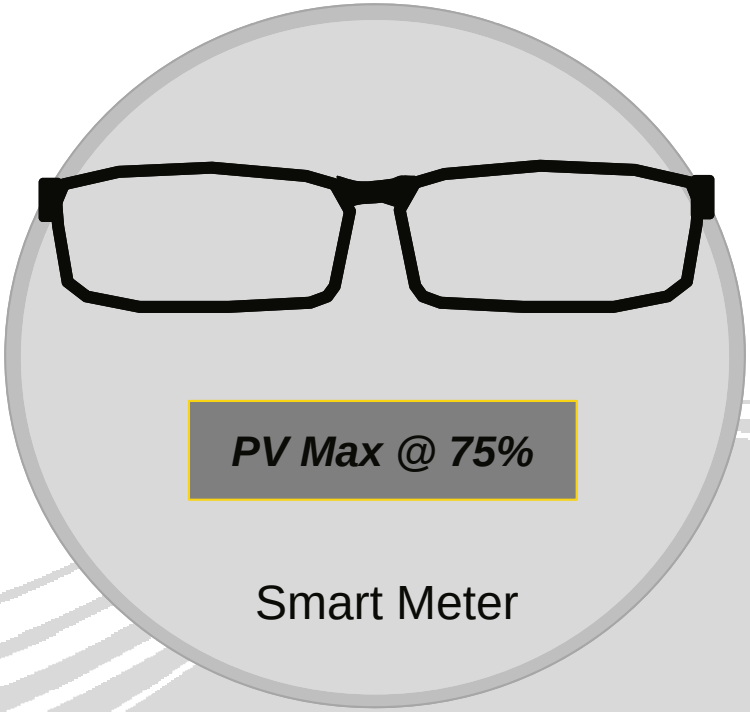
Obadiah Bartholomy

4/20/2012

CSI RD&D Program Manager

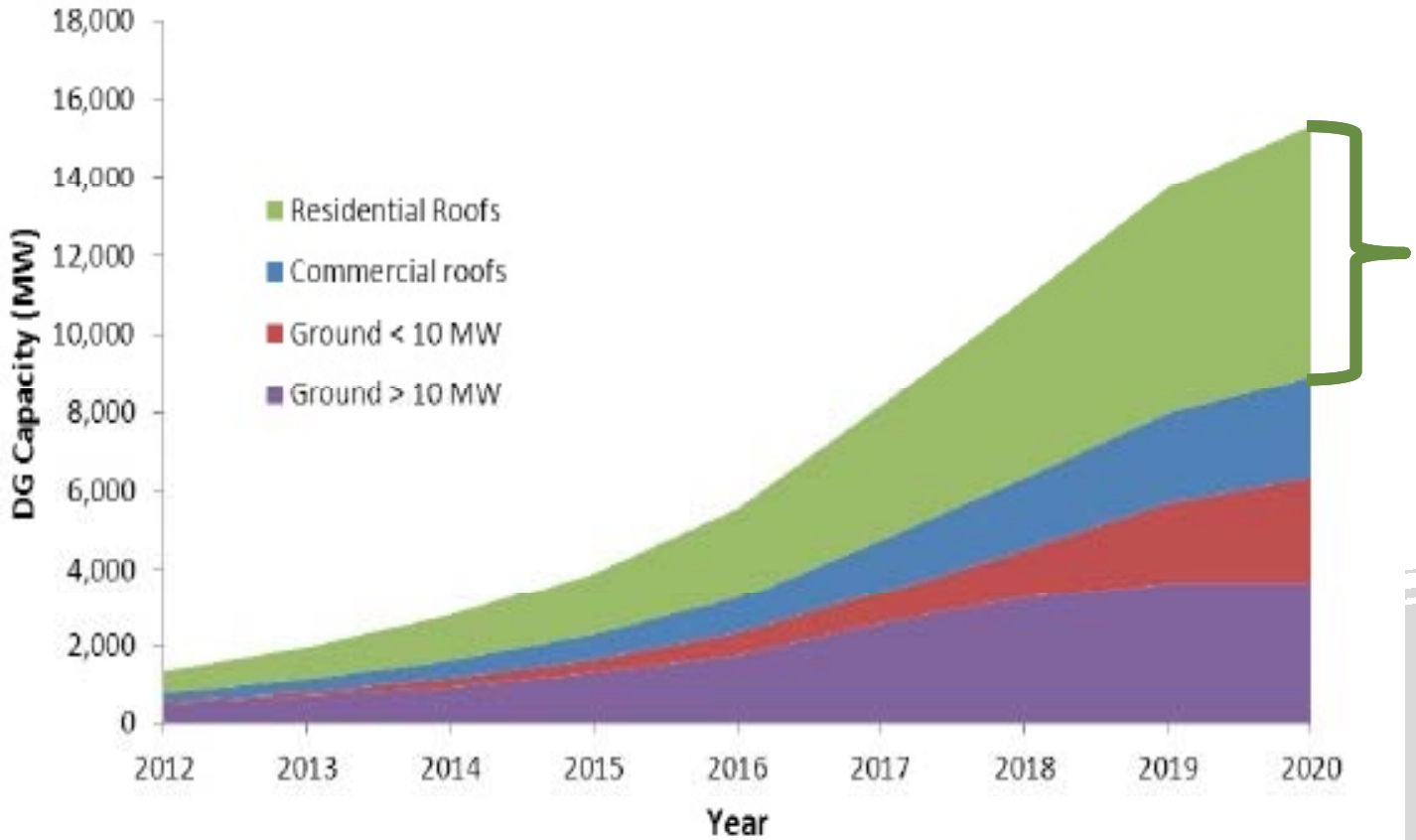
Outline

- Challenge facing California Utilities
- Research Objectives/Approach
- Scope of Work
- Timeline



Challenge Facing California Utilities

Figure 1: Installed PV by Type Under the *Least Cost* Scenario, Maximum Without Curtailment



Potentially 6-7 GW of residential PV by 2020 with no currently validated communications or controls strategies, plans, standards, or solutions

From "Technical Potential for Distributed Photovoltaics in California" Preliminary Assessment March 2012, E3

SMUD™

Challenges Cont'd

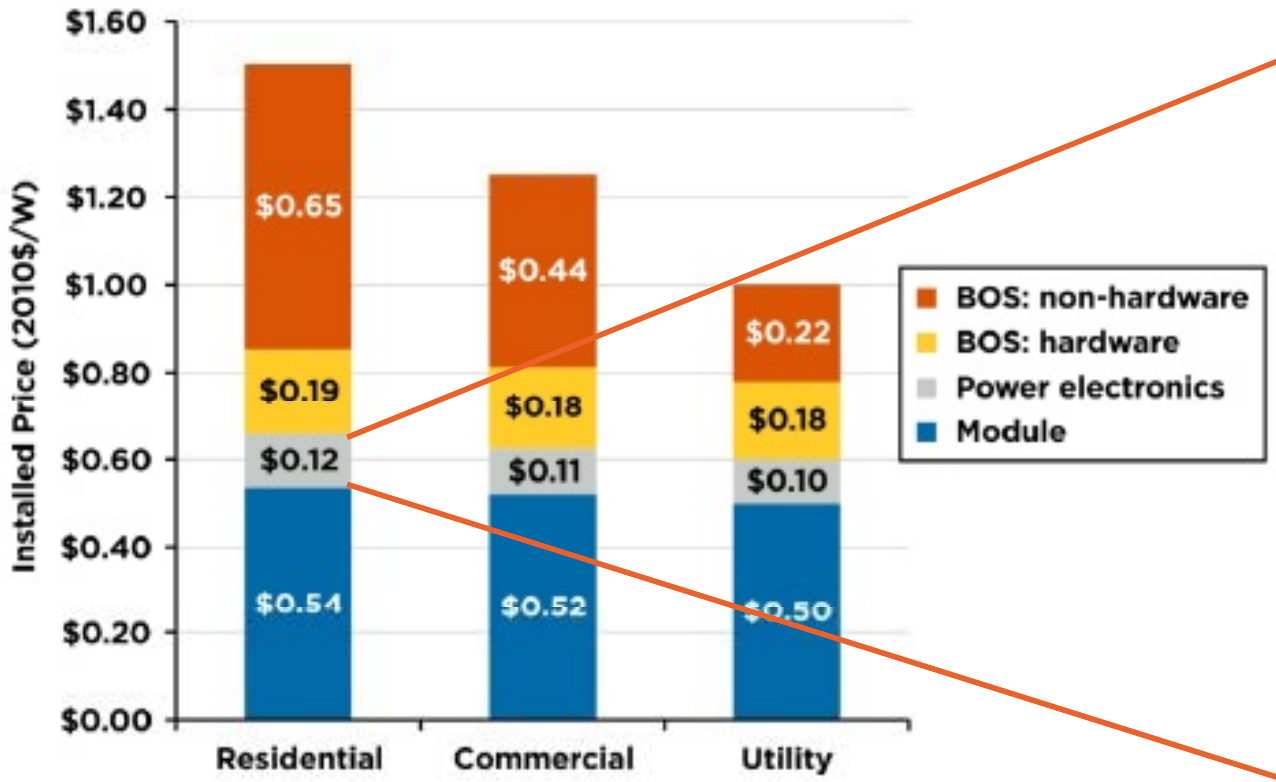
- Big Bold Energy Efficiency Strategies:

  "All new residential construction in California will be zero net energy by 2020"

- If between 100K and 200K homes per year, at 4kW per home, this represents additional 400 – 800 MW per year after 2020

Challenges Cont'd

Figure 4-6. Estimated Subsystem Prices Needed to Achieve 2020 SunShot Targets



With targeted residential inverter costs at $0.12 per watt, communications/controls capability must be a fraction of this. At $0.01 per watt, the net cost is $40 per 4 kW system – Solution must be embedded, easily configurable, robust

Sunshot Vision Study, February 2012

Research Objectives

- Does it make sense to leverage the AMI system for communicating with Residential inverters?
  - Existing/currently being implemented infrastructure
  - Similar capabilities being developed for DR purposes primarily
  - Potential for low-cost communications and control

SMUD™

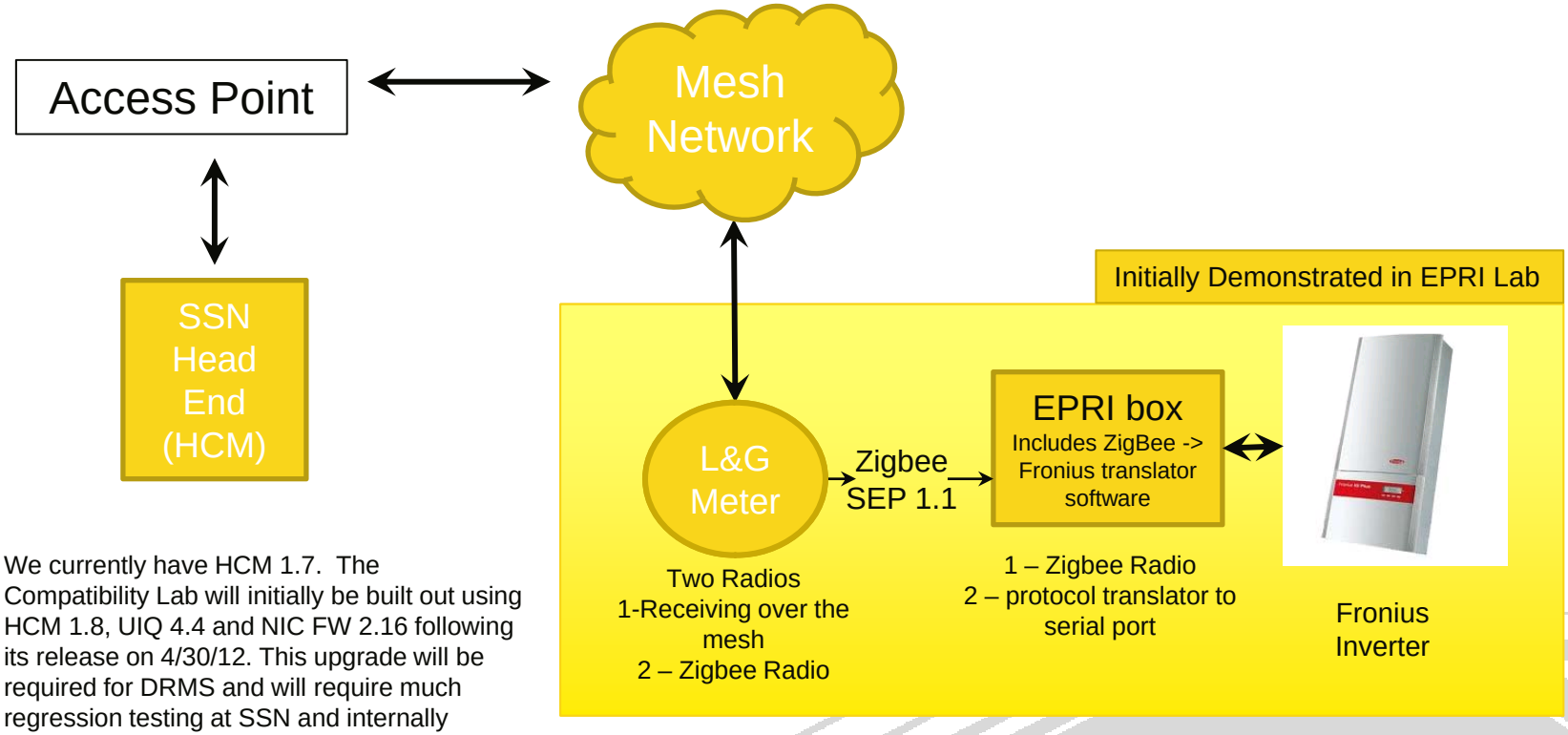
Research Approach

- Demonstrate end to end AMI communications/control with PV inverter
- Identify barriers and pitfalls to this approach
- Determine capabilities of AMI system for various desired control functionalities
- Identify alternative approaches that meet objectives
- Recommend next steps for pursuit of AMI-based or alternative communication routes for solution that is:
  - Low cost
  - Robust
  - Flexible
  - Simple

Scope

- EPRI to develop hardware and software to receive and interpret Zigbee SEP 1.1 signal from L&G meter, translate, control Fronius residential inverter
- Using same setup, EPRI will support end to end demonstration at Silver Spring Networks Compatibility lab in Palo Alto
  - Test lab mimics SMUD AMI system and provides Production based environment for testing hardware

Development Environment
SSN Compatibility Lab, Redwood City



We currently have HCM 1.7. The Compatibility Lab will initially be built out using HCM 1.8, UIQ 4.4 and NIC FW 2.16 following its release on 4/30/12. This upgrade will be required for DRMS and will require much regression testing at SSN and internally through June or July 2012.

Scope Cont'd

- Functionality demonstrated will include at minimum
  - On/Off
  - Max Setpoint Inverter Output
- Additional functionality as allowed under SEP 1.1 modules and SSN HAN Communications Manager (HCM) capabilities
  - Monitor functions (output, fault codes, most recent output prior to fault, historical generation)
  - Control functions (Volt/var adjustment, dynamic power adjustment in response to changing system conditions)

Scope Cont'd

- Evaluate bandwidth needs for end-to-end communication network (Central Data Repository/AMI/HAN/Inverter Comm) and determine scaling parameters needed to achieve appropriately high resolution PV system data and control commands as a function of increasing PV penetration
- Report describing demonstration, necessary next steps for AMI scale-up, barriers to this approach, security concerns/constraints, latency of data signals on AMI system, functionality capabilities and constraints, likely cost of scaled deployment. SMUD authored, with EPRI input

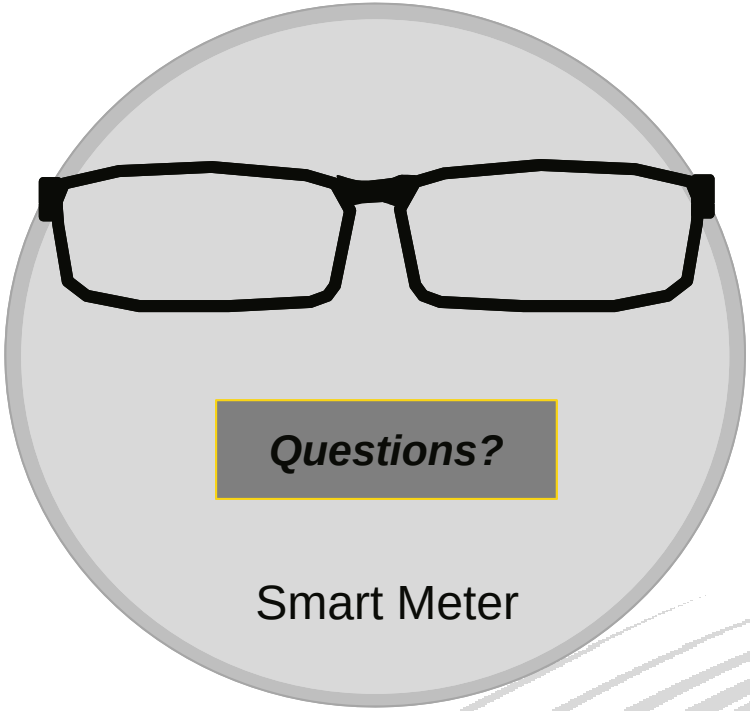
Additional Related Work (DOE)

- Currently scoping broader report that would assess multiple pathways for communications and control functions, compare against multiple criteria to provide context for this demonstration
  - Report would be written by Navigant with input from SMUD, EPRI, Gridpoint

Timeline

Milestone	Timeframe
EPRI under contract to begin development work	June, 2012
Demonstration of L&G meter to Fronius Inverter Zigbee SEP 1.1 Control Functions	August, 2012
Demonstration of End to End Solution at SSN Compatibility Lab	October, 2012
Final Report on SSN AMI Demonstration	December, 2012

?



Obadiah Bartholomy
Obadiah.bartholomy@smud.org
916-732-6835