

# DOCKET

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## California Energy Commission Workshop on Energy Storage Technologies April 2, 2009



# Energy Storage

- Critical for integration of intermittent resources
- To date not a cost effective solution
- Integration Issues
  - Lack of models for proper system integration
  - Lack of real world experience
- Further system studies needed
  - Affects on ramping and regulation
  - Optimal location of storage
  - Power quality
  - Additional transmission
    - Stability
    - Load flows
  - Additional Generation studies for ramping and regulation
    - Hydro flexibility
    - Fossil generation performance
- Wide Area Monitoring and Controls needed



## SCE's Efforts

- Electric Vehicle Technical Center
  - Advanced battery technologies for EVs and PHEVs
  - Stationary Batteries
  - PV Solar integration
  - PEV Testing
  - 300 Electric Vehicles in SCE fleet
- Joint effort with CEC and ERPI, (application stage)
  - 15MW Above Ground Compressed Air Storage
  - Use of ARRA Funds
- CPUC Applications
  - Renewable Integration Application
    - Interconnect Storage Technologies
    - Gather Data on Planning and Operations Effects
    - Gather Real World Experience
  - Solar Roof Top Project
    - 250 MW of PV connected to the Distribution system

# SCE's "Garage of the Future" Systems Study

1-3 kW  
Photo Voltaic Panels

Customer HAN  
Control Interface

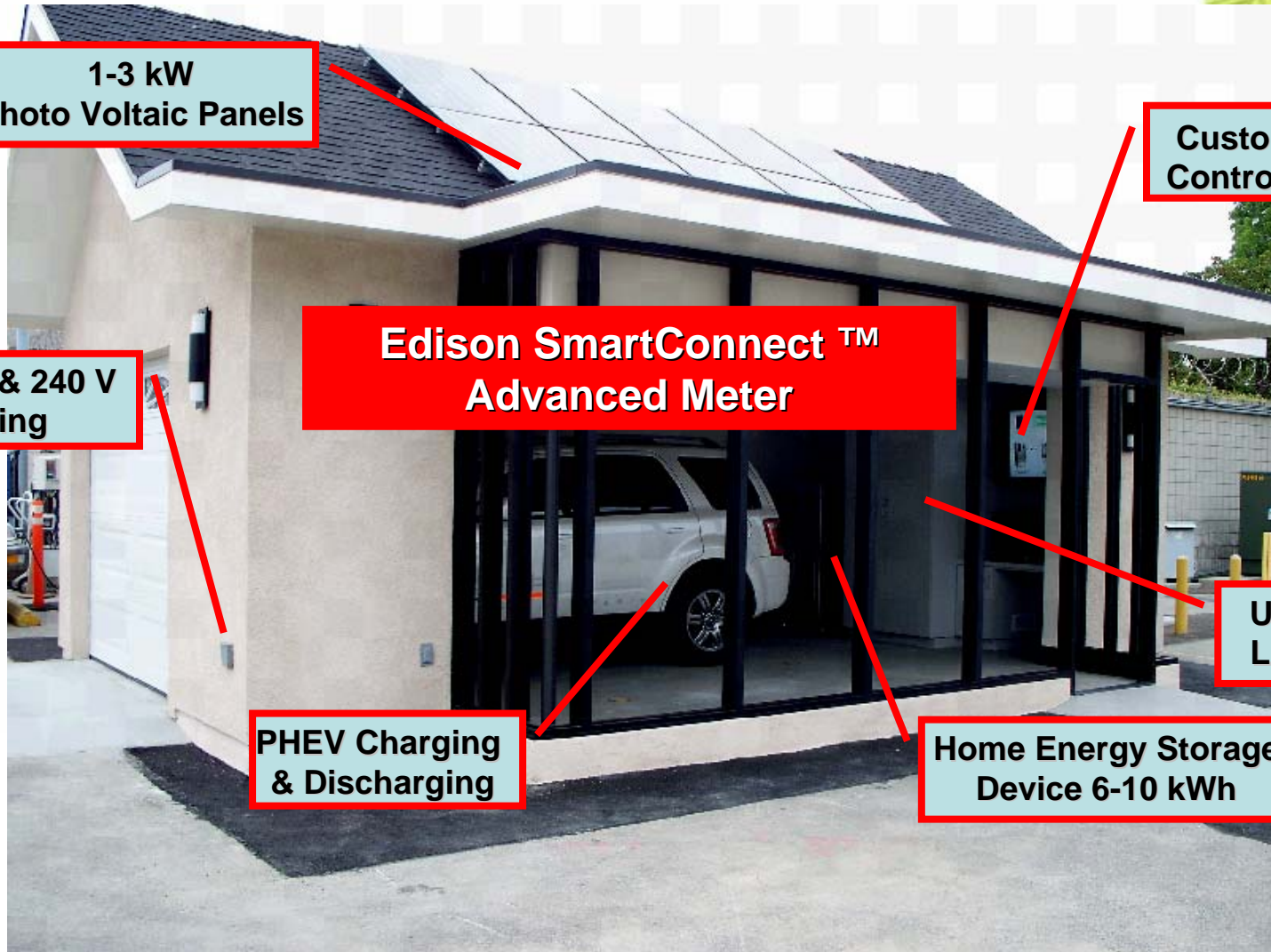
PHEV 120 & 240 V  
Charging

Edison SmartConnect™  
Advanced Meter

Up to 9 kW  
Load Bank

PHEV Charging  
& Discharging

Home Energy Storage  
Device 6-10 kWh





# SCE's Efforts Continued

- Model Development
  - SCE working with WECC Load Modeling Task Force on inverter models to simulate dynamic response to system voltage and frequency transients
  - NREL, WECC, SCE and Oak Creek Energy working on wind machine models to accurately represent both the steady state and transient behavior of wind generation facilities.
- Deploying Phasor Measurement System
  - Use High Data Rate PMU's
    - For Wide Area Monitoring
    - To Monitor Storage Performance
    - To Validate Storage Models



## Conclusions

- Need Funding to Provide Real World Experience on Large Scale Storage
- Need to Study the Integration Issues
- Need to develop Wide Area Controls
- Need to Establish Fossil and Hydro Generation Performance for Integration of Intermittent Resources