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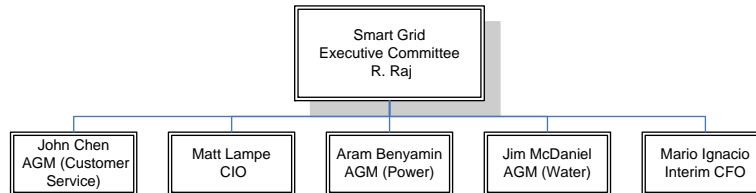
Smart Grid Regional Demonstration Program



Background

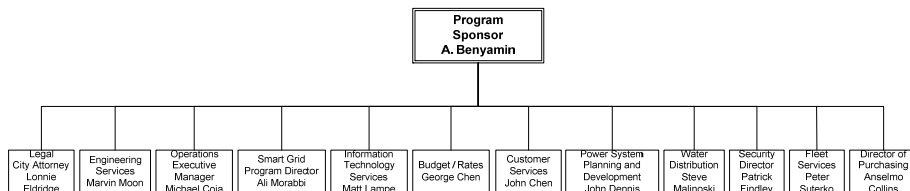
- In 2009, DOE, through the American Recovery and Reinvestment Act (ARRA), released a funding opportunity award for the Smart Grid Grant
- Los Angeles Department of Water and Power (LADWP) submitted an application in August 2009 and was awarded a \$60 million ARRA Smart Grid Demonstration Grant
- LADWP's Board of Commissioners authorized acceptance of the Smart Grid Grant on March 18th 2010
- This project will leverage LADWP's expertise in power systems and power delivery, while USC, UCLA, and JPL (project participants) will provide a multi-dimensional understanding of smart grid technologies

Smart Grid Executive Committee Org Chart

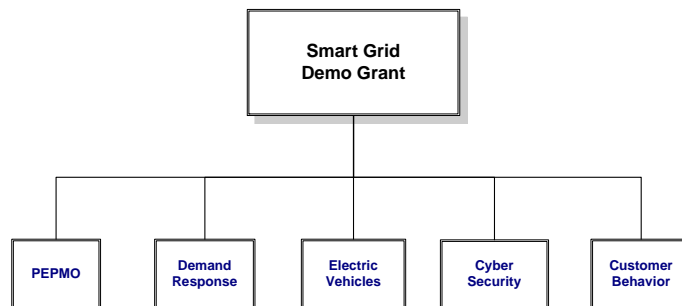


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Program Steering Committee Org chart



Smart Grid Program



PEPMO Office

- Program Governance
- Time & Status Reporting
- Program Scheduling
- Issue & Risk Management
- Project Communications
- Financial / Benefits Realization
- Change Control Process
- Release Management
- Change Management & Training
- Testing
- Requirements Definition
- Architecture Definition
- Process Design
- Process Implementation
- Use Case Development
- Testing Support
- Administrative Process

Demand Response

■ Demonstrations will include:

- AMI communications and Smart Meter deployment applied to DR
- Demand response systems in buildings - Building to Grid (B2G) technology integration
- Open source communications protocol, and prototype Home Area Network (HAN) technology
- Campus test bed demonstration : React reliably and precisely to a demand response event from the utility by activating procedures to curtail demand

DR Functions To Be Demonstrated

- Demo the control and monitoring of all meters as spec indicates (see Meter Specs)
- Demo the production of the MW for short durations as specified as per micro grid
- Demo regulation and voltage adjustments where appropriate
- Demo control of as many appliances as specified
- Demo the MDM functionality receiving various format meter and appliance information
- Demo the Internet information for customers to act upon
- Demo all customer functions, billing, the bill, discounts, TOU...
- Demo DWP website capabilities
- Demo network latency for controls and monitoring of devices
- Demo power flow analysis tool for correction to the distribution system
- Demo functionality of a DMS
- Demo functionality of the OMS
- Demo functionality of the asset management
- Demo initiation of a meter first time it is installed
- Demo distribution automation functions as per Chatsworth circuit

EVs

■ Demonstrations will include:

- ☐ AMI communications and Smart Meter deployment applied to EVs
- ☐ Smart charging
- ☐ Battery aggregation and backfill
- ☐ Fully operational Microgrid
- ☐ Renewables and battery integration
- ☐ Using car sharing programs at UCLA and USC

EV Functions To Be Demonstrated

- Demo monitoring of all chargers
- Demo reading of all MW for the vehicles
- Demo control of the chargers
- Demo use of the batteries into the grid (two way)
- Demo use of the batteries into the grid (one way)
- Demo disconnect of the chargers in case of need
- Demo use of community storage on EV batteries and external storage
- Demo inductive charging where possible (remote charging)
- Demo above on various vehicles, cars, mopeds, trucks, utils cars, bikes, etc
- Demo util truck (bucket, etc), use pattern, duration, etc
- Demo garage of the future
- Demo recycling of the batteries
- Demo aggregation of batteries
- Demo distribution effects



Next Generation Cyber Security Technologies

- Demonstrations for
 - Grid resilience
 - Testing for assurance of operational effectiveness
 - Redefining the Security Perimeter



Cyber Functions To Be Demonstrated

- Demo plant of various viruses and test
- Demo detection of intrusions
- Demo detection of uninvited activities
- Demo stop/interrupt signals as appropriate
- Demo monitoring of the network
- Demo logging activities
- Demo pattern recognition

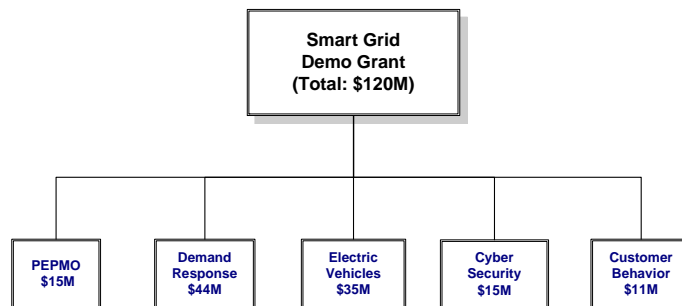
Sociological & Behavior Studies

- Studies will
 - Use the USC test bed and surrounding neighborhood to conduct the studies
 - Address Customer Communications and Outreach for the DR project
 - Measure and track baseline attitudes and behaviors relevant to EVs and the potential to buy in the future

CB Functions To Be Demonstrated

- Demo customer use pattern
- Demo customer usage data
- Demo utility behavior
- Demo customer savings
- Demo utility savings
- Demo utility to customer pattern of communication
- Demo failures and successes
- Demo DWP response to customers on DR, and EV questions and reactions

Smart Grid Program Expenditure



Chatsworth Circuit

- LADWP will use an existing distribution circuit to test the effectiveness of new smart technologies in a real world setting
- Using the Chatsworth Circuit LADWP will demonstrate the following:
 - Remote Overhead Capacitor Bank Control
 - Monitoring of Overhead, Underground and Pad-Mounted transformers
 - Renewable and Battery integration
 - Grid Impact Stability/Power Study
 - Distribution Automation (DA) using wireless communications
 - Advanced Metering Infrastructure

Remote Capacitor Banks Demonstration

- Power factor management capabilities will be demonstrated using remotely controlled capacitor banks
- Functions to be demonstrated:
 - Demo of remote operation of capacitor banks
 - Demo of autonomous operation of capacitor banks
 - Demo of power factor improvement will be realized

Monitoring of Overhead, Underground, and Pad-Mounted Transformer Demonstrations

- Using such transformers, LADWP will determine effective technology for monitoring transformers performance with regard to loading voltage, current, core temperature, and presence of any “hot spots”
- Power theft detection technology will be demonstrated as well
- Functions to be demonstrated:
 - Demo of usage of transformer monitoring devices
 - Demo transformer performance in conjunction with EV chargers



Renewables and Battery Integration

- The viability of using charged EV batteries will be demonstrated as providing an integrated set of storage devices to use for maintaining grid integrity as LADWP pursues RPS and IRP goals
- Functions to be demonstrated:
 - Demo of community storage on EV batteries and external storage
 - Demo of the garage of the future
 - Demo cycling of the batteries
 - Demo aggregation of the batteries
 - Demo integrated solar and EV



Grid Impact Stability/Power Study

- President Obama mentioned during his campaign that he wanted one million EVs in the US by 2015
- A large percentage of those vehicles are expected to be in California
- This demonstration will reveal the impact of the EVs on the electrical grid
- Functions to be demonstrated:
 - Demo generation, transmission, and distribution effects
 - Demo various loading scenarios



Distribution Automation Using Wireless Communications

- Through this demonstration, smart equipment will be installed along the Chatsworth Circuit
- Demonstrations will exhibit use of smart technology with wireless communication
- Function to be demonstrated:
 - ☐ Demo automatic capacitor banks controls
 - ☐ Demo remote switching
 - ☐ Demo remote fault indicating
 - ☐ Demo transformer monitoring
 - ☐ Demo local energy storage integration



Advanced Metering Infrastructure

- Advanced Metering Infrastructure (AMI) will be integrated with Distribution Automation (DA)
- Functions to be demonstrated:
 - ☐ Demo 2-way AMI communication
 - ☐ Demo AMI remote on/off switching
 - ☐ Demo fault monitoring and switching
 - ☐ Demo various billing schemes (time of use, critical pricing)
 - ☐ Demo voltage, demand and VAR reads
 - ☐ Demo AMI – EV charger communication
 - ☐ Demo Multi Family Residence charging/Metering scheme(s)