SDG&E- Microgrid Projects

EPRI Smart Grid Advisory Meeting
October 13, 2009
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Agenda

1. Project Overview
   - Objectives/Benefits
   - Pyramid
   - Site
2. Architecture Overview
   - OPEX 20/20
   - Interface implications
   - Microgrid system architecture
   - Changes to architecture
   - Status
3. Issues and Challenges
4. Questions

MicroGrid Project Overview: Goals & Scope

SDG&E's Microgrid project integrates a DOE component, focused on feeder applications and a CEC component, focused on customer-side applications

MicroGrid Project

DOE Portion

- **$7.2M in DOE funds contribution towards $12M total project cost over 3 years**
- **Goal to achieve >15% reduction in feeder peak load and improve system reliability**
- **Perform cost/benefit analysis for full scale deployment**
- **Involves Integration of 5 technologies:**

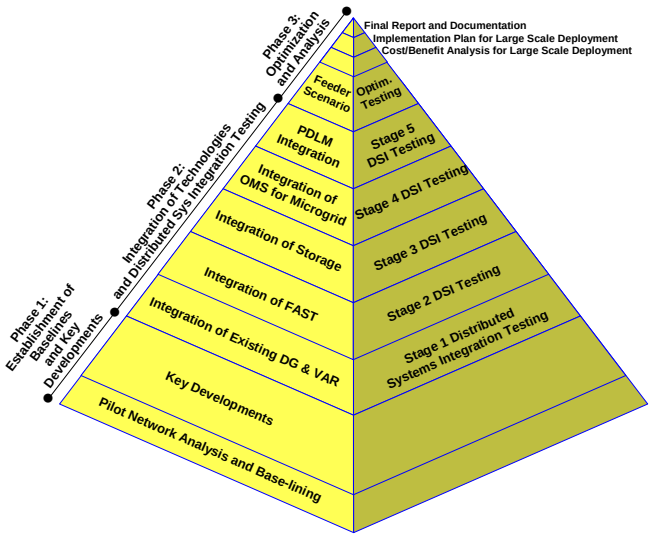
1. ***Distrib. Energy Res. (DER) and VAr***
2. ***Feeder Automation System Technologies (FAST)***
3. ***Advanced Energy Storage (AES)***
4. ***OMS/DMS system***
5. ***Price Driven Load Mgmt (PDLM)***

CEC Portion

- Entirely CEC Funded ($2.8M)
- Sustainable Communities MicroGrid focused on interoperability, AMI and customer DER
- Schedule to mesh with larger DOE proj.
- Involves Integration of customer based technologies:

1. *Remote Controlled Demand Response Devices (e.g. Thermostats)*
2. *Solar panels*
3. *Battery storage*
4. *Plug-in Hybrid Electric Vehicles (PHEV's)*
5. *Grid-friendly appliances*

Microgrid Project Overview "Pyramid"



MicroGrid Selected Site: Borrego Substation

Sempra Energy utilities

Key Characteristics:

Strengths:

- No residences nearby, plenty of land
- More Existing Solar Customers
- Large Reliability Improvements Possible
- Possibility of 'Islanding' Entire Community
- Great learning environment
- Extendable to service territory

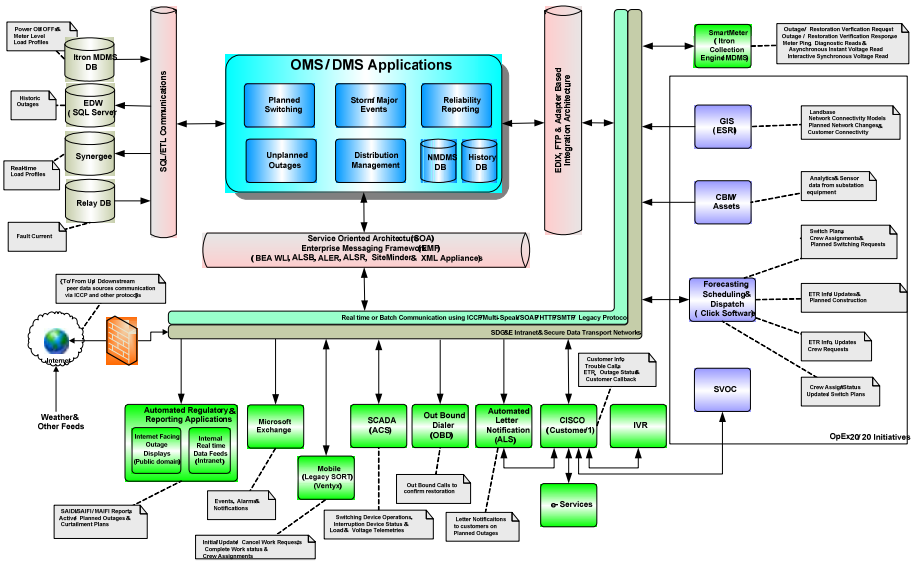
Challenges:

- Remote Area
- Challenging Communications Environment
- New Fencing Required
- Requires Accelerating schedule for Condition Based Maintenance and AMI Deployment

Borrego offers SDG&E an opportunity to be the leader in the Micro Grid area, with the possibility of being able to island an entire substation with peak load of over 10 MW.

Project Architecture: Enterprise Architecture

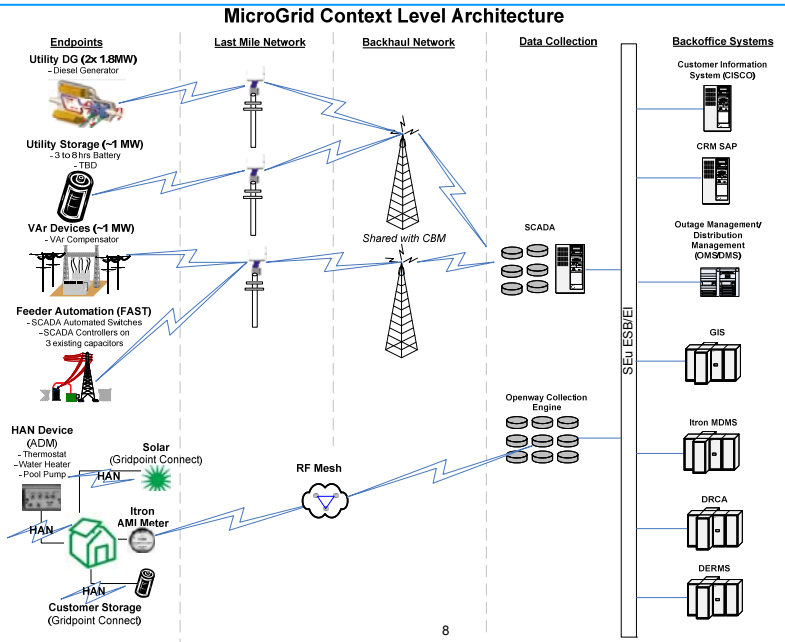
Sempra Energy utilities



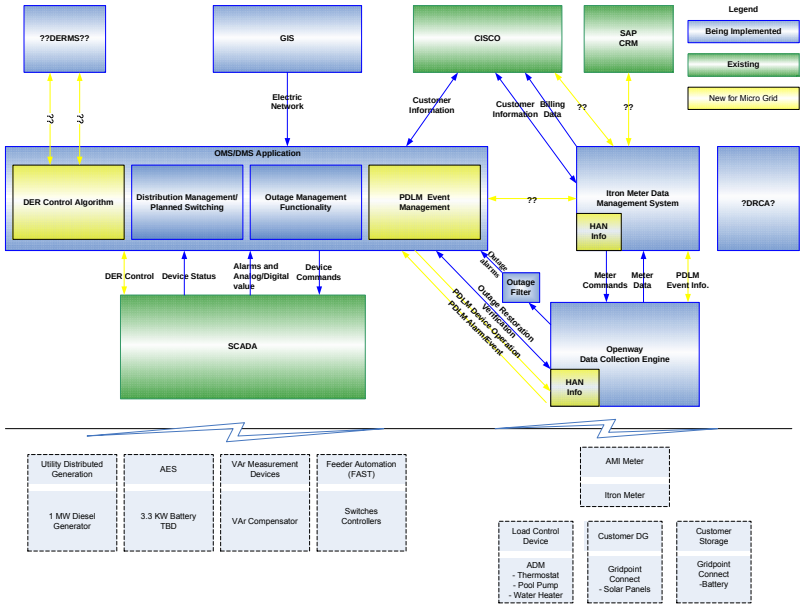
Interface implications to legacy systems

- DMS
  - Interaction with new systems to support advanced operations
    - Distributed energy management systems (internal and 3rd party), Microgrid controller (if it is a distinct system), AMI, Condition Assessment systems for dynamic ratings
- SCADA
  - New equipment and device types require integration
- AMI
  - Smart grid requires more control and interactivity within the AMI network – if it is to move beyond simple meter-centric operations and data collection
- Work Management
  - Improved integration of field workers with real-time visualization of system status and grid information rather than static maps
- Customer
  - Interaction with external 3rd party groups and aggregators

Project Architecture: System Architecture



Project Architecture: Context Level Architecture



Changes to the Existing Architecture

- Multiple networks (logical and physical) should move to a converged shared solution. Requires a new backbone that can support multiple applications with appropriate security and quality of service to meet business requirements
  - Traditional SCADA
  - AMI networks
  - System status (dynamic rating and system condition)
  - Introduction of the public network (e.g., HAN)
- Incorporate new system components and external trading parties
  - Virtual service providers
  - Demand response management
  - Microgrid control
- Moving to more decentralized control mechanisms from a centralized model
  - Current model – centralization of functionality in the DMS
    - Load flow and state estimation
    - Switching
  - Future state
    - Federated model for scalability
    - Distributed energy management – supply and demand
    - Integration of new information (e.g., dynamic ratings)
- More Service-based orientation to provide more logical packaging of control over the grid
  - Provide more capability to migrate functions between system elements – e.g, DMS and microgrid control

Phase 1 Overview: Status of Activities

Task	Status	Comments
Task 1A –Develop a **Project Management Plan** (PMP):	Complete	The final SOPO and a project management plan have been updated
Task 1B – **Site Selection**: Select a demonstration site for the project	Complete	Site has been selected as Borrego
Task 1C – Analyze **Advanced Energy Storage (AES)** Solutions. Select appropriate types of AES devices to deploy for substation peak load shaving and support during transitions to/from islanded operation	Complete	The Use Cases for storage have been completed The RFP for storage device has been sent to the AES vendors
Task 1D – **Negotiate AES Pricing** and Obtain Cost: Quotes Analyze submitted price quotations, select vendor(s) and initiate purchase order(s)	In Progress	Currently evaluating responses to RFP. An award will be made in October, 2009
Task 1E – Install Initial **Field Hardware**: Begin installing equipment to be used for subsequent phase of the project.	In Progress	Permits have been acquired. Civil & Electric engineering activities initiated Generator to be installed by September
*Task 2.1 -- Pilot **Network Analysis and Baselining**:*	*Pending DOE approval*	DOE funds have not been fully released
*Task 2.2 -- **Key Developments**:* *Establish the functional specifications and test programs*	*Pending DOE approval*	DOE funds have not been fully released

Status of Activities: Use Cases

The Microgrid Team has conducted ten (10) Use Cases to the explore the various operational modes of the microgrid. The Use Cases aim to:

- Identify the major separate operations of the microgrid- each with a separate use case
- Capture the value-added (to the utility, to the customer) of each use case
- Identify various scenarios within each use case that may have slightly different triggers or outcomes
- Document all steps necessary to carry out the objectives of each use case Scenario
- Identify the actors (persons, department, agencies) responsible for each step
- Identify Functional Requirements need to achieve the operation of the microgrid

Issues and Challenges

- Coordination of Efforts Across Departments and with Subcontractors
- Integration of Distribution Energy Resources
- Distribution Automation
- Asset Management
- Security – Cyber & Physical
- Establishing Secure Communications Network
- Development of Appropriate IT Architecture
- Customer Participation in DG and Demand Response Programs
- Regulatory and Tariff Impacts
- Cross-jurisdictional Issues

Questions???