Smart Grid

NASPI Summit Meeting

Kevin Dasso
Smart Grid & Technology Integration

October 13, 2011

A Smart Grid

Overlay with intelligence and automation

Sense

Communicate

Compute

Control

Power Plants

Transmission Networks

Substations

Distribution Networks

Consumers

Smart Grid Vision

Customer Service Drivers
- Reliability
- Safety and Security
- Cost Effective

Energy Policy Drivers
- AB 32
- CA Solar Initiative
- 33% RPS
- Demand Response
- ZNE Buildings
- Electric Vehicles

SB17 SG Characteristics
- Self-healing
- Resist Attack
- DG & Storage
- Efficiency
- Empower Customers
- Power Quality and Reduced Outages
- Enable Markets
- Intermittent Resources

Engaged Consumers

Smart Markets

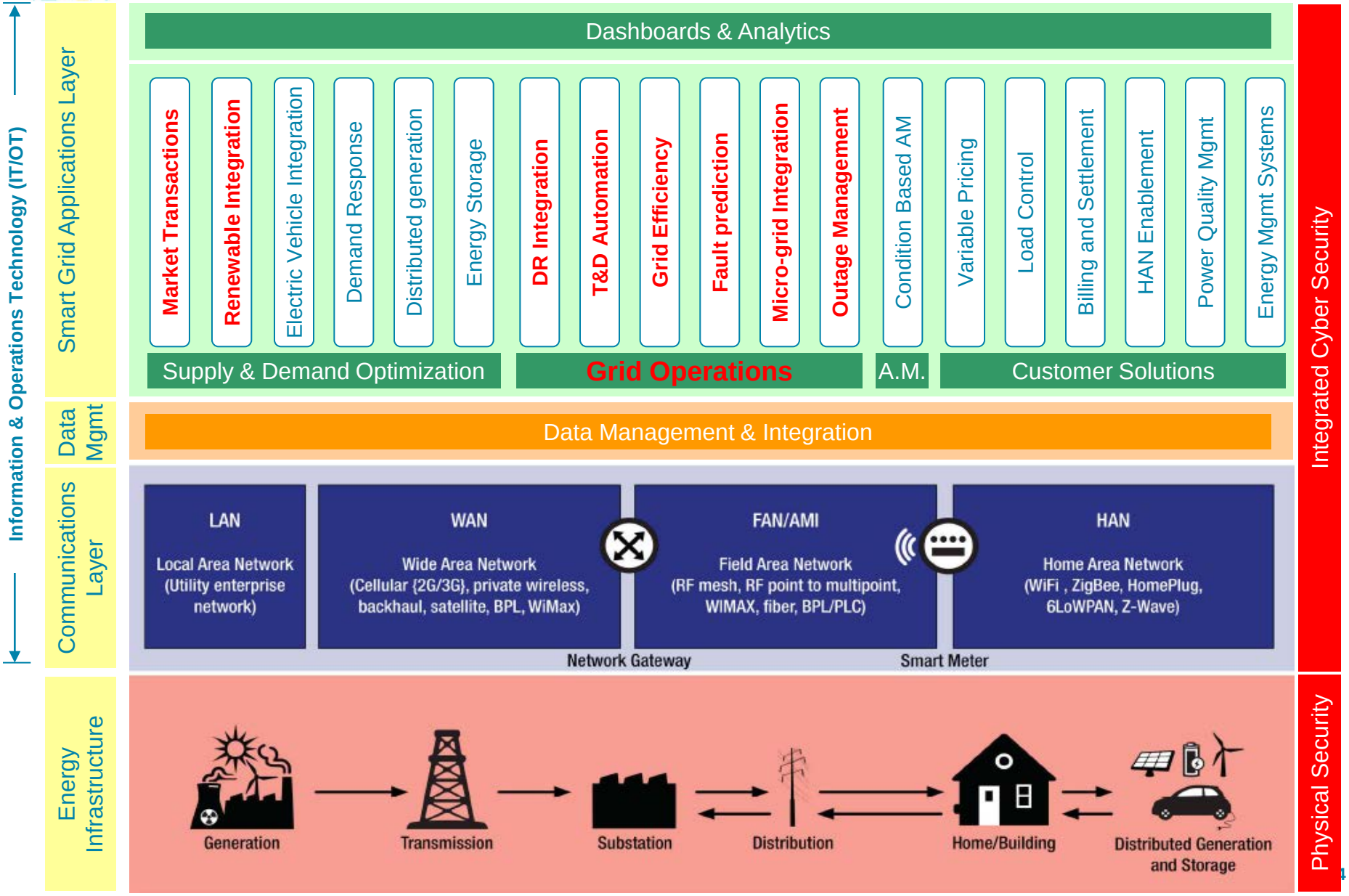
Smart Utilities

PG&E's Smart Grid Vision

PG&E's vision for the Smart Grid is to provide customers **safe, reliable, secure, cost-effective, sustainable** and flexible energy services through the integration of advanced communications and control technologies to transform the operations of our electric network, from generation to the customer's premise.

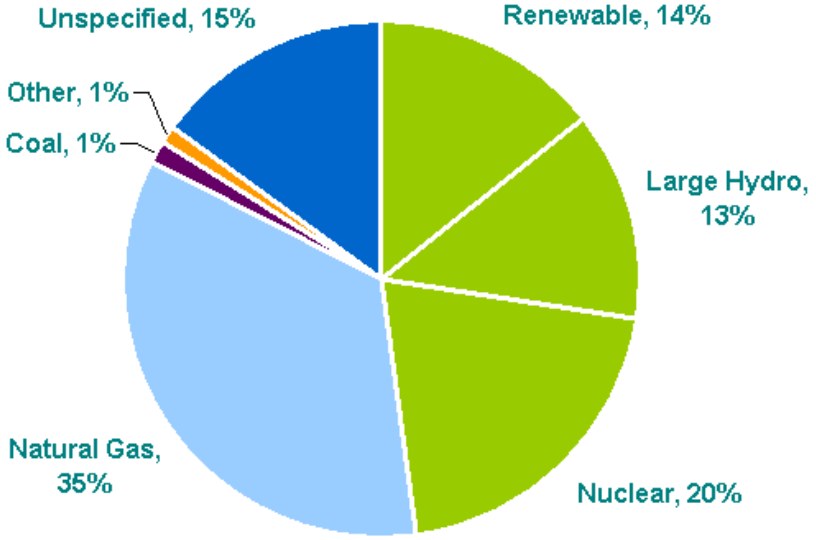
PG&E Smart Grid Framework

Synchrophasor Aspects



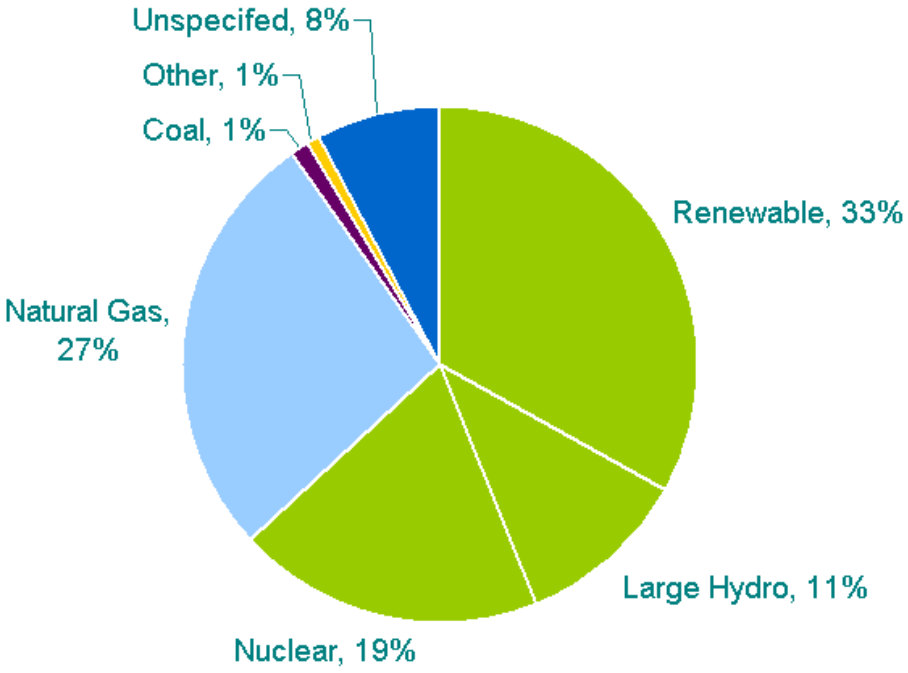
A Growing Reliance On Renewables

2009



47% Non-GHG emitting

2020



~63% Non-GHG emitting

Implementation Approach

Standards definition

- Shape and validate the standards that will underlie future smart-grid implementations

Testing

- Prototyping and testing of smart-grid technologies before piloting
- Accelerate technology development and ensures standards compliance early on
- Develop preliminary customer communications to support pilots

Controlled Pilots

- Implement tested technologies in a real-world but controlled setting to demonstrate value
- Work with customers to prepare for the new technologies and services

PG&E Service Area in Northern & Central California

Targeted deployment

- Extend pilots to targeted roll-outs based on benefits
- Insights used to feed the next cycle of technology deployment

PG&E's Smart Grid In Progress

Engaged Consumers

Online Information

Home Energy Reports

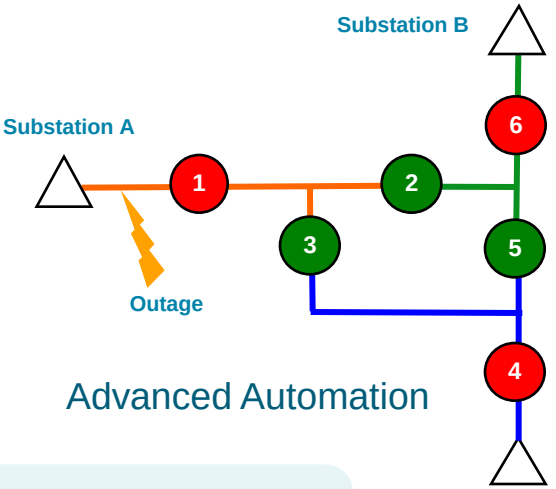
Smart Markets

Customer Energy Management

Automated Demand Response

Smart Utility

Transformer Load Management



Advanced Automation

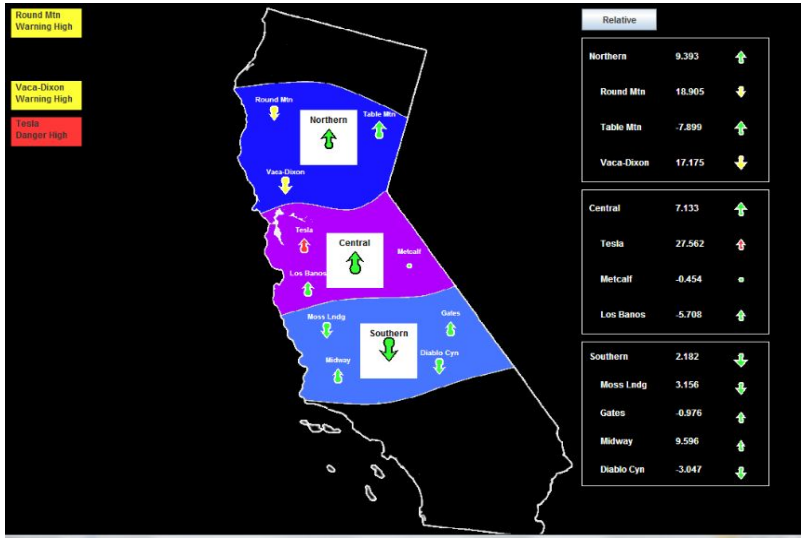
PG&E is using Smart Grid technologies to provide customers with benefits today

Optimal PMU Placement and Number Selection

Maximize benefits for multiple applications based on ***Application Roadmap***

Applications' criteria:

- *Monitor Critical Paths (tie-lines, WECC paths, congestion, cut-planes)*
- *Monitor Major Generation and Loads*
- *Monitor Critical Substations*
- *Improve State Estimation*
- *Renewable Generation Integration*
- *Islanding Separation & Restoration*
- *Remedial Action Schemes, Adaptive Protection*
- *FACTS, SVC and HVDC Controls*



Cluster Overview

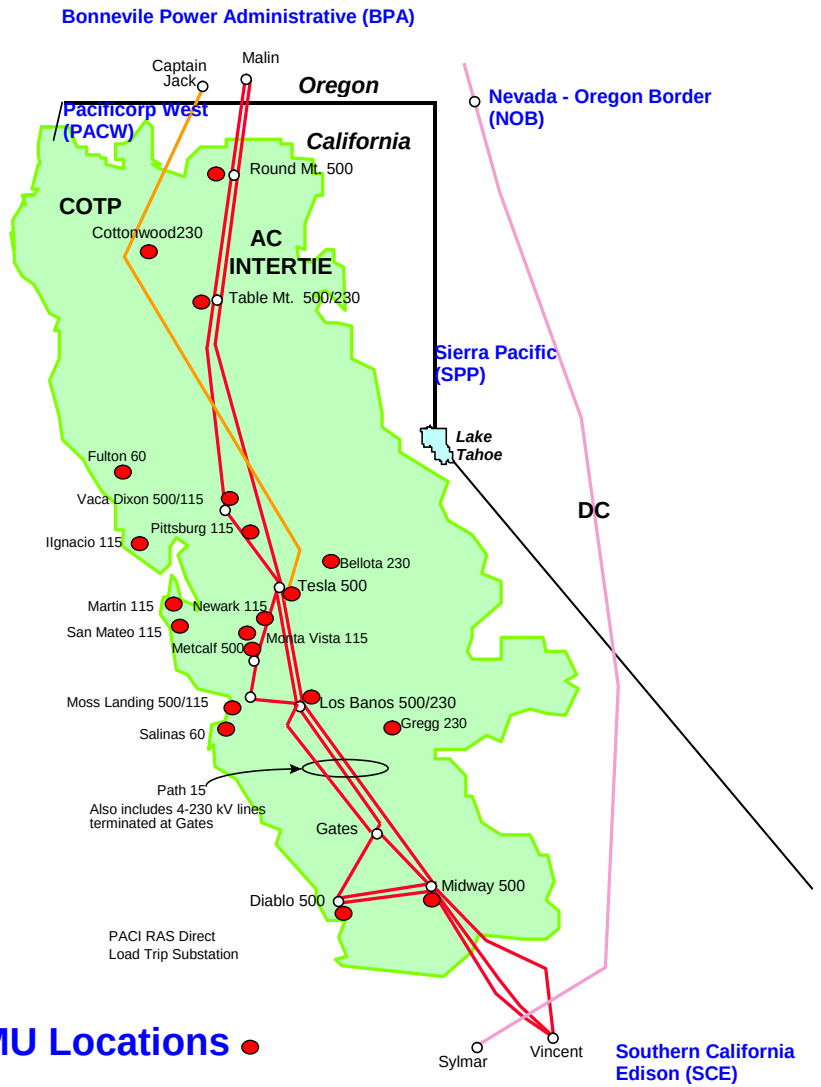
Cluster – Zoomed In

Selection Methodology and Locations

Least cost solution:
Leverage existing or planned infrastructure, PMU placement in neighboring systems, etc.

Decision process:
Choosing PMU Locations among **Alternatives** based on multiple **Criteria**

- Applications
- Infrastructure
- Maintenance over life cycle



Questions?