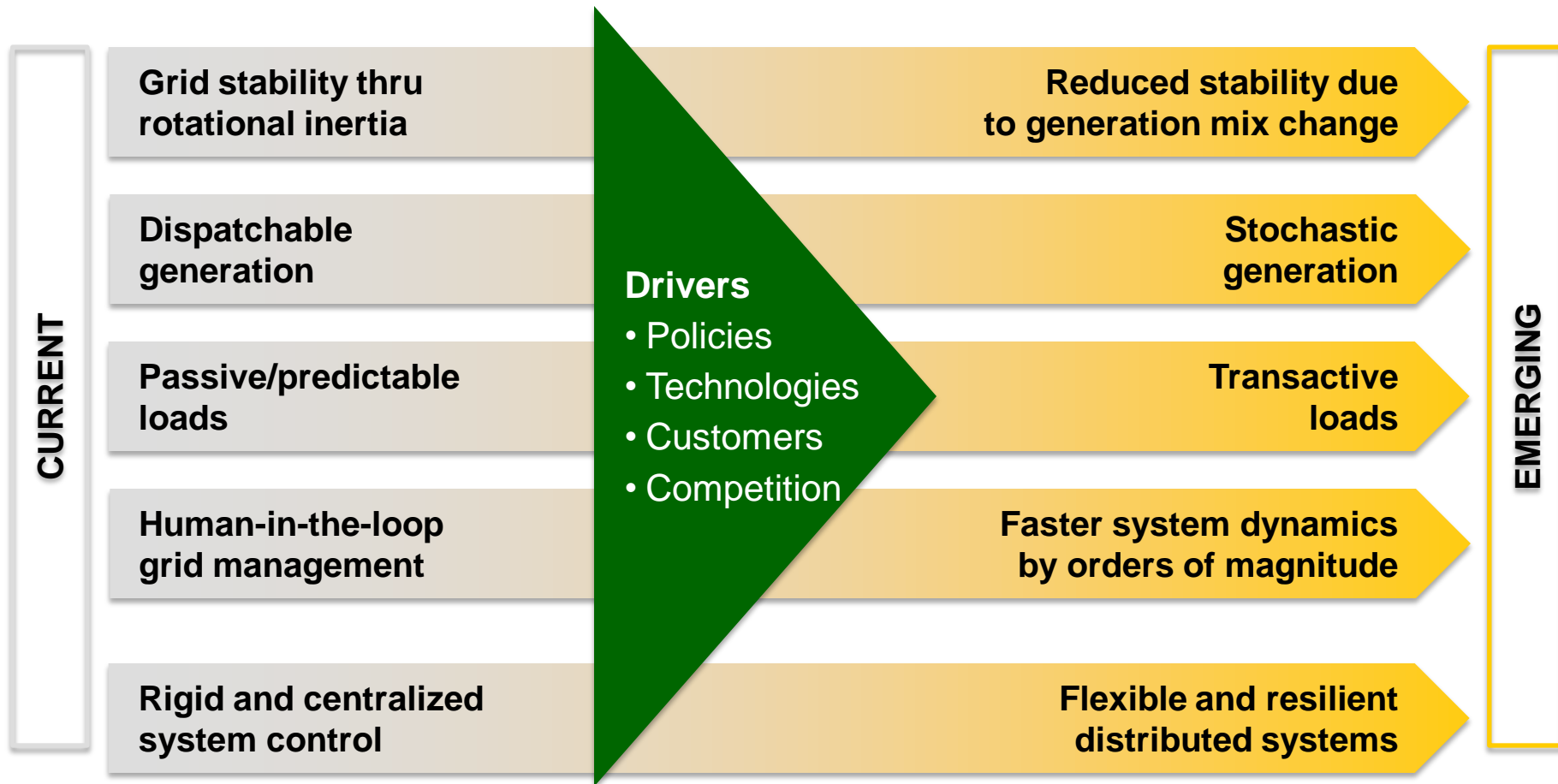


Meeting the Challenges of a Changing Electric Industry

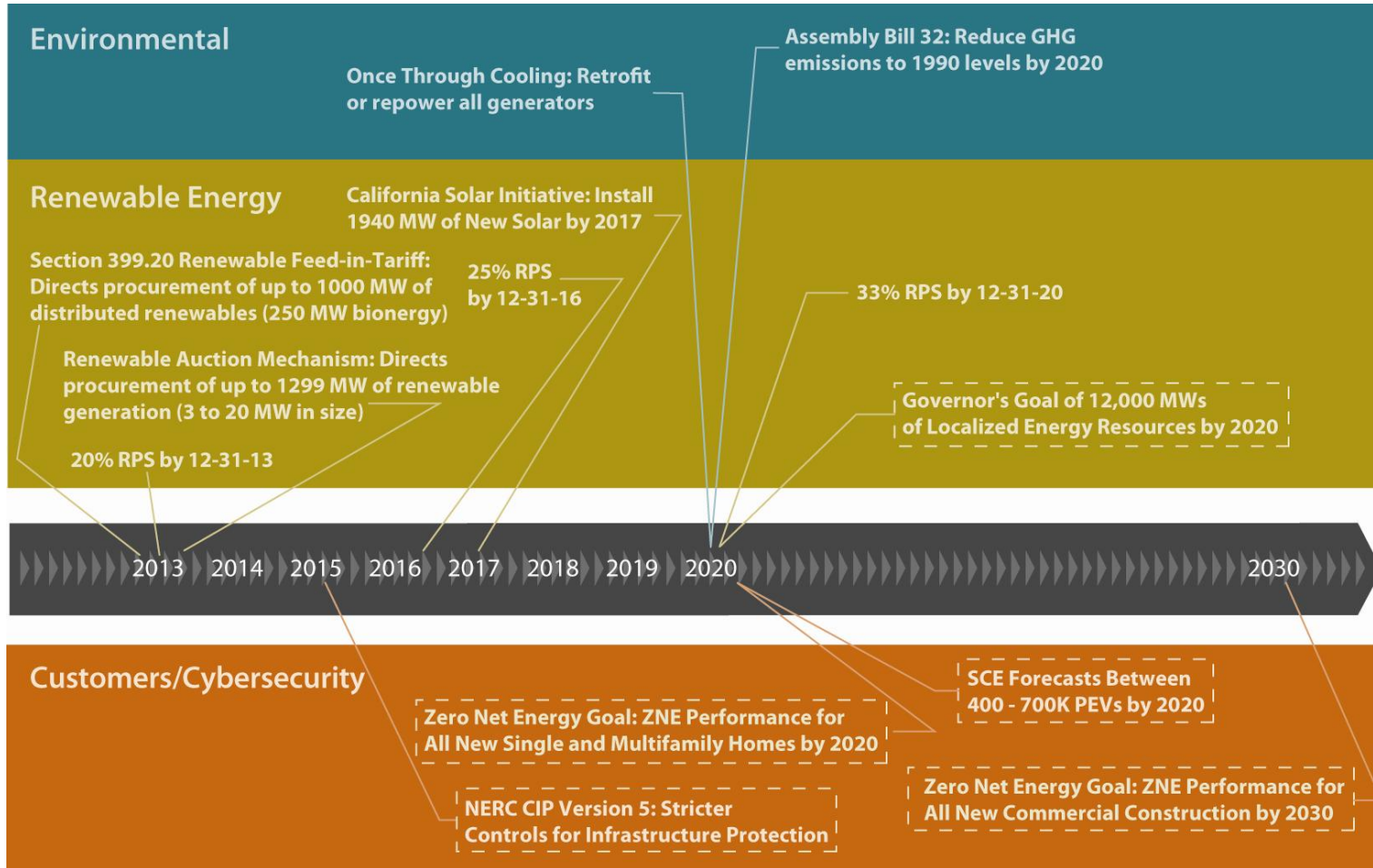
Michael Montoya

February 20, 2013

The electric utility system is facing fundamental changes



In particular, ambitious policies are creating challenges for safety, reliability, cost and investment risks

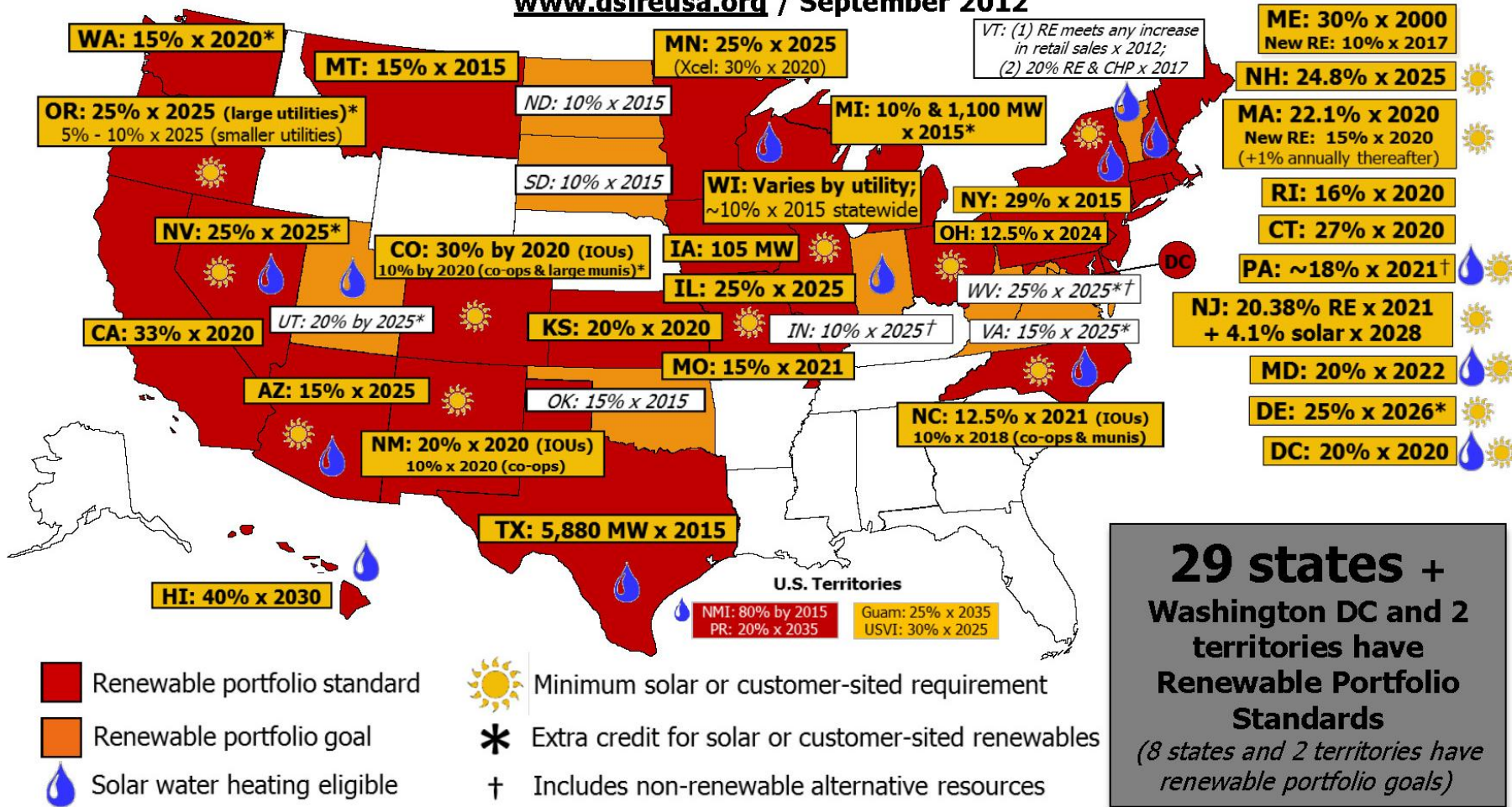


Legend

- Mandate
- Goal

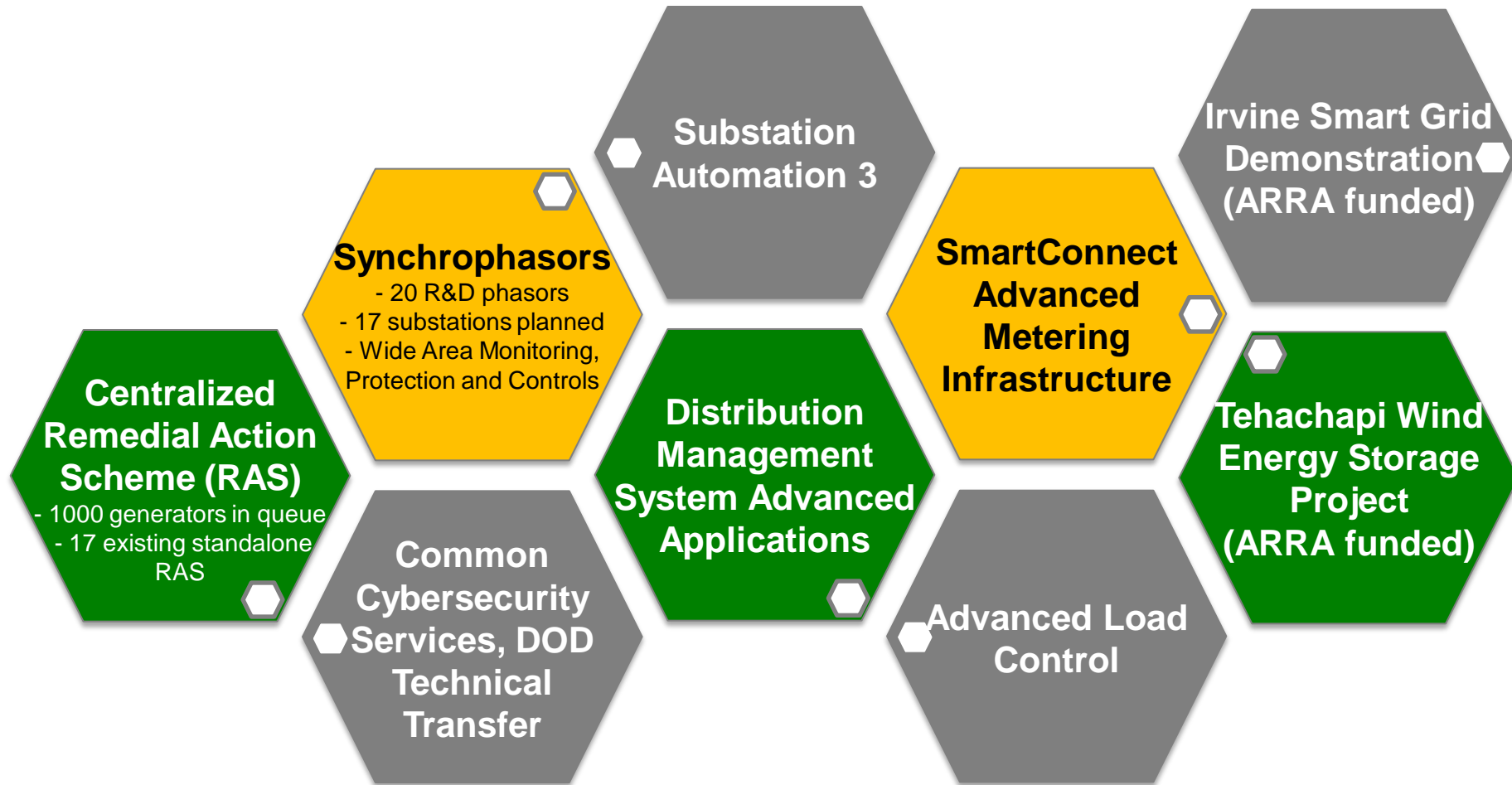
Many states across the U.S. are implementing RPS

www.dsireusa.org / September 2012



Source: Database of State Incentives for Renewables & Efficiency, www.dsireusa.org

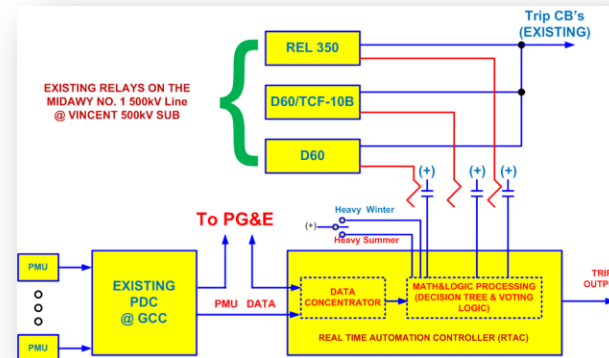
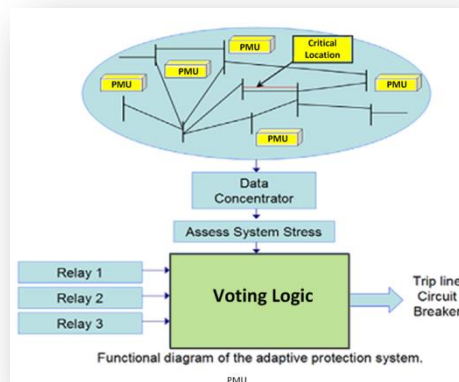
And there are already a number of smart grid projects in flight to meet policy and changing customer needs



Wide Area Monitoring Protection & Control

Protection: Early Warning Systems with Adaptive Protection

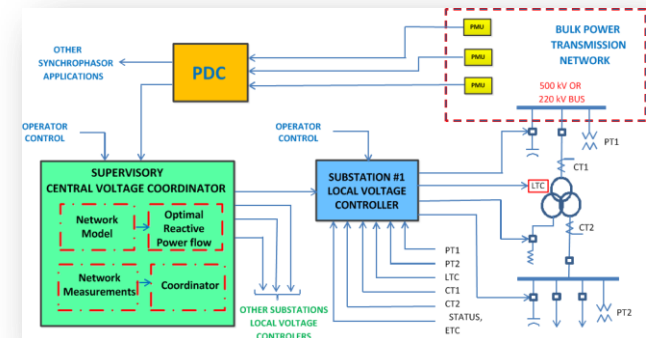
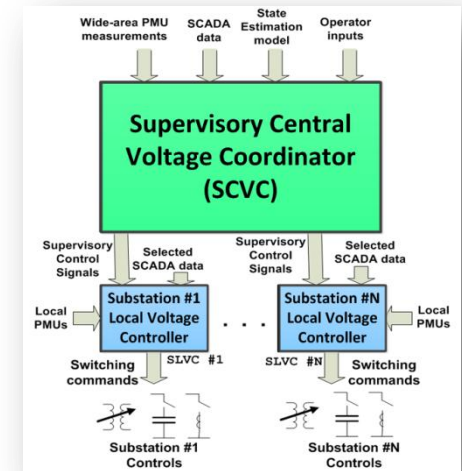
- **Problem:** Analysis of recent cascading blackouts has indicated that undesirable relay operations (“false trips”) are often an important contributing factor in the sequence of events leading to a cascading outage.
- **Cause:** Protection systems are calibrated for normal system conditions, and can’t automatically compensate for outages and other events that weaken or stress the transmission system
- **Result:** False trips during normal system conditions are not a significant detriment to reliability, but false trips during abnormal conditions can exacerbate system vulnerabilities (
- **Goal:** Find ways to make protective relaying technologies more “adaptive” to changing system conditions
- **Hypothesis:** Synchrophasor data can be used to develop advanced protection systems that will detect system conditions in real time, “supervise” the operation of protective equipment to improve system security (“Adaptive Relaying”)
- **Objective:** Develop these advanced protection systems, demonstrate them in an actual utility environment.



Wide Area Monitoring Protection & Control

Control: Coordinated Voltage Control in SCE Transmission Network

- System Conditions:
 - Bulk power substations typically include a number of transformers with variable taps, as well as reactive support capability in the form of SVCs, switched capacitors and reactor banks.
 - Transformer under load tap changers (LTC) are used to control the secondary voltage, while capacitors are switched to correct power factor during peak loads and switched off during light loads.
- Objectives:
 - Develop algorithms to control the voltage at substation level using synchrophasor (PMU) data in real time.
 - Install controllers at substation level.
 - Develop algorithms to supervise voltage control at central location to prevent hunting among near substations.



To evaluate the safety and operability of new technologies in a controlled environment first

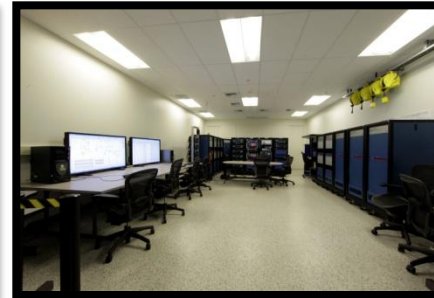
Situational Awareness Lab



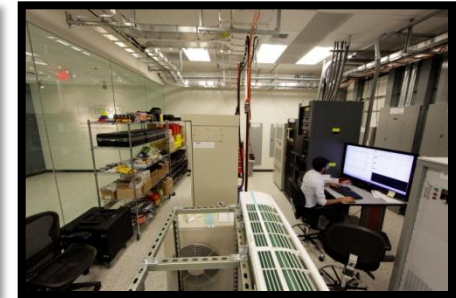
Communications & Computing Lab



Power Systems Lab



Distributed Energy Resources Lab



Substation Automation Lab



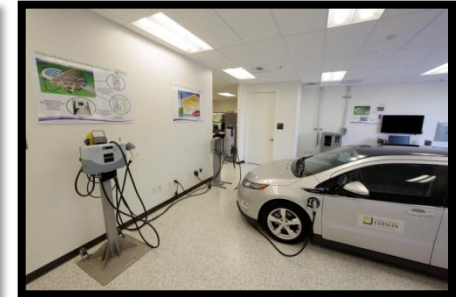
Distribution Automation Lab



Home Area Network Lab



Garage of the Future Lab



Integrated platform for evaluating the safety and operability of smart grid technologies in a controlled environment before being deployed on the grid

**THANK YOU AND WELCOME TO
SOUTHERN CALIFORNIA!**