

California DR Integration Projects: San Diego and Marin County

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Topics

- Background on DOE and CEC Distributed Energy Resources and Renewable Programs
- San Diego Gas & Electric (SDG&E) Microgrid Project
- Marin County Sustainable Community Project with Infotility GridAgents

(US) Department of Energy (DOE): Renewable and Distributed Systems Integration (RDSI) Program

- DOE's Office of Electricity Delivery and Energy Reliability
- **Renewable and Distributed Systems Integration (RDSI)**
RDSI focuses on integrating renewable energy, distributed generation, energy storage, thermally activated technologies, and demand response into the electric distribution and transmission system.
- This integration is aimed toward managing peak loads, offering new value-added services such as differentiated power quality to meet individual user needs, and enhancing asset use.
- The program goal is to demonstrate a 20% reduction in peak load demand by 2015, through increased use of both utility- and customer-owned assets.

California Energy Commission (CEC) and its Public Interest Energy Research (PIER)

- California Energy Commission (CEC) was formed in 1974 with the mission to assess, advocate and act through public/private partnerships to improve energy systems that promote a strong economy and a healthy environment.
- The California State Legislature created the **Public Interest Energy Research (PIER)** Program in 1996 during California's utility restructuring legislation.
- This law requires that \$62.5 million be collected annually from the three investor-owned electric utilities for energy-related research, development and demonstration (RD&D) efforts not adequately provided by competitive and regulated markets.
- In doing so, administration of public interest RD&D was shifted from California's investor-owned utilities to state government, **a major change intended to ensure an appropriate role for public interest energy research in a newly competitive energy marketplace.**

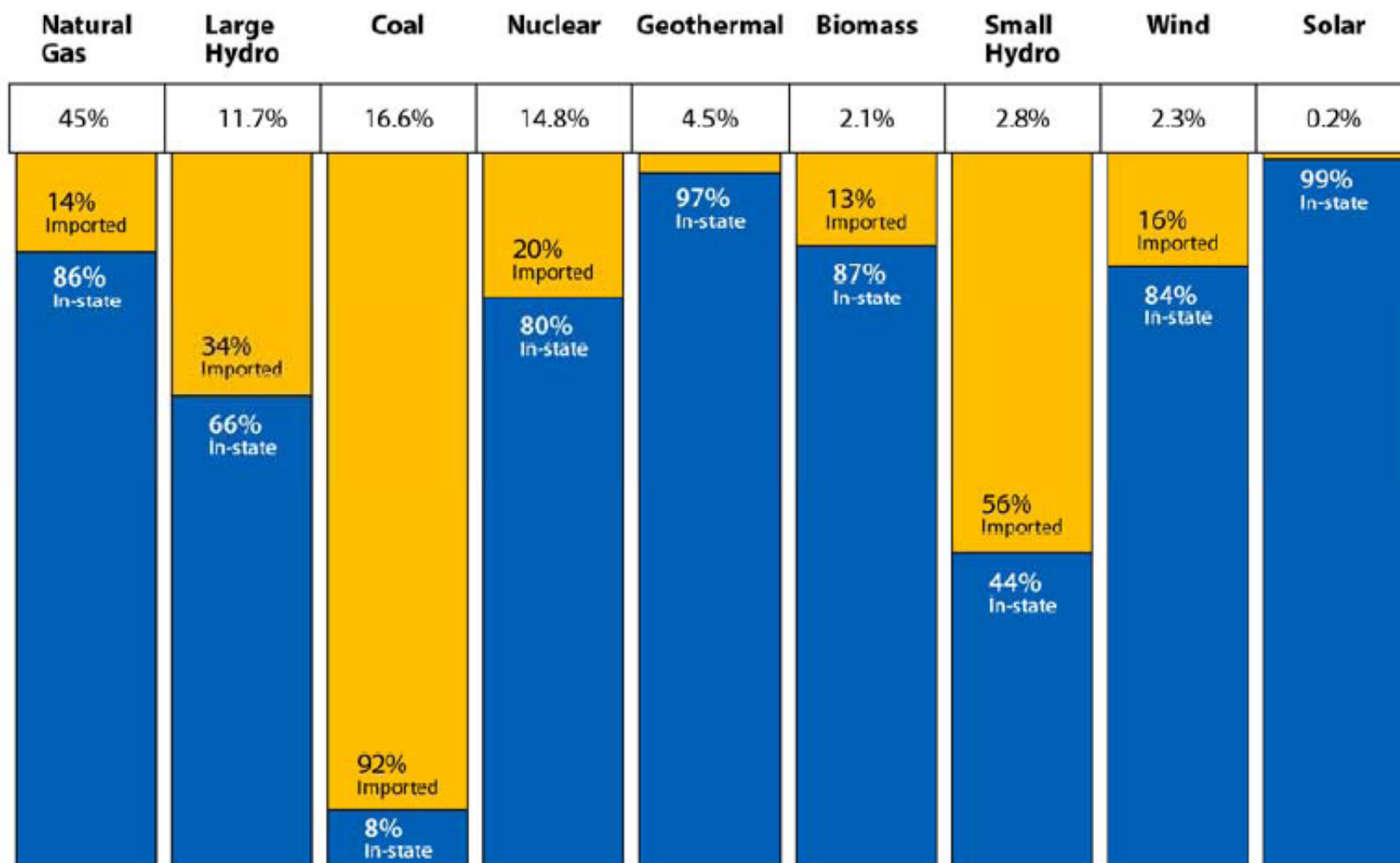
CEC Public Interest Goals for a Sustainable Community

- Integrate utility and customer-based energy resources, including carbon and non-carbon-based energy sources
- Enhance the management of intermittent renewable resources, including the impact of resources from sustainable communities
- Identify and evaluate the key technical and operational issues with designing, implementing, and managing an integrated energy portfolio of utility and non-utility interconnected resources
- Improve power reliability and quality via utility asset optimization

California and Renewable Energy

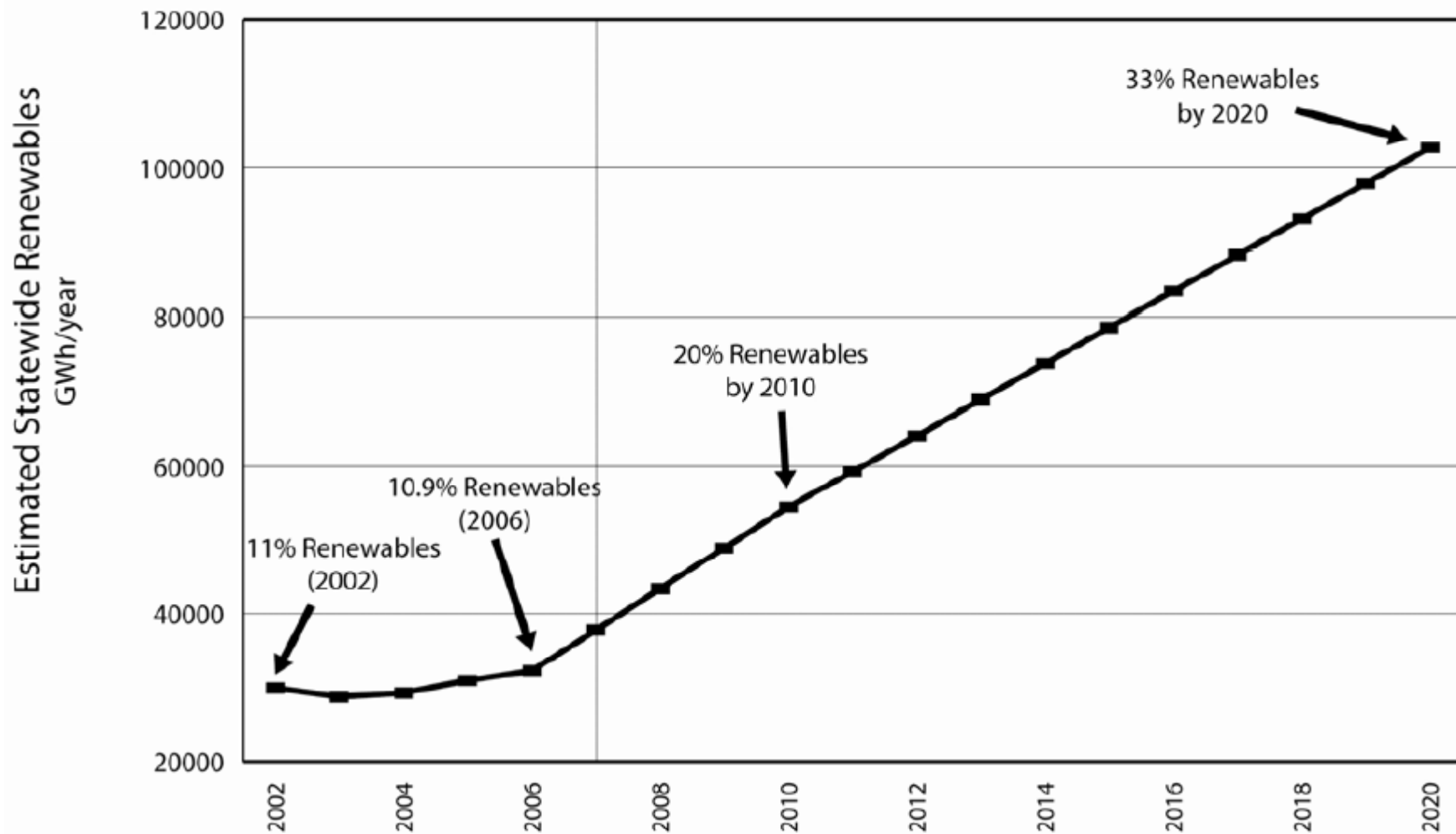
- On November 17, 2008, Governor Arnold Schwarzenegger signed Executive Order # S-14-08 that **raises California's renewable energy goals to 33 percent by 2020** and clears red tape for licensing renewable projects.
- The Executive Order will advance California's transition into a clean energy economy and directs state agencies to create comprehensive plans to prioritize regional renewable projects based on an area's renewable resource potential and the level of protection for plant and animal habitat.
- In 2007, 11.8 percent of all electricity came from renewable resources such as wind, solar, geothermal, biomass and small hydroelectric facilities. Large hydro plants generated another 11.7 percent of our electricity.

Figure ES-1: California's Electricity Mix - 2007



Source: California Energy Commission, *Gross System Power Report 2007*

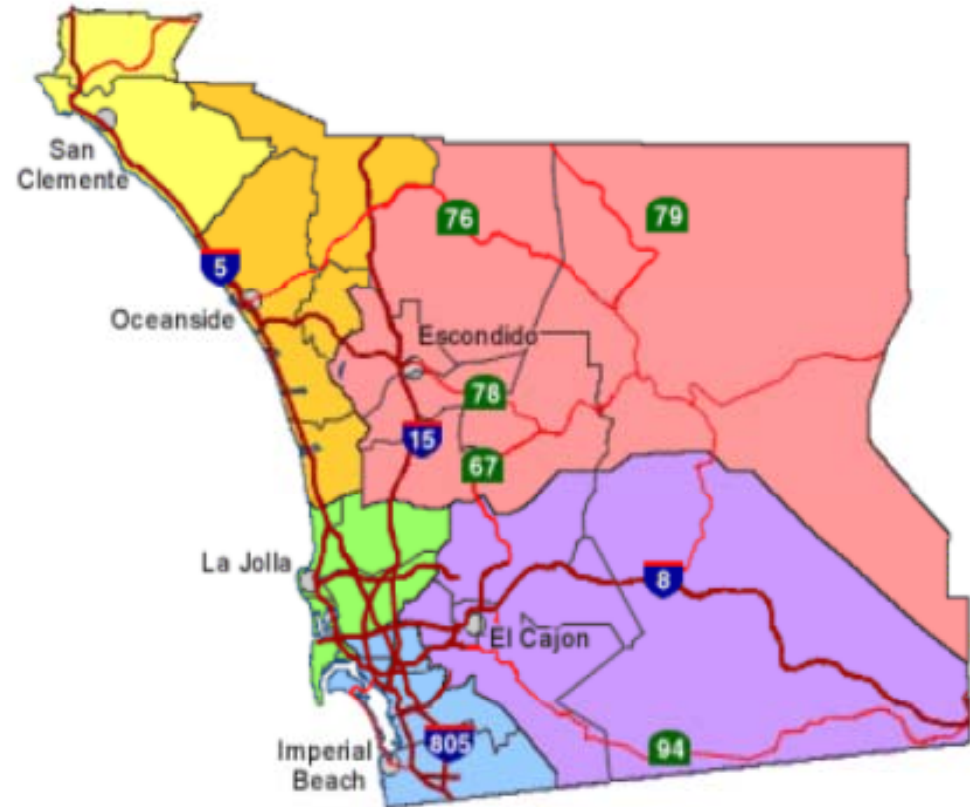
Figure ES-2: Progress Toward California's Renewable Energy Goals





SDG&E Beach Cities Microgrid Project

SDG&E is conducting a pilot scale “proof-of-concept” test in San Diego, CA of how information-based technologies and DER may increase asset utilization and reliability.



Jointly funded by the Department of
Energy (DOE) and the California
Energy Commission (CEC)

SDG&E Beach Cities Microgrid Project Objectives

- Achieve > 15% reduction in feeder peak load
- Demonstrate capability of Volt-Amps-Reactive (VAr) management
- Develop a strategy and demonstration of information integration focused on both security and overall system architecture:
 - Integrate Advanced Metering Infrastructure (AMI) into Microgrid operations;
 - Develop self healing networks through the integration of Feeder Automation System Technologies (FAST)
 - Integrate an Outage Management System (OMS) and a Distribution Management System (DMS) into Microgrid operations
- Develop Information requirements and appropriate tools to assess the impact of multiple DER technologies
 - control algorithms for autonomous DER operations/automation that address multiple DER interactions and stability issues
 - coordination and interoperability of multiple DER technologies with multiple applications/customers.
- Use automated distribution control to intentionally island customers in response to system problems
- Demonstrate Programmable and Controllable Thermostats (PCT) to achieve Demand Response goals within the smart grid.

Benefits

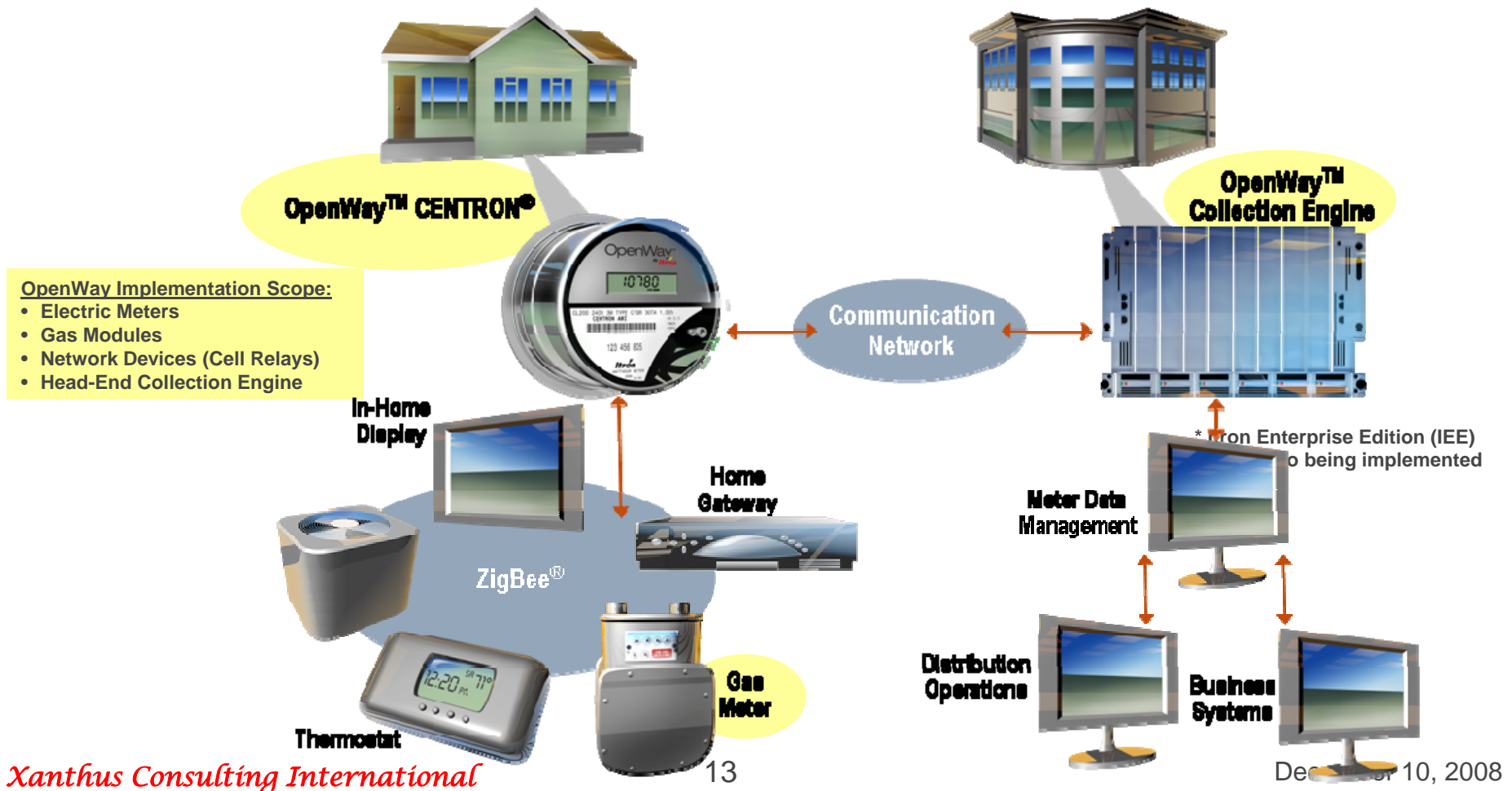
- Allow more power to be delivered through existing infrastructure and reduce the need to build more in the future
- Increase in the reliability and security of the grid by adding elements that make the grid more stable and reconfigurable.
- Allow Utility to utilize and control customer-owned resources
- Optimize the design of circuit operations for microgrid capabilities given consumer DG, demand response, automated response, and other advanced tools

Project Strategies

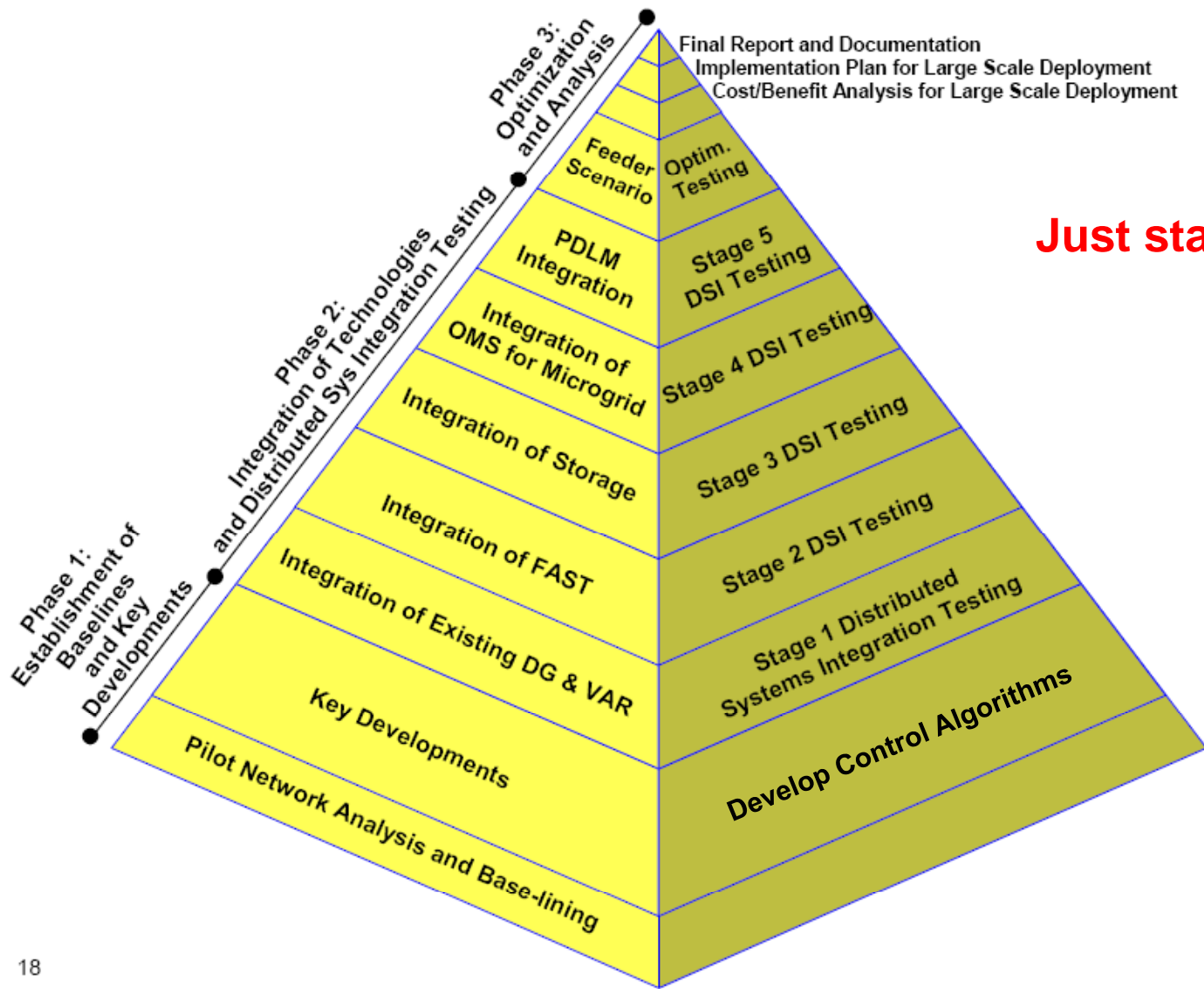
- Design and demonstrate a smart electrical grid that incorporates sophisticated sensors, communications, and controls in the following ways:
 - Intelligently incorporate solar power generators on homes and businesses into the electrical delivery system.
 - Enable coordinated Demand Response (DR) programs whereby heavy electrical use during peak demand periods can be moderated to prevent electrical supply emergencies.
 - Integrate and control multiple distributed generation and electrical energy storage devices to operate the grid in a more cost-effective and reliable manner, benefiting customers and electrical rates.
- This project will proactively identify and apply leading-edge technologies to improve the security and reliability of electricity supply and to lower costs to consumers.

SDG&E Smart Meter Technology Selection

- SDG&E has selected Itron's OpenWay technology for its AMI technology solution



Tasks for Beach Cities Microgrid Project



Just started in late 2008

- FAST: Feeder Automation System Technology
- OMS: Outage Management System
- PDLM: Price-Driven Load Management
- DSI: Distributed Systems Integration Testing

Participants in Project

- SDG&E (PM, facilities, customers, AMI, implementation)
- Horizon Energy Group (project coordination, design, testing)
- Pacific Northwest National Labs (DER design)
- University of San Diego (regulatory design)
- Advanced Control Systems (software, modeling)
- Motorola (communications, security)
- Lockheed Martin (system architecture, facilities)
- IBM (DER automation, security)
- Xanthus (protocol standards, security, integration)

Marin County Sustainable Community Project



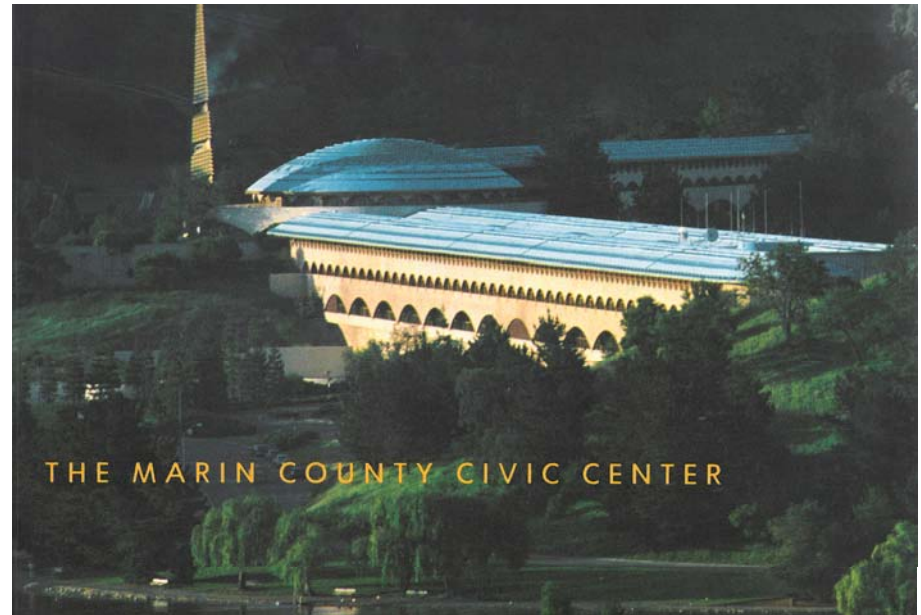
Marin County Sustainable Community

- US Department of Energy funding:
 - Three year –three phase project schedule and scope with \$1.6 Million budget for 2008-2010.
 - Collaboration and cost share with ECN –Netherlands for EU field testing and technology transfer.
- California Energy Commission (CEC) funding – incremental work focusing on integration and communications standards using IEC 61850.
- Contractors: Infotility, Inc. and Xanthus Consulting International



Marin County Sustainable Community – Using Infotility Grid Agents to Monitor Photovoltaic Systems, Control Load, and Bid into the Electricity Market

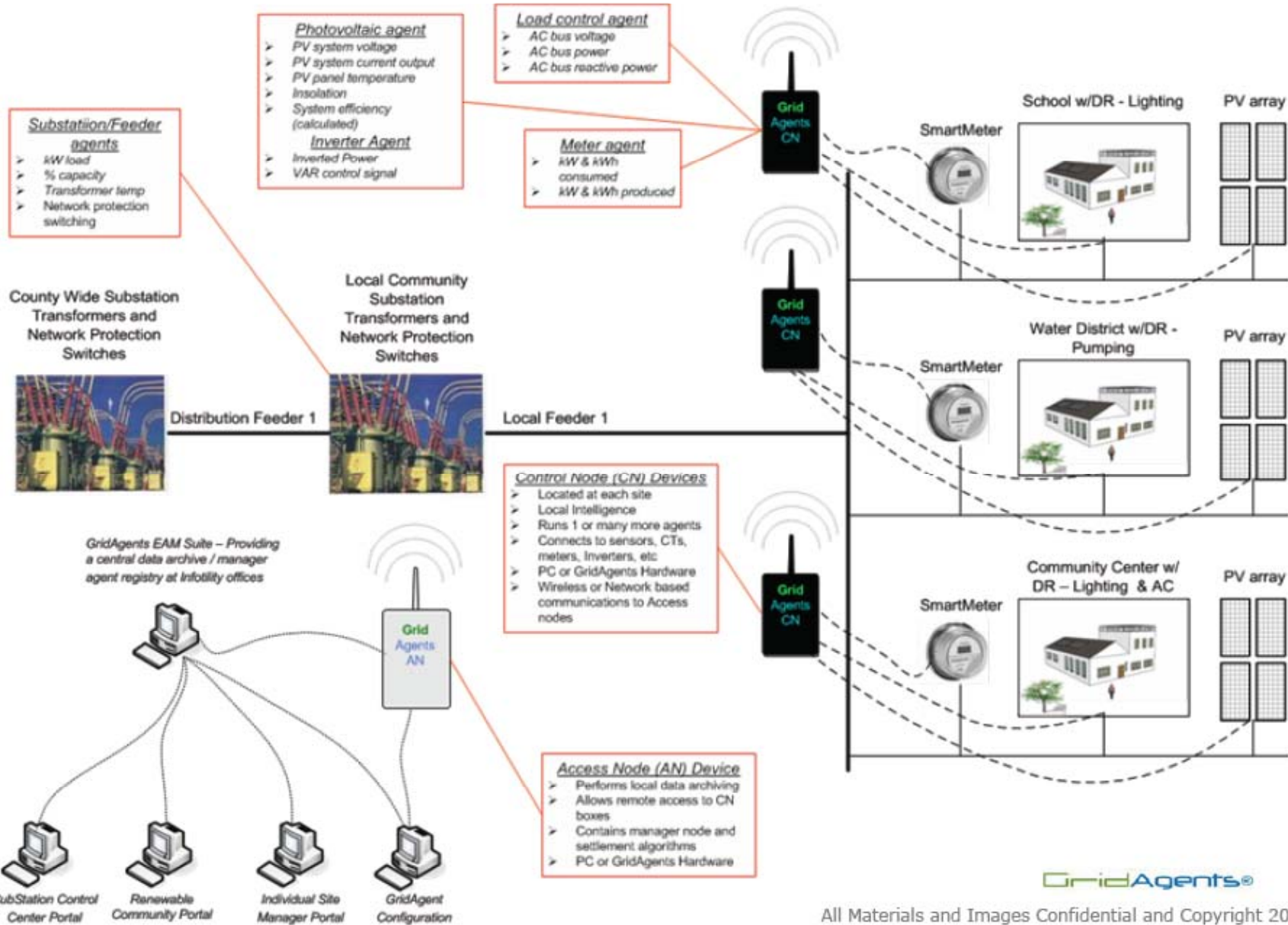
- Infotility is providing “Grid Agents” which collect information from municipal PV and other distributed generation
- Grid Agents then use that information to develop market strategies
- Collaborating with the Marin County Sustainability Office on using the Civic Center Campus, and near-by municipal facilities for early stage demonstrations.
 - PV already installed
 - Access to EMS systems with capabilities to embed Grid Agent intelligence.
 - Potential load control of lights and HVAC
 - PG&E also receiving monitored data



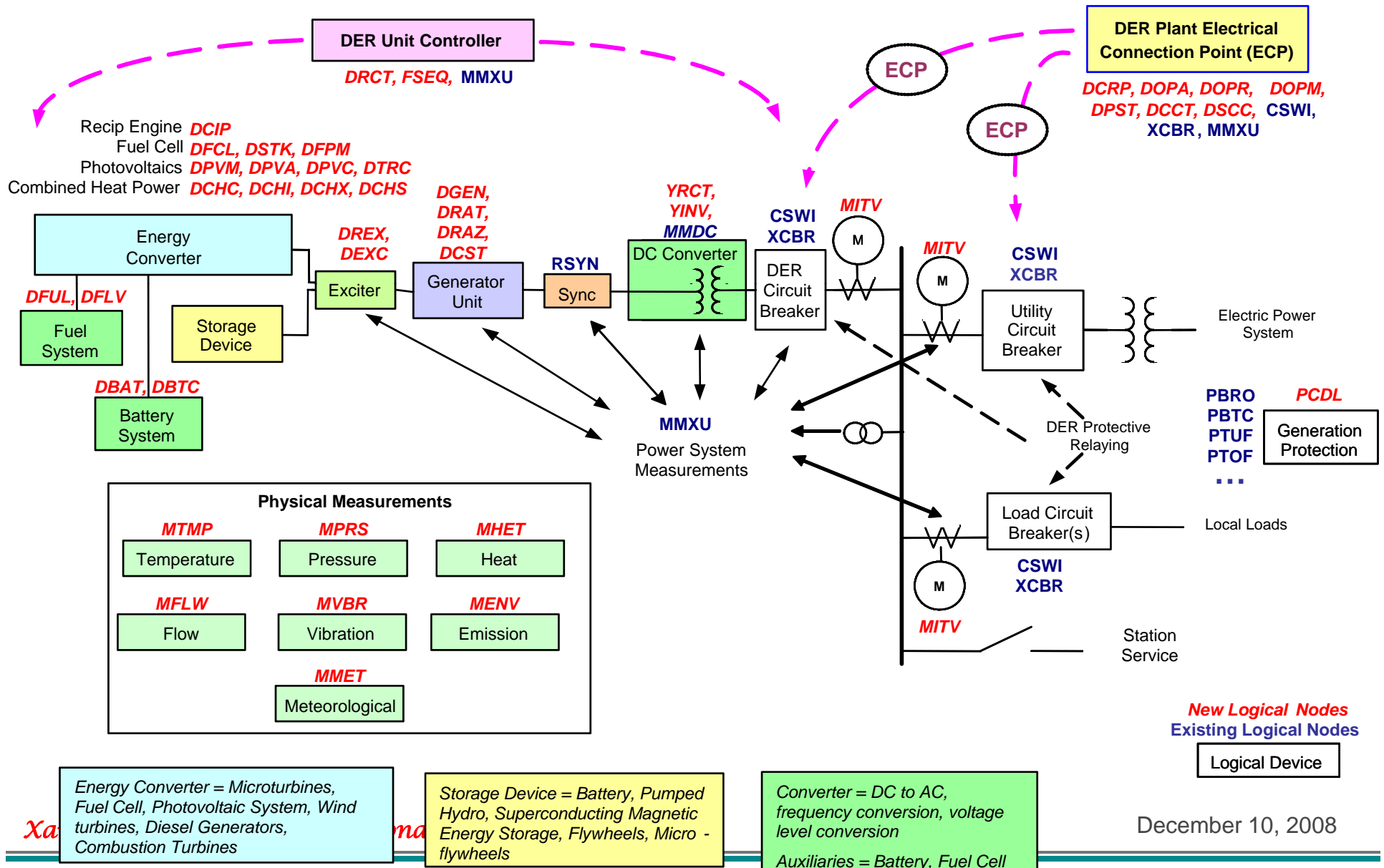
Marin County Solar Potential Map



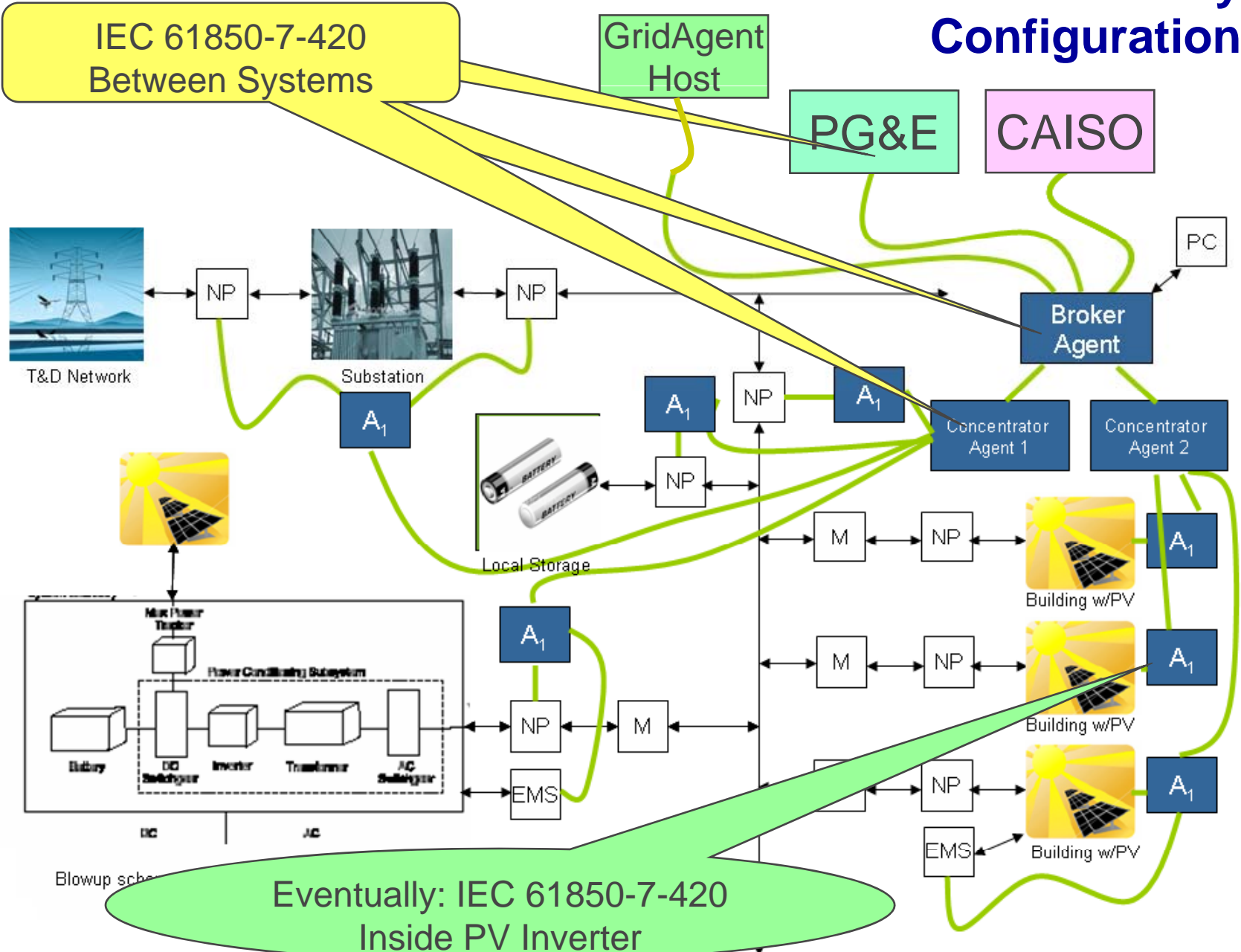
Infotility's Grid Agents in Marin County



Overview of IEC 61850-7-420: Logical Devices and Logical Nodes for Distributed Energy Resource (DER) Systems



Marin Community Configuration





Questions?