



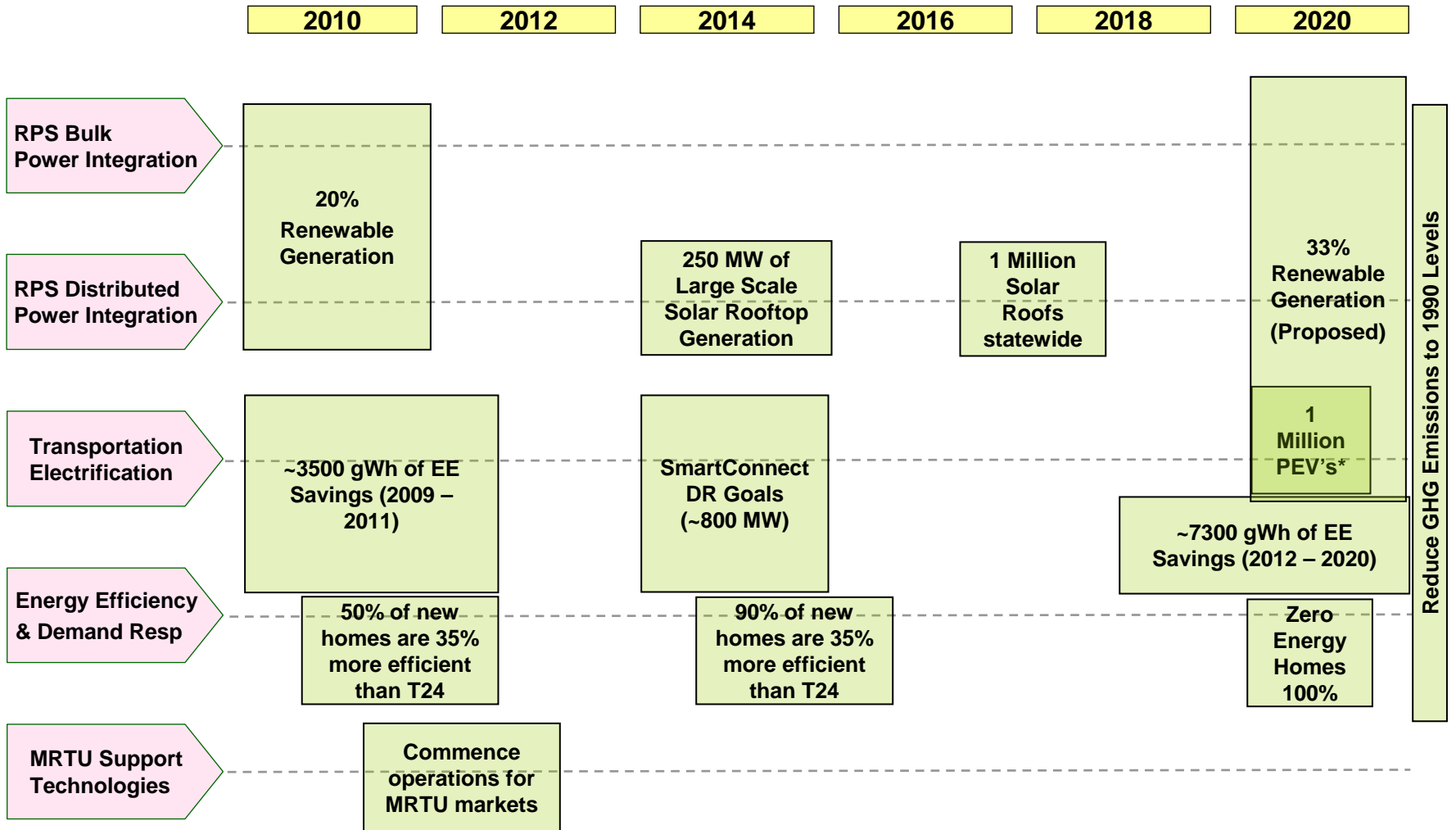
**ADVANCED**TECHNOLOGY  
Transmission & Distribution Business Unit

## **SCE Smart Grid**

**CPUC OIR 08-12-009  
Workshop #2**

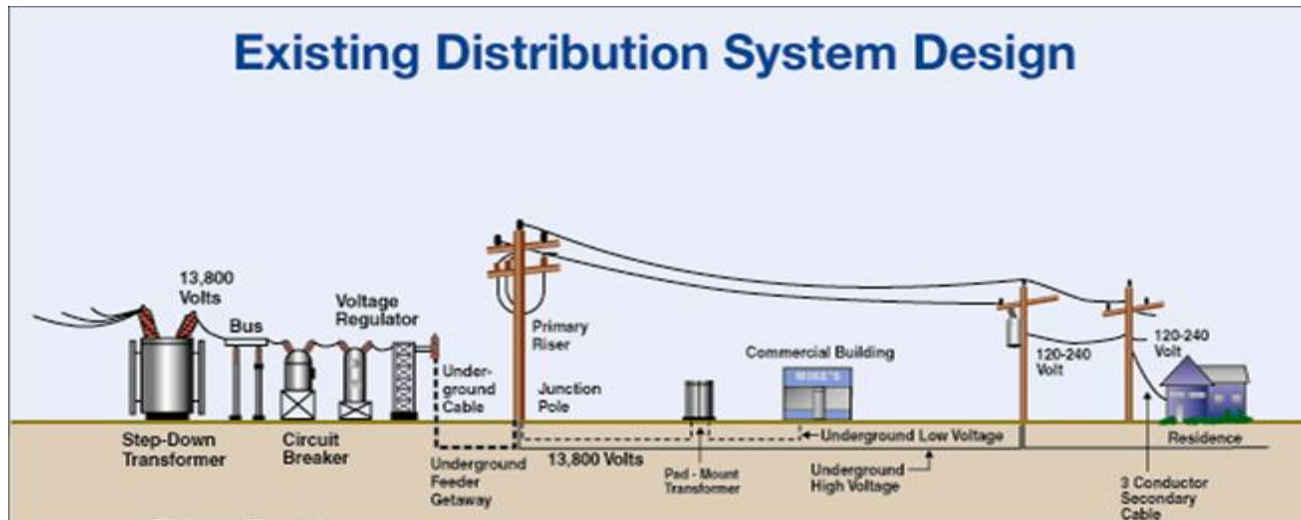
**Distribution  
June 5, 2009**

# Key Energy Policy Goals Mapped to Initiatives



# Distribution Grid Emerging Issues

New distribution system design will be required for a highly distributed resource future



- Radial distribution systems are not designed for 2-way power flows or multiple supply inputs into a single circuit
- New electric transportation loads may create overloading at points on distribution
- Proliferation of DER may create significant power quality issues from voltage variations harmonics and loss of reactive power control
- Coordination of DER and demand response is needed to ensure reliability of distribution systems
- Preventing unauthorized DER energizing distribution lines to protect worker and public safety

# SCE Smart Grid Development

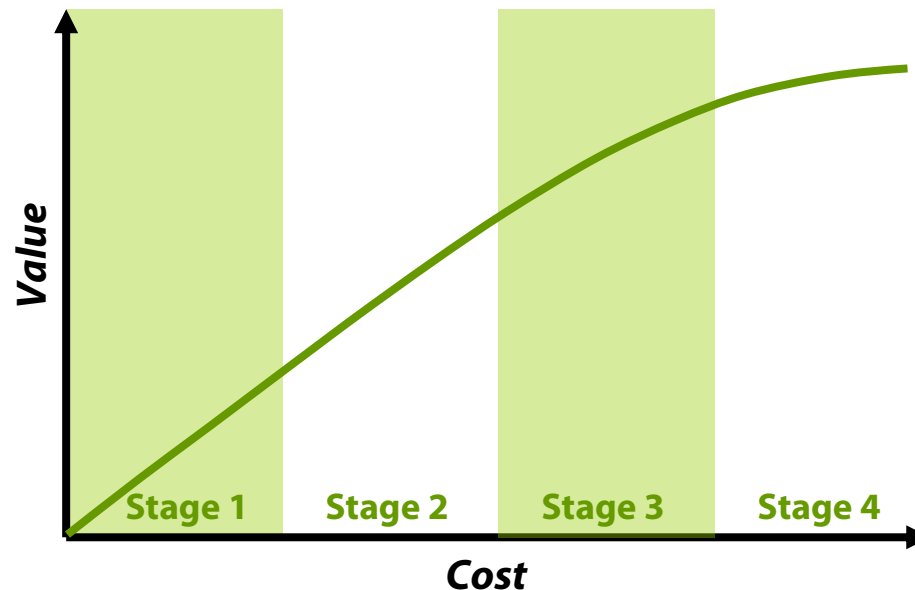
## Distribution technologies and control systems

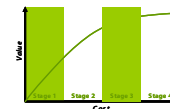
Stage 4: Advanced Micro-control (2020-2030)

Stage 3: Distributed Intelligence & Automation (2012-2019)

Stage 2: Measurement & Control Systems (2009-2012)

Stage 1: Foundation (1995-2008)



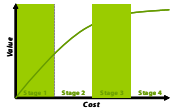


# SCE Smart Distribution Dev. (Stage 1)

## Developing a smart foundation

- SCE's automation strategy allows for both remote control/monitoring and autonomous control of critical grid component to protect the system during abnormal conditions and maintain reliability.
- Drivers and limitations of the past efforts toward a smarter grid
  - Field worker productivity and operational efficiencies
  - Improve distribution reliability at circuit level (but not below)
  - Limited by the expense and performance of computing power and communication technologies
  - Lack of coordination on inter-operability standards across industry and vendor community
- SCE is an industry leader in both substation and distribution system automation technologies.
  - Over 55% of 900 substations with automation technology
  - 30% of substations have state-of-the-art microprocessor-based systems that operate over local area networks,
  - 25% of substations have remote terminal units and programmable logic controllers.
  - 35% of its 4,300 distribution circuits with automation equipment that operates using advanced wireless technology.

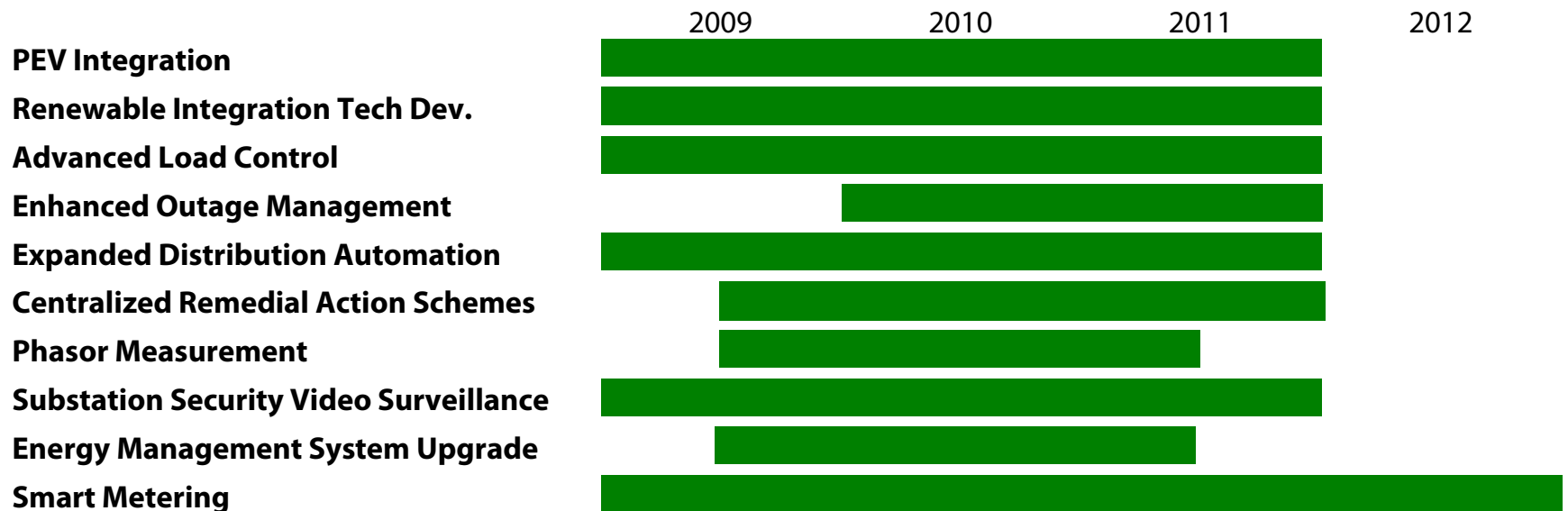
While SCE believes it is an industry leader with its current automation strategies, much work remains to be done to fully integrate both distribution and substation automation into one comprehensive and coordinated system automation approach.

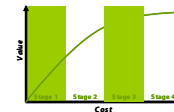


# SCE Smart Grid Dev. (Stage 2)

Expand measurement capability and control systems

## ~\$1.5 Billion Smart Grid Development Projects

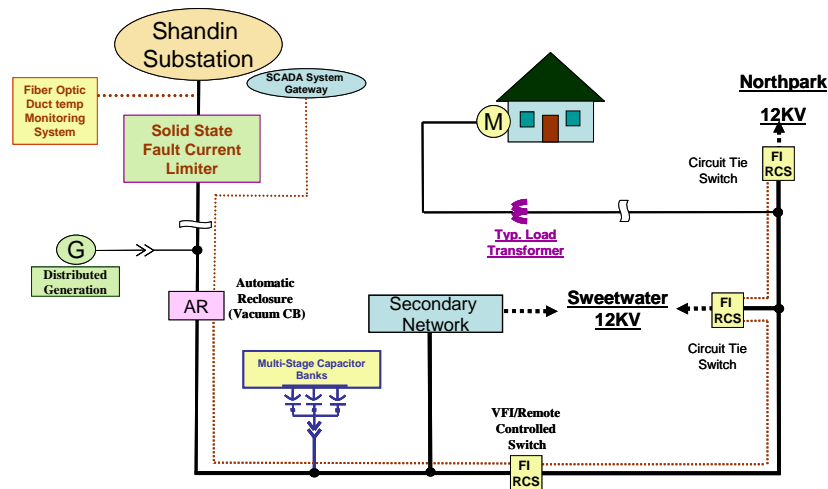


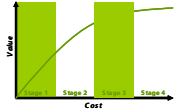


# 2020 Distribution Attributes (Stage 3)

## Add Distributed Intelligence & Automation

- Capability to integrate DER and PEVs at scale – new circuit designs and equipment
- Self-healing distribution system for smaller outages and faster restoration
- Strong assurances of power quality for customers
- Coordinate DER & smart consumer devices for reliable distribution service
- Management of circuit voltage/VAR for reduction of system losses





# Self Healing Design Approach

- Limit the number of customers impacted by system outages
  - Quickly isolate faults to limit the impact
  - More precisely locate faults to facilitate crew dispatch
  - Automate restoration of healthy portions of the circuit
- Deploy equipment that automatically adjusts to voltage fluctuations and system disturbances to prevent customer impacts
- Apply distributed monitoring and control to eliminate single points of failure

# Circuit of the Future



**Distributed Intelligent Controls**  
**Mobile Distributed Generation & Storage**

# Smart Grid Cyber-Security

# SCE Recognizes the Challenge

- Recognition of the problem
  - Smart Grid touches everything (Consumers, Enterprise & External Systems)
  - Smart Grid is a command and control system
  - Smart Grid involves millions of points (generators, grid devices, meters, smart appliances, plug-in electric vehicles, etc)
- Evolving landscape creates new organizational challenges
  - Fast pace of new technology adoption
  - Technology maturity concerns
  - Multiple stakeholder concerns
- Rapid pace of adoption creates a new set of technical challenges
  - Millions of end points in the system
  - The systems touch the consumer space
  - Represents the integration of several technologies

# SCE Smart Grid Security Approach

- SCE has developed a Risk Adaptive Security Approach based on:
  - System engineering principles
  - DoD information assurance initiatives
  - Risk driven requirements
- Approach is Unified (Technology, Physical, and Operational Security) and allows for:
  - Smart Grid Application tailoring
  - Reuse of common elements
  - End to end security traceability
  - Lifecycle transferable
- Used as the basis for the joint Utility - DOE's ASAP program for smart meter security
  - Cyber-Security must foster interoperability not prohibit it
  - Standards and certifications should be addressed nationally
- Used as the basis for the next generation of Home Area Networking (i.e., ZigBee and HomePlug)

# SCE AMI Security System

- Using risk adaptive security SCE has worked closely with Itron to build a first of its kind smart meter (AMI) security system
- Rich set of security services
  - Audit Service
  - Confidentiality Service
  - Device Authentication Service
  - Automated Registration Service
  - Identity and Access Control Service
  - Programmable Filtering Service
- The system is massively scalable
  - Supports 5+ million meter deployment
  - Manages 30+ million keys
- Robust cryptographic methods based on NIST approved cryptography

# Enable Next Generation

- Education and outreach
  - Security concerns while challenging are manageable
  - Industry and regulations needs to adapt next generation principles
  - In fuse technology lifecycle with security engineering (research, commercialization, acquisition, operations)
- Specification Adoption
  - Develop next generation risk adaptive requirements
  - Use requirements to motivate vendors and Standards Development Organizations (SDOs)
  - Develop enforcement and certification processes

# Smart Grid Cybersecurity Lifecycle

- Goal is to create a self-sustaining market where vendors compete to deliver higher quality and increasing secure and interoperable product
- Federal and State cyber security standards should be closely aligned
- Several security and standards related white papers are available on [sce.com](http://sce.com)

