Smart Grid Strategy & Deployment

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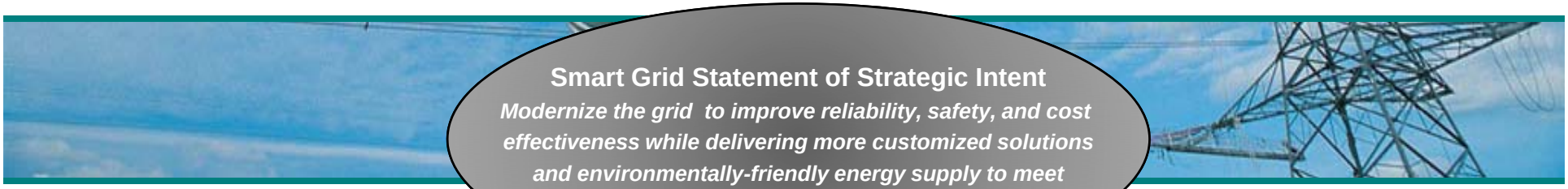
Transmission & Distribution

Edison International Vision



Smart Grid Statement of Strategic Intent

Modernize the grid to improve reliability, safety, and cost effectiveness while delivering more customized solutions and environmentally-friendly energy supply to meet customer energy management needs

Customer Solutions

Allow customers to become "active" participants in the energy supply chain managing their own energy consumption

- Provide real-time info and response capabilities enabling customers to adapt their energy use to changing grid conditions
- Enable the grid to automatically adjust to changing loads and supply requirements

DER & Renewables

Integrate and manage new sources of renewable and distributed energy supply

- Integrate renewables into bulk power system to meet requirements for green energy supply
- Enable DER integration to improve grid stability, support customer end-use requirements, and improve power supply options for economic dispatch

Grid Control

Automatically monitor, assess, and control the grid with changing conditions to meet customer reliability and power quality requirements

- Prevent catastrophic bulk power system failures
- Minimize service disruptions due to distribution system failure
- Provide timely and accurate information about service issues

Asset & Capital Efficiency

Improve capital efficiency and assets using better intelligence and technology for optimal system planning

- Increase power throughput on transmission and distribution assets
- Improve capital efficiency through condition-based maintenance/replacement
- Use better info on load and grid operating performance to improve system planning

Workforce Effectiveness

Maximize workforce productivity, effectiveness, and safety by using enabling tools

- Use advanced visualization and control systems to support and automate decision-making
- Use emerging field technologies to improve crew safety and efficiency

Strategic Objectives

SOUTHERN CALIFORNIA EDISON

An EDISON INTERNATIONAL Company

Strategic Objective

Enable DER integration to improve grid stability, support customer end-use requirements, and improve power supply options for economic dispatch.

Initiatives :

- Energy Storage Systems
- Distributed Generation
- DER Integration/Management Systems
- DER Strategy Development
- DER Tracking Database
- PHEV Integration
- Microgrids (Catalina Island)
- Distribution Harmonics
- Universal “Plug-and-Play” DER Interfaces

Strategic Objective

Prevent catastrophic bulk power system failures

Initiatives:

- Real Time Grid Monitoring
- Power System Outlook (PSO)
- Synchronized Measurement and Analysis in Real Time (SMART®)
- Voltage VAR Control Using PMU Data
- Phasor Wind Penetration (Renewables Integration)
- Phasor Black Start Capabilities
- Protection Using PMU Data
- Dynamic Voltage Control
- Dynamic Nomograms
- C-RAS Coordination
- Advanced Visual Interfaces PMU data on SCADA
- Predictive Grid Control System

Strategic Objective:

Minimize service disruptions due to distribution system failures

Initiatives:

- *Distribution Automation*
- *Next Generation Substation Automation*
- *DCMS + EMS Coordination & Integration*
- *Substation Gateway for DA Integration*
- *Dynamic Voltage Control*
- *Cable Monitoring*

SCE Smart Grid Activities

SCADA, Phasor Measurement, CRAS, FACTS, Advanced Conductors

Substation Automation

Customer

Distribution

Generation

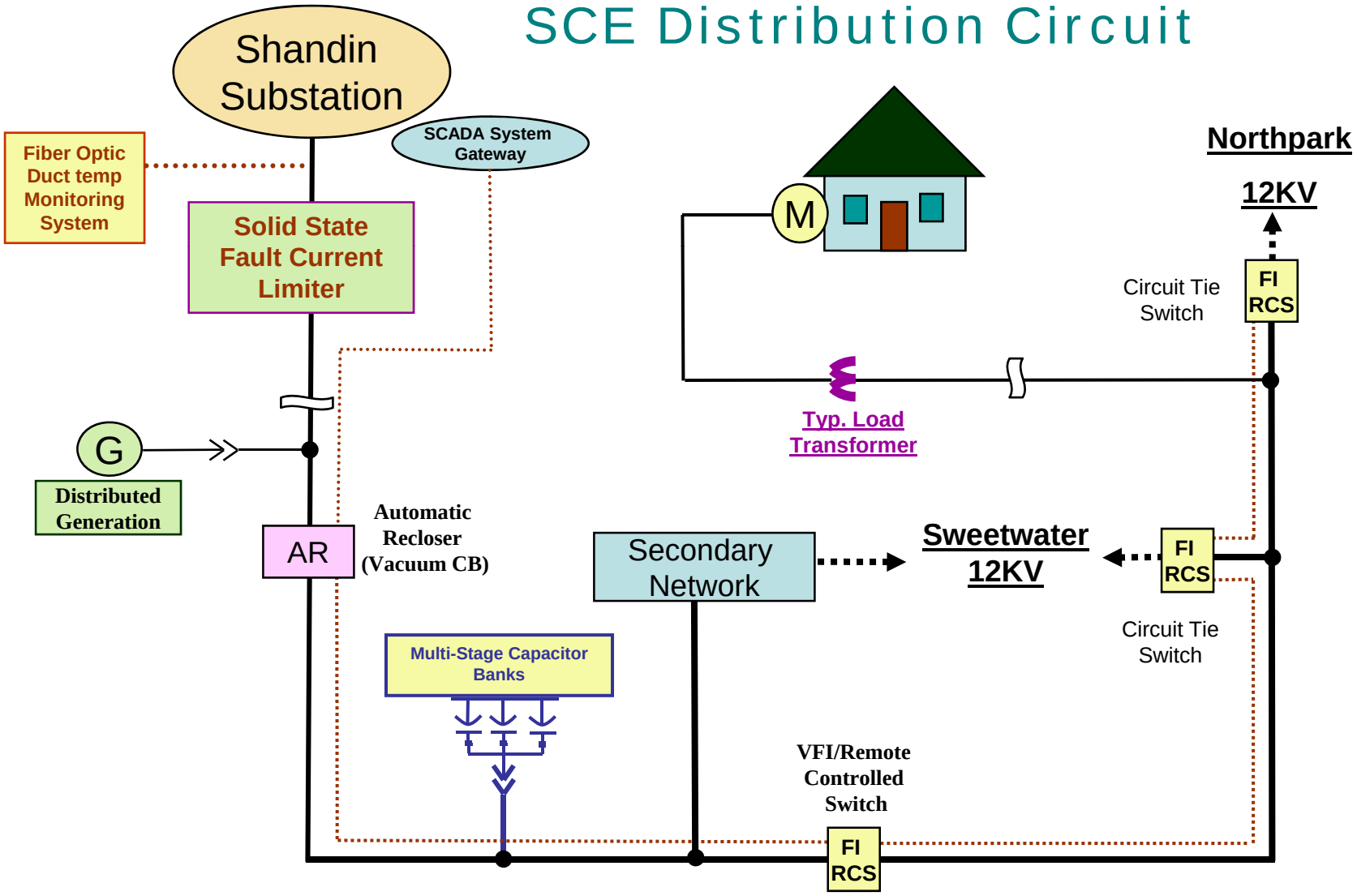
Transmission & Sub-transmission

Advanced Metering, Demand Response, and Distributed Resources

Distribution Automation

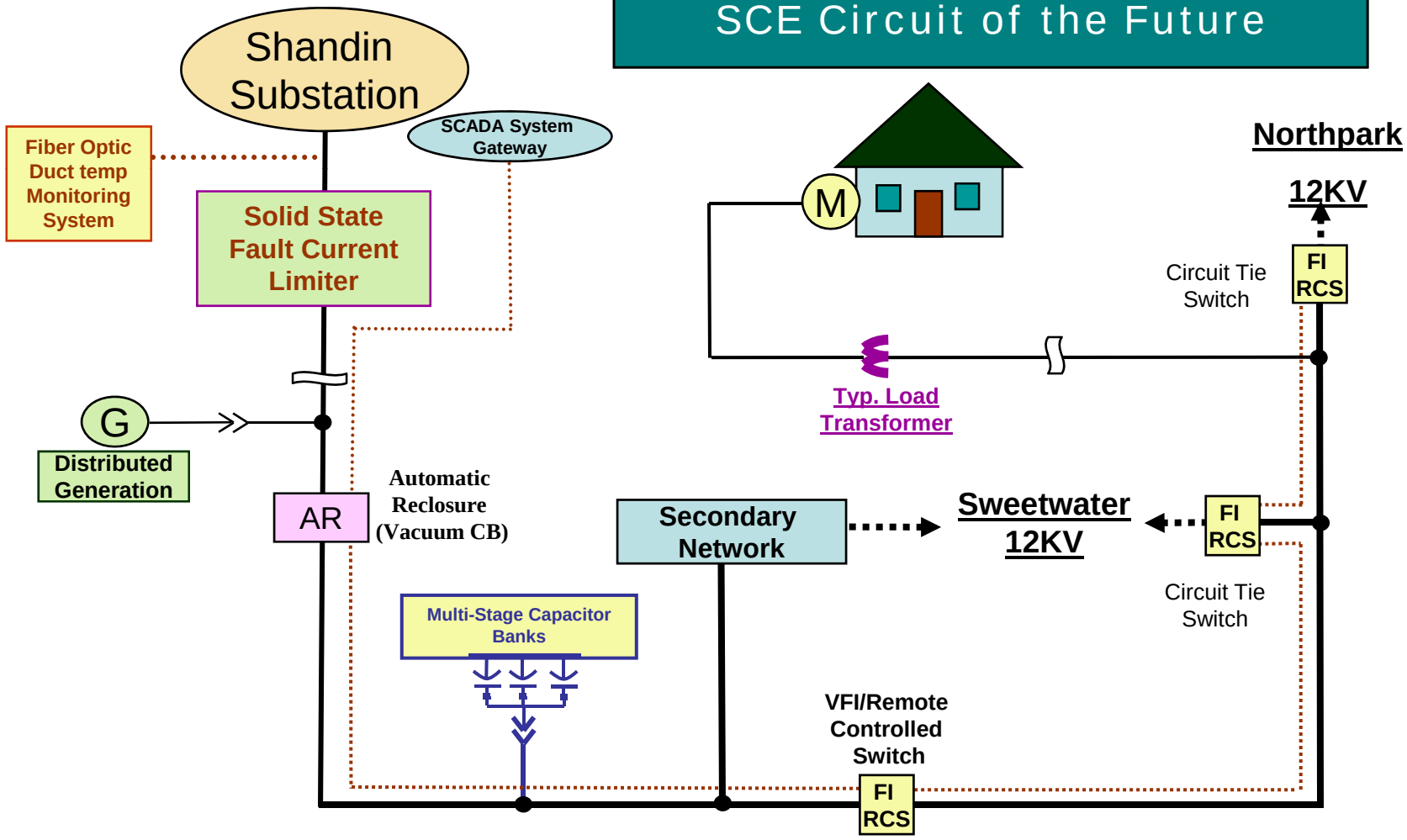
Distribution Circuit of the Future

SCE Distribution Circuit



Moving Beyond the Traditional

SCE Circuit of the Future



SmartGrid/SmartConnect as Enabling Technology

Customers

Demand-Side Management & Efficiency

Conserve Power

Transportation

Plug-In Hybrid Vehicles

Integrate Generation

Advanced Generation

- **Renewables**
- **Energy Storage**
- **Nuclear**
- **Clean Coal**
- **Carbon Capture & Storage**
- **Distributed Generation**

Lower Costs

Higher Reliability

SmartConnect Technology

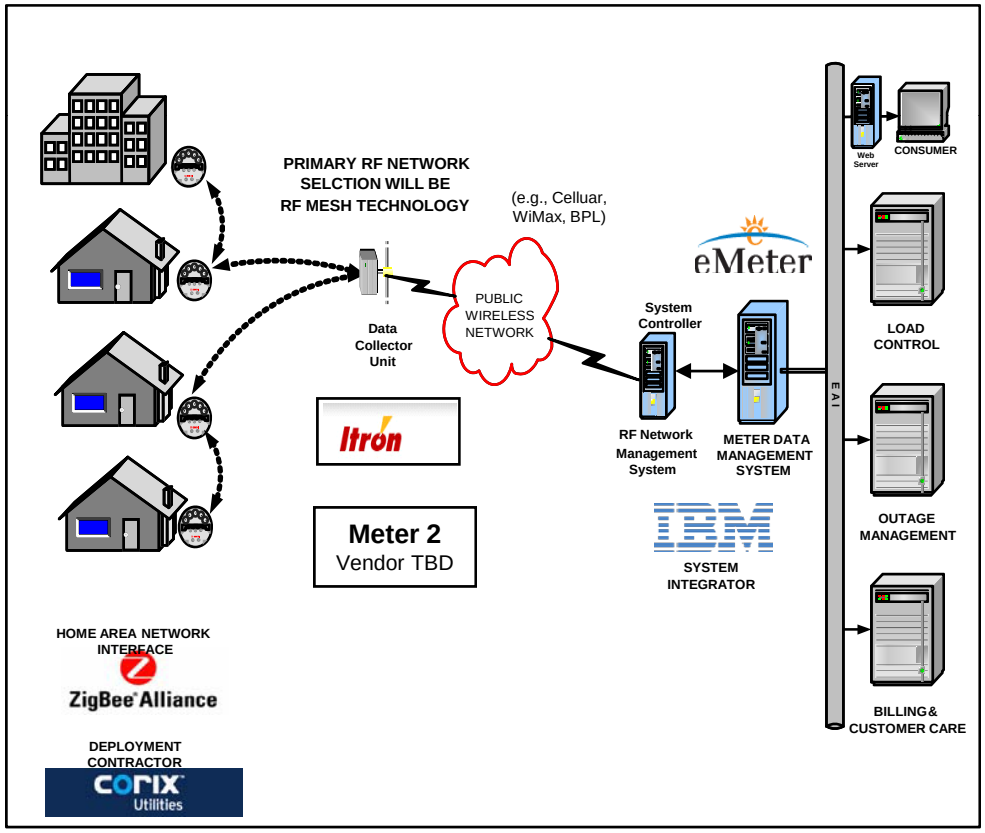
3rd Generation Electronic meters:

- 200A integrated service switch
- Home Area Network interface
- Energy & voltage measurement
- Outage detection & service status
- Theft/tamper detection
- Remote firmware upgradability
- Robust security

Multi-Tier Telecom Network

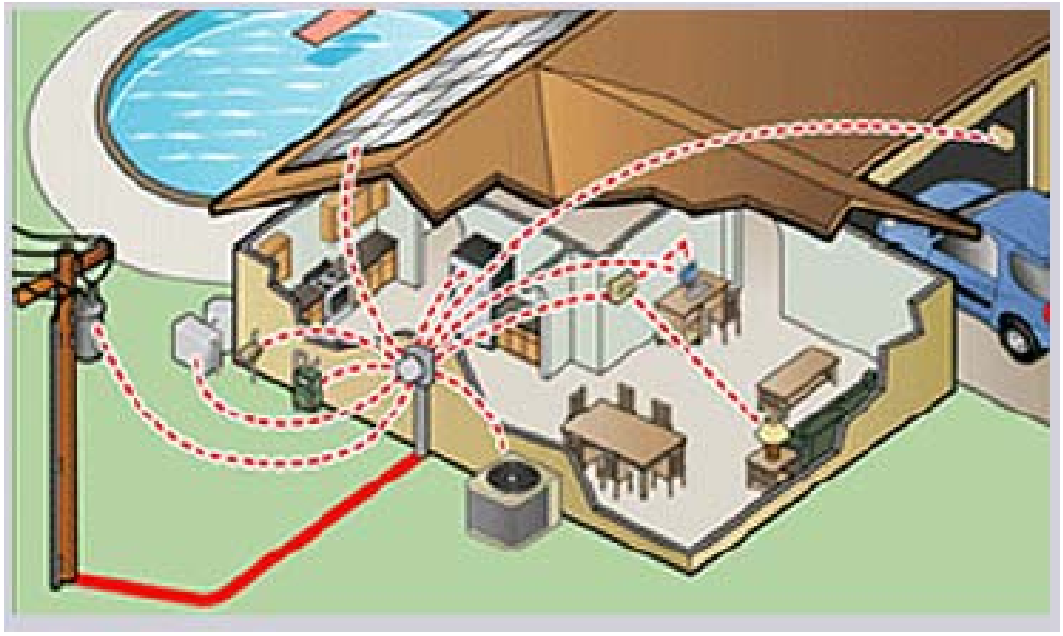
- Designed for flexibility & security
- 2-way narrowband 900MHz RF LAN
- Open standard ZigBee 2.4GHz HAN
- Cellular based WAN with flexibility for technology changes

Technology & Vendor Map



What a Smarter Grid Means for Customers

- Enhanced utility service reliability
- More stable, higher-quality electricity supply
- Shorter customer outages, faster service restoration
- A “self-healing” grid
- New Customer program and service options
- Increased customer control of energy costs

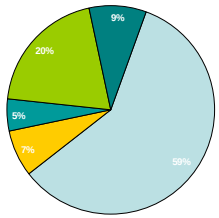


EIX Vision for Clean Energy Future

Integration of Information Technology with Energy Technology Delivers Environmental Benefits

Renewable & Clean Generation | **Smart Grid** | ***SmartConnect*** | **Connected Home** | **Connected PHEV**

Low Carbon Fuel Mix



Energy Management & Efficiency

- Reduced Cost & Rate Pressures
- Meeting Customer Expectations for Value & the Environment

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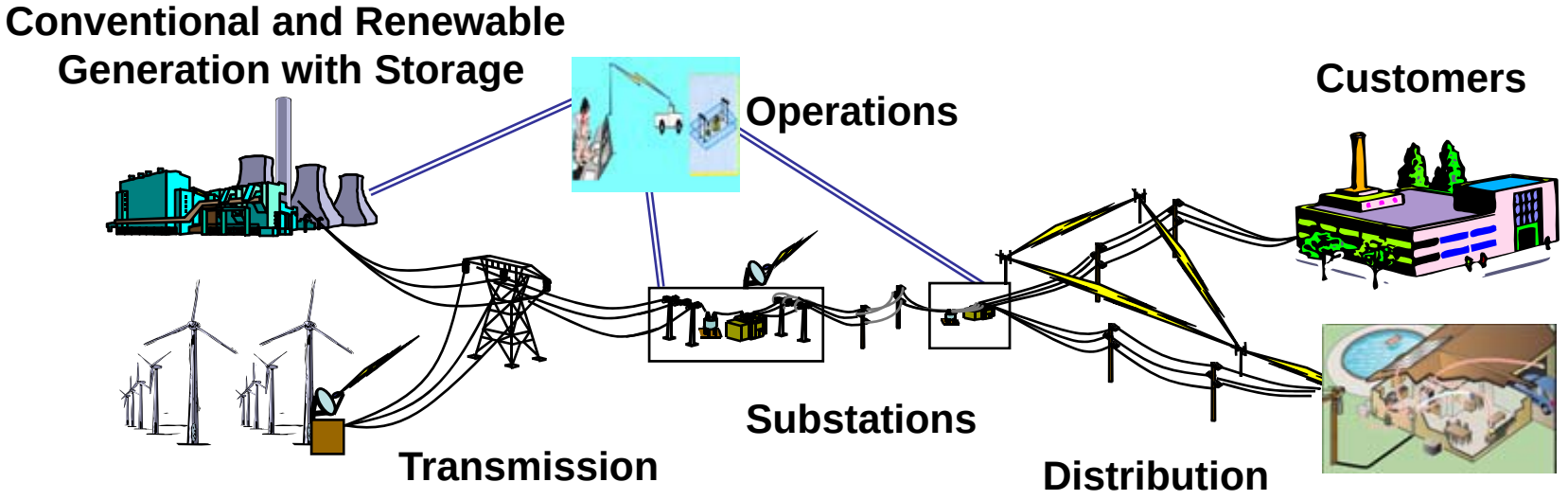
An Overview of the Smart Grid

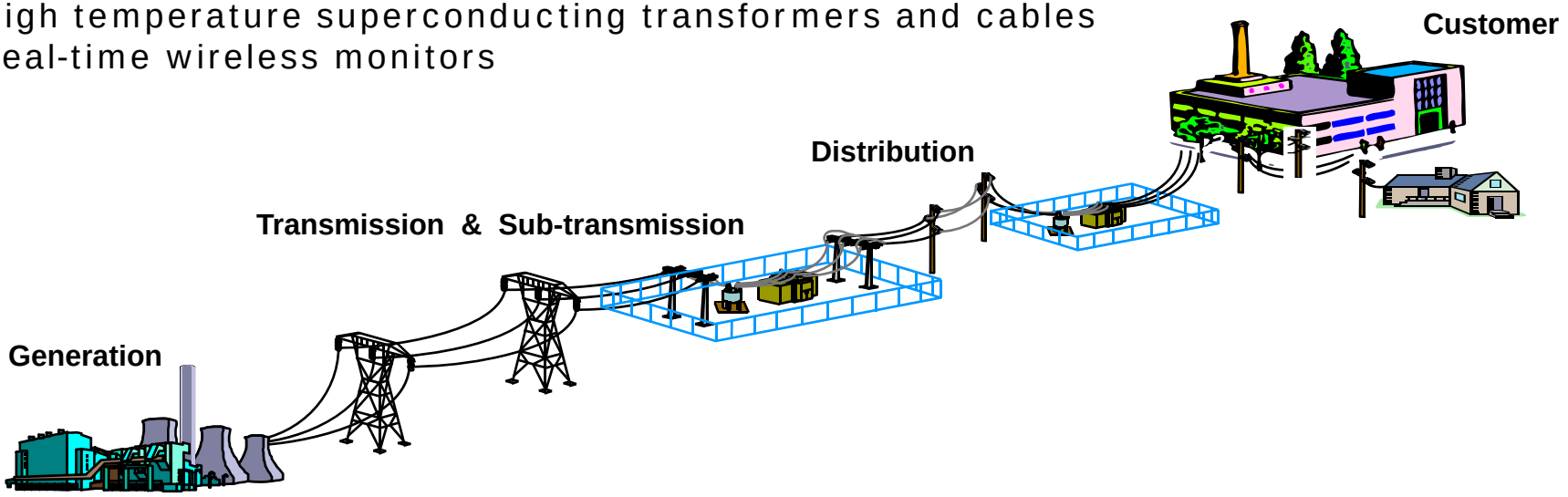
Interoperability from the generator to the customer



Self healing, more reliable, safer, and flexible

Smarter Transmission

- More intelligent protection schemes
- Real-time equipment monitoring
- Predictive data
- Centralized voltage and VAR control
- Dynamic nomograms
- Centralized Remedial Action Schemes (CRAS)
- Flexible AC Transmission Systems (FACTS)
- Static VAR compensation
- Synchronized phasor measurement
- High temperature superconducting transformers and cables
- Real-time wireless monitors



Smarter Distribution

- Avanti, SCE's "Circuit of the Future"
- High Speed Communications
- Transmission Technologies for Distribution Use

Workforce, Asset & Capital Efficiency
Using Smarter Worker Tools

The lineman of the future's tools may include:

- Wearable computers
- Wireless communications with a central database and live support staff
- Wireless video transmission
- Heads-up displays
- RFIDs
- Video recognition and diagnostics
- High-tech personal protective equipment