Edison SmartConnect™

The Complexities of Operating 5 Million Smart Devices: Edison SmartConnect Operations Center

Jim Cherrie
Director of Deployment
Edison SmartConnect
Southern California Edison
An Edison International Company

- Southern California Edison (SCE), headquartered in Rosemead, California, employs approximately 15,500 people.

- SCE has been providing electric service in the region for more than 120 years.

- Serves a population of 13 million people in 50,000-square-miles of service area, encompassing 11 counties in central, coastal and Southern California.

- Service territory includes 430 cities and communities.

- 5,000 MW of generating capacity from interests in nuclear, hydroelectric, and fossil-fueled power plants.

- Award-winning energy efficiency and demand response customer programs.

- Industry leader in renewable energy, electric transportation, Smart Grid and smart metering.
Edison International Vision

A cleaner, more diverse generation supply. A smarter and more reliable electricity grid. Serving customers who are using electricity more wisely, and in more ways, than ever before.
Irvine Smart Grid Demonstration (ISGD) Project
The Edison SmartConnect Program

5 million existing electric meters will be replaced with “smart” meters between 2009 and 2012

- Providing customers access to detailed energy use and cost information and new dynamic pricing programs

$1.6 billion project cost (2008 – 2012)

- Approved by California Public Utilities Commission in 2008
- $1.25 billion in capital
- $304 million Favorable Cost Benefit Analysis – Net PVRR
The Rewards of Maintaining Operational Excellence: Millionth Meter Event
SmartConnect Operations Center Area of Responsibility: From Meter to Collection Engine
Many key SOC Operational Functions are based on data flowing through the NMS

- Operational Reporting
- Cell Relay Monitoring
- Predictive Analysis
- Visualization Tool
- Security Monitoring
- Data Accuracy & Synchronization
- Asset Tracking
- Key Management
- Security Key Management
- Network Management System
Complexities of Operating a Smart Meter Deployment

Managing the convergence of installation, operations and quality at high volume

**DEPLOYMENT**
- Qualification testing of 10 meter forms
- 78,000 meters Quality Control tested
- Logistics for 27,000 meters per day
  - Meter delivery (~10,000 meters per truck)
  - Removal and processing of legacy meters from installer trucks
  - Processing and loading of smart meters on installer trucks for next day
- 290 installers in the field
- Installation of 8,700 meters per day
- 33,000 appointments set
- 1.2 million second read validations performed

**OPERATIONS**
- Data synchronization and metric
- Sector Acceptance of ~200,000 meter districts performed over 45-day period
  - Benefits Realization People Strategy
- Firmware Download
- Field Investigation and Mitigation
- Trouble Report and Basic Work Requests
- Coordination of Root Cause Analysis
- Network security monitoring
- Security key management
- Control points, metrics and RMA
- Addressing the risk of intelligent devices in the field
Sector Acceptance Testing

Maturing, repeatable process

1. Meters are deployed in a district.

2. Sector Acceptance Testing is initiated based on minimum meter saturation levels.

3. Upon successful Sector Acceptance Test, the district is cut over to operations.
Quality Management Methodology

**Quality Planning**
- Sampling Plans
- Test Plans
- Requirements Management
- Process Definition
- Process Capability
- Change Management

**Quality Assurance**
- Process-driven,
  systemic,
  end-to-end,
  “before the fact”

**Quality Control**
- Inspect
- Test
  - Scale
  - Integration
  - Regression
  - System

**Continuous Improvement**
- Increase effectiveness and efficiency
  - Lessons learned
  - Metrics
  - Quality Tools

**Qualify - Small Scale**
- Reliability
  - HALT/HASA
  - FMEA
- Environmental Stress
- Accelerated Life

**Act**
- Plan
- Do
Automated Product Line
Driving Issue Identification from the Quality Control Stage to the Design Stage

<table>
<thead>
<tr>
<th>Design</th>
<th>Manufacture</th>
<th>Test</th>
<th>Defects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design For Excellence</td>
<td>Pre - Production Review</td>
<td>Process Testing</td>
<td>Post Production Fault Tracking</td>
</tr>
<tr>
<td>Production Readiness Planning</td>
<td>Proof of Manufacturing</td>
<td>Final QC Sample Testing (100%)</td>
<td>Root Cause and Corrective Action</td>
</tr>
<tr>
<td>Supply Chain Readiness Planning</td>
<td>Process Improvement</td>
<td>Sample Acceptance Testing (100%)</td>
<td>Lessons Learned</td>
</tr>
<tr>
<td>Qualification</td>
<td></td>
<td>Source Acceptance</td>
<td></td>
</tr>
</tbody>
</table>
Equipment Forecast, Supply Chain and Inventory Management Strategy

- 3.0 Removed from Inventory
- Deliveries Above forecast
- Deliveries of Reconfigured Meters
- Deployable Receipts (Tested)
- Inventory After Installs
- Installs (Actual and Forecast)

5/18/2010 - 11/14/2010
Managing Supply Chain, Inventory and Logistics from an Empty Warehouse...
... To a Full Warehouse
Having the Tools and Environment to Manage Operational Complexity

View From Manager’s Modular Workstations
SOC Key Actions

*Actions roll up to three Areas of Responsibility*

- **Monitor and Manage Over-the-Air (OTA) Operations**
  - 7 x 24 “real-time” operations
  - Monitor devices, network, OTA infrastructure and security
  - Identify initial investigation and escalation of incidents
  - Daily report generation, communication and coordination

- **Operations Optimization, Triage, and Trouble Analysis**
  - Integrated trouble triage, analysis and root cause
  - Network performance trending and optimization
  - Quality assurance monitoring, analysis and remediation

- **Planning and Service Support**
  - Configuration and release management
  - Business process/procedure development and review
  - Budget and resource planning
Monitor Meter Status via Virtual Information Management System (VIMS)
Managing Operational Complexity on a Daily Basis
Questions ?