Schneider Electric

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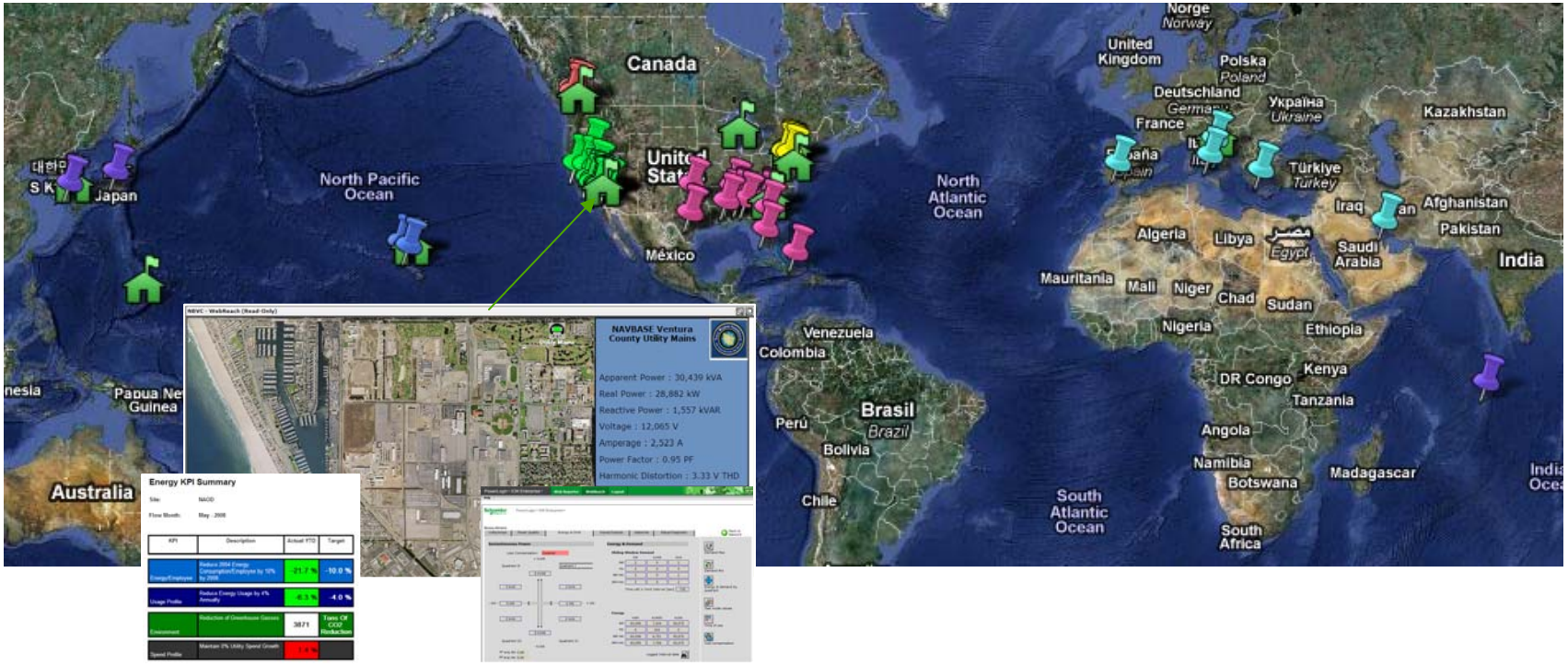
NAVFAC

ADVANCED METERING INFRASTRUCTURE (AMI) PROGRAM

Case Study



SQUARE D

PowerLogic

Topics

- **AMI Overview**
  - AMI Program
  - Global AMI Program Architecture
- **Core AMI System Requirements**
  - Advanced Electric and Mechanical Metering
  - Energy and Meter Data Management Software
  - Network Communications
- **Schneider Electric AMI Program Solution**
  - PowerLogic ION8600 Intelligent Electric Meters
  - PowerLogic ION Enterprise DAS Software
  - Wired and Wireless Network Communications
- **Program and Project Challenges**

Who is Schneider Electric?

Global Leadership in Energy, Power, Automation and Security

28,000 employees in North America, 114,000 Globally

SQUARE D by Schneider Electric

APC by Schneider Electric

t.a.c by Schneider Electric

PELCO

JUNO LIGHTING GROUP by Schneider Electric

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AMI Program Overview

- **AMI Program drivers:**
  - Congressional Mandates
    - EPACT 05
    - EISA 07

- **AMI Brief Program History**
  - Program initial efforts began with DoD metering plan executed in 2006 by NAVFAC
  - Leveraged A/E contract to conduct global surveys, generate FRS and provide a preliminary design for pilot project at NBVC.
  - Developed SOW and awarded a 5 year, $250M IDIQ MACC to:
    - Square D Company (Schneider Electric)
    - Weston Solutions
    - American Systems

- **Goal is to capture 95% of consumption**

AMI Program Overview

- **Program Funding**
  - Initially funded by CNIC for program management startup efforts (1 FTE, contract support, surveys, and NBVC pilot AMI design)
- **Project Funding**
  - Initially funded by AR&RA and CNIC
  - Additional funding provided by region/site for post award support
- **Current Projects:**
  - NBVC, Northwest, Southwest, Southeast, Midwest, Naval District Washington, PMRF (Hawaii)
  - MCB Butler, MCAS Iwakuni, MCLB Albany, MCB Quantico, Camp Lejeune

Global AMI System Architecture

CIRCUITS

MDM as part of Centralized & Integrated Reporting for the Comprehensive Utilities Information Tracking System (CIRCUITS) program: Enterprise metering database and data analysis tool.

MDM (NBVC)

REGIONS

CONUS

Southwest

Regional DAS

Northwest

Regional DAS

Midwest

Regional DAS

Mid-Lant

Regional DAS

Washington (NDW)

Regional DAS

Southeast

Regional DAS

OCONUS

Hawaii

Regional DAS

Far East

Regional DAS

EURAFSWA

Regional DAS

Marianas

Regional DAS

Core Functional Requirements

- **Advanced, Intelligent Electric Meters**
  - Monitors and Records
    - Energy Usage/Demand, TOU
    - Power Quality, Disturbances and Events
    - Store Interval Data Logs
    - Aggregate and Store Mechanical Meter Data Logs
  - Multiple Communication Ports and Protocols
    - Ethernet, IP Addressable
  - Utility Class Accuracy (0.2%)
  - Programmable Frameworks
  - Alarm Notification

- **Mechanical Meters**
  - Water, Natural Gas and Steam
    - Pulse or Encoder Outputs

Core Functional Requirements

- **Data Acquisition System (DAS)**
  - Provides Tools for Energy / System Management and Reporting
  - Retrieves 15 Minute Interval Data (Electrical and Mechanical)
  - Management of Alarms, Outages, Unusual demand, Meter Failures, etc
  - Information Available at Your Desk Top

- **Network Communication**
  - Two Way Communication Via a Wired and/or Wireless Ethernet
  - Integrated onto the Navy Public Safety Network (PSNET)
  - Meets Enhanced Security Requirements (IA)

Schneider Electric AMI Program Solution

- **Schneider Electric Current NAVFAC AMI Projects:**

  - Naval Base Ventura County (NBVC)
  - Navy Region Northwest
  - Navy Region Southeast
  - Navy Region Midwest
  - Pacific Missile Range Facility (PMRF), Hawaii
  - MCB Butler, Okinawa, Japan
  - MCAS Iwakuni, Japan
  - MCLB Albany

PowerLogic ION8600 Electric Meter

ION8600 Intelligent Meter

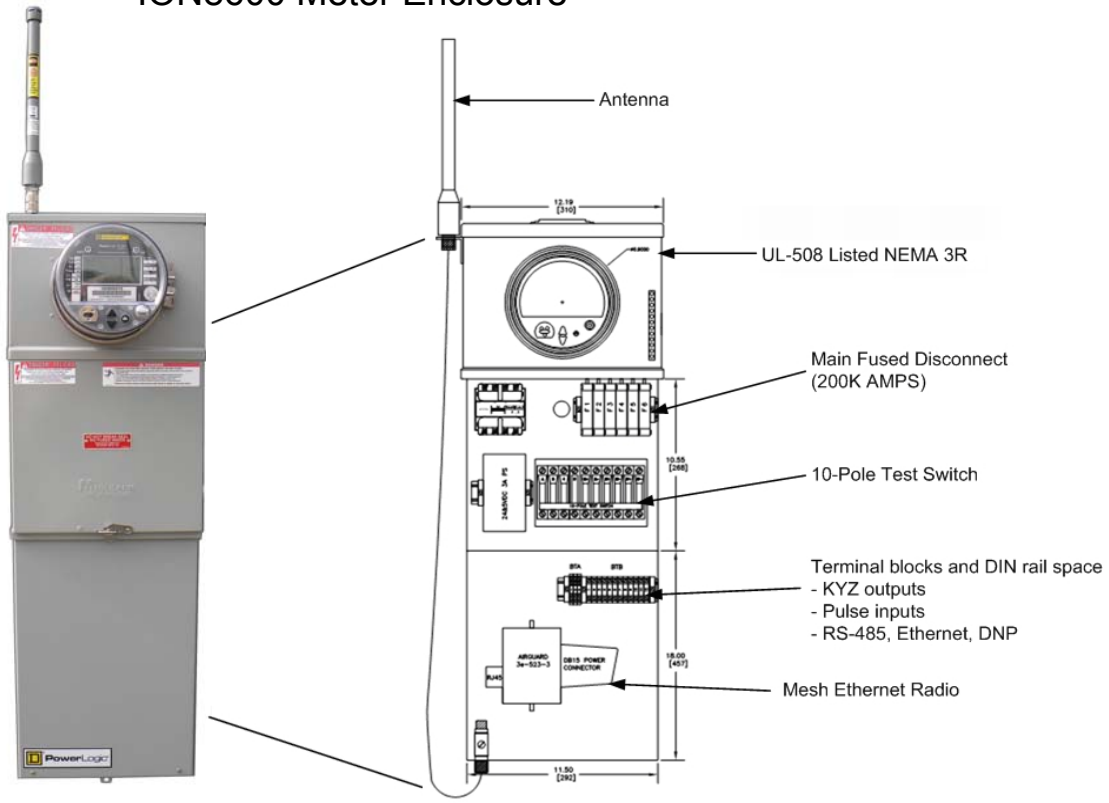
Features

- Smart Grid Ready Metering Technology
- Power and Energy Measurement
- Multiple Tariff and TOU Calculation
- Power Quality, Sag/Swell, THD (256 Samples/Cycle)
- Logging and Recording (1 ms Resolution)
- Multiple Communications and I/O (8/8)
- Alarming and Control (65 Set points)
- Data and Event Logging, Sequence of Events Recording
- RTU Functionality
- WAGES Data Acquisition
- Equipment Status Monitoring and Control
- Enhanced Modbus Mastering

The PowerLogic ION 8600 Intelligent Electric Meter provides load profile data (consumption and instantaneous status), event/alarm logs, security logs, 0.2% class accuracy, is IP addressable with three modes of registers, 8/8 pulse and relay inputs/outputs and supports multiple protocols over Ethernet and serial communications.

Factory Assembled Meter Enclosures

ION8600 Meter Enclosure



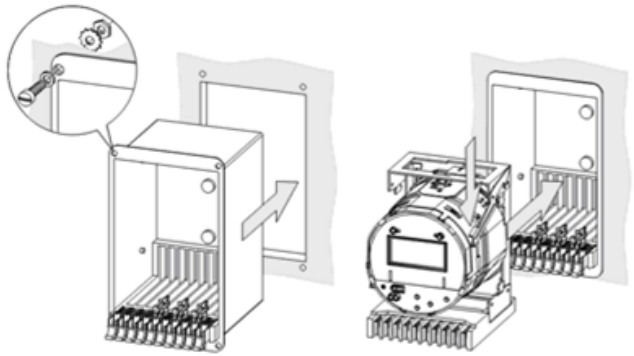
Features

- Prewired Meter and Devices
- UL Listed
- Voltage Disconnect
- 10 Pole Test Switch
- Mesh Network Radio
- Ethernet and Serial Communications
- Digital and/or Analog I/O
- Optional Bar Type Ct's
- Tailored to Meet any System Voltage
- Available in Stainless Steel
- Pad Lockable Latch

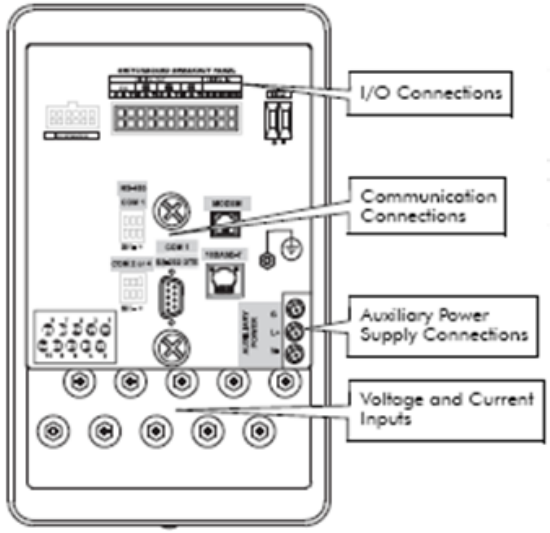
Industrial NEMA Type 3R UL-508A socket meter enclosures are utilized for pad mount transformer and wall mount installations. Leveraging our manufacturing expertise, Schneider Electric enclosures are designed, assembled, pre-wired with all components installed and tested before leaving the factory. Provides for rapid installation and commissioning.

Switchboard Draw-out Case Meters

ION8600 Switchboard Meter



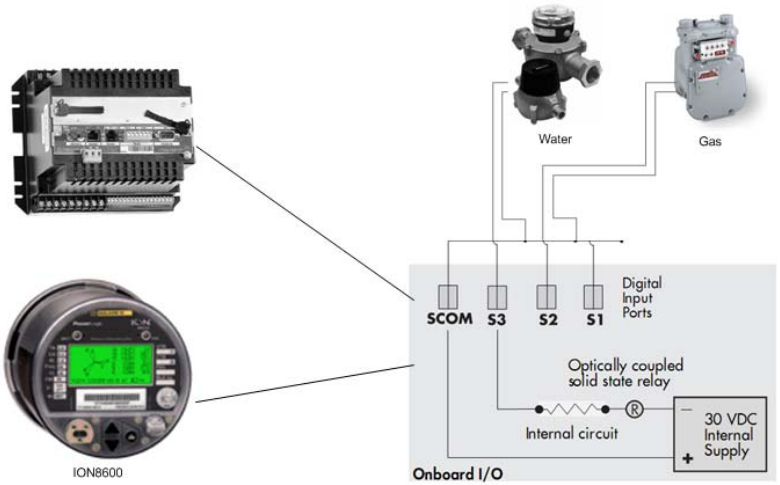
Switchboard meter mounting



The PowerLogic ION8600 is provided as a draw-out type for switchboard installations. The draw-out cases have window removable covers sealed against tampering. The meters can be withdrawn through sliding contacts from fronts of panels or doors without opening current-transformer secondary circuits, disturbing external circuits, or requiring disconnection of any meter leads.

Mechanical Flow Meters

Water, Gas and Steam Meter Integration



Features

- Signals Connect Directly to the ION8600 or ION7550 MIU Inputs
- Scaling Units Programmed into the ION8600 or ION7550 MIU
- Counts, Timestamps and Logs Flow Readings
- Aggregated Flow Reading
- Stored in Onboard Memory
- Configurable Alarms
- Utility Shadow Metering (KYZ Energy Pulse)

The Schneider Electric AMI Solution provides Utility consumption data for all metered commodities, aggregated flow readings and event/alarm logs. The ION8600 and ION7550 MIU inputs/outputs can also be utilized for breaker status and control functions.

PowerLogic ION Enterprise DAS Software

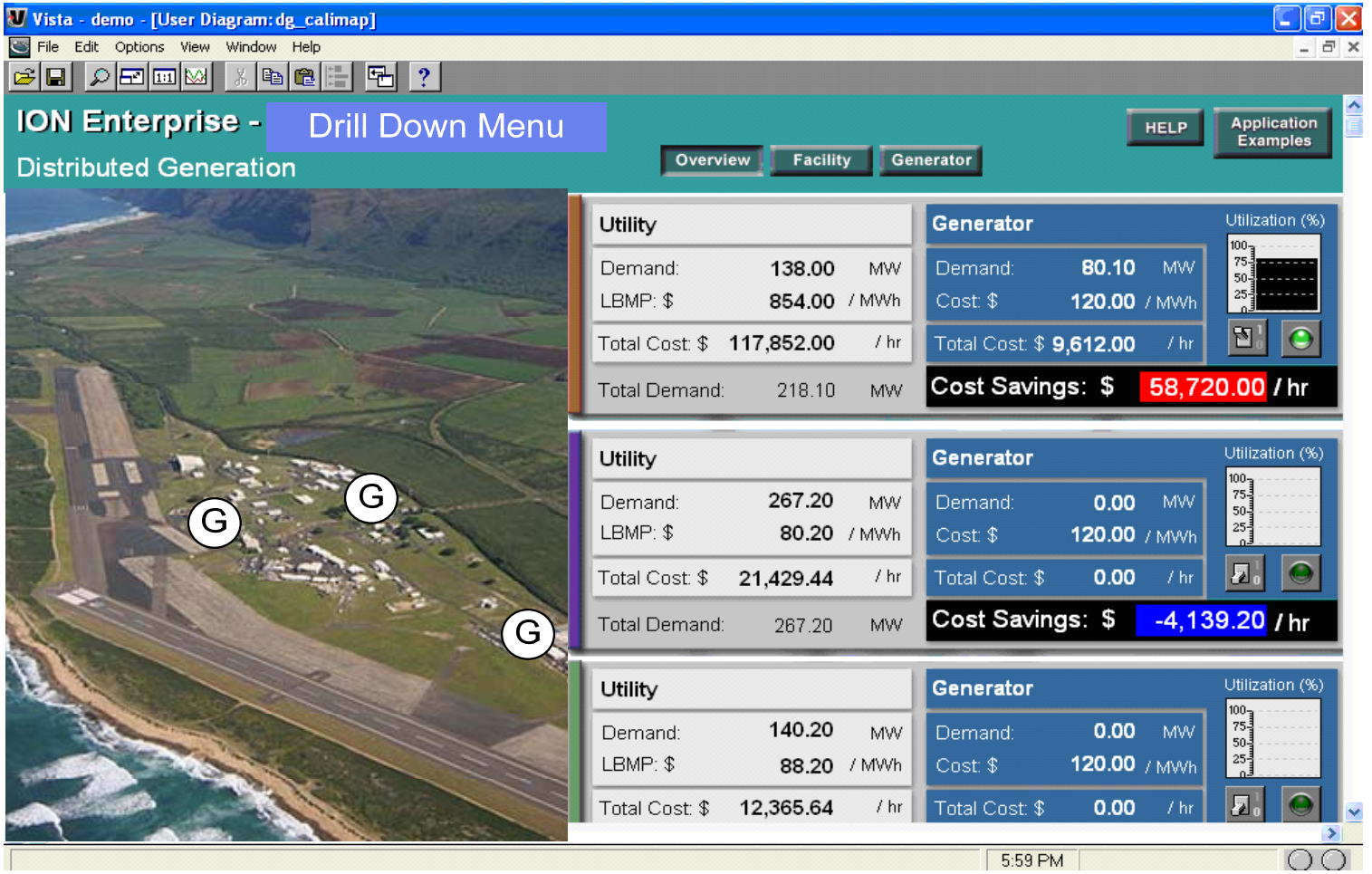
PowerLogic ION Enterprise

Features

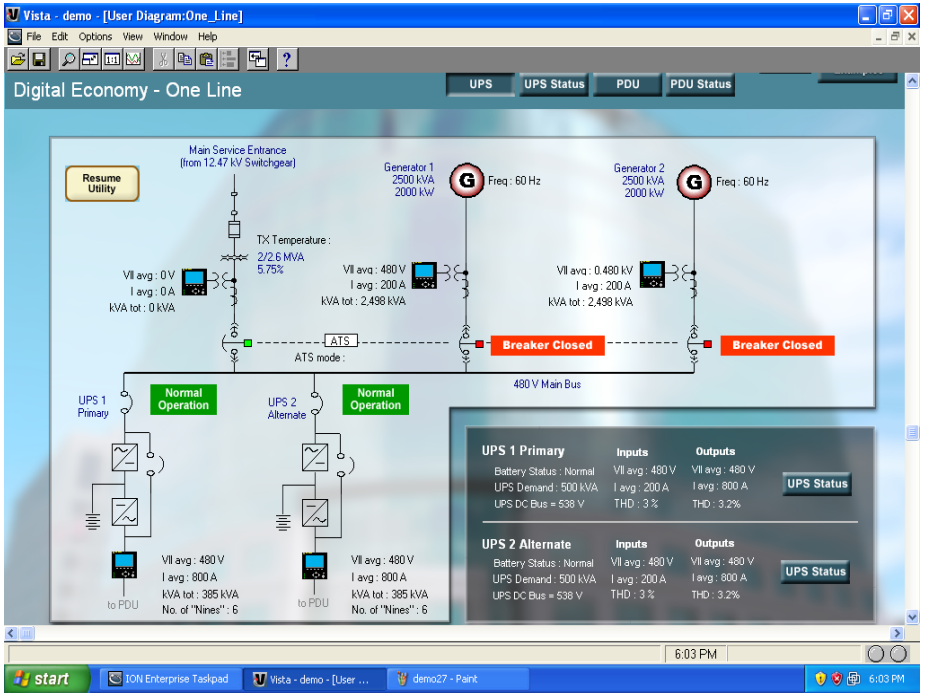
- Energy and Utility Monitoring
- Reporting
- Historical Analysis
- Trend Analysis
- Power Quality Analysis
- Alarming and Events
- Data and Event Logging
- Manual and Automated Control
- Interoperability (SCADA, DDC, BAS)
- Stores Collected Data
- Equipment Status Monitoring and Control
- Output Data Reports to the MDM (CIRCUITS)

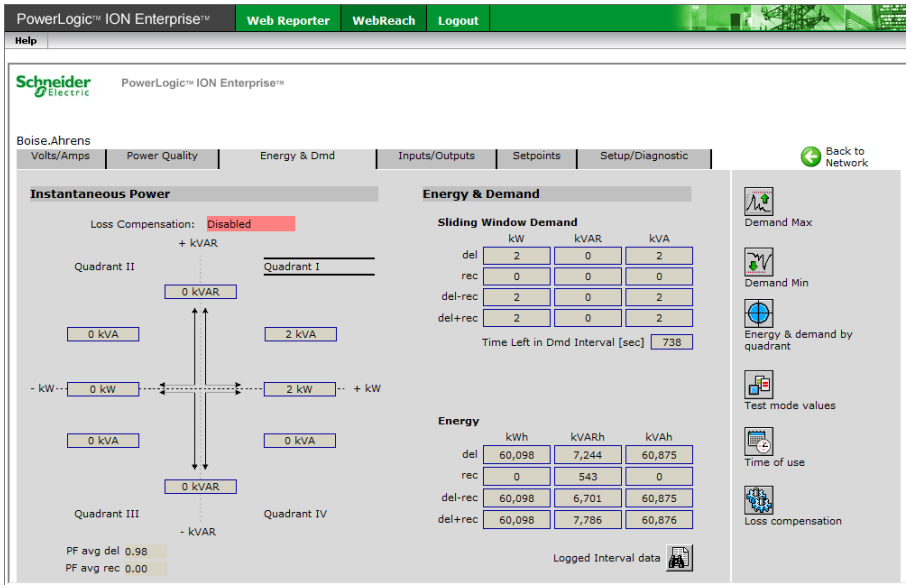
PowerLogic ION Enterprise software manages all consumed commodities. The system reveals energy inefficiencies and losses, allocates energy costs (billing), generates system reports, manages demand and power factor. Benchmark reliability against standards and validate improvements. Provides equipment status and supervisory control capabilities with alarm condition notification. The Local ION Enterprise DAS's report data to the regional ION Enterprise DAS.

Real Time Monitoring Drill Down Menu



Real Time Monitoring





SQUARE D

PowerLogic®

Reporting and Billing

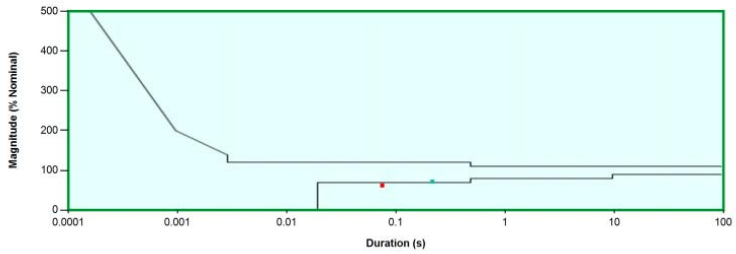
NAVFAC
Naval Facilities Engineering Command

Power Quality Report

4/12/2009 12:00:00 AM - 5/12/2009 12:00:00 AM (Server Local)

Number of Incidents	25
Incident Interval	1.301448
Number of Disturbances	29

Disturbances[1996 CBEMA - ITIC]



Worst Disturbances

Incident	Meter	Time	Type	Phase	Duration (s)	Magnitude (%)
1	*ION.7650*	*4/20/2009 2:45:57 AM*	*Sag*	*V2*	*0.216*	*71.19*
2	ION.7650	4/22/2009 8:21:21 AM	Transient	V1	0.000032	103.25
3	ION.7650	4/23/2009 8:29:35 AM	Transient	V1	0.000032	107.32
4	ION.7650	4/23/2009 2:21:00 PM	Transient	V1	0.000032	104.07
5	ION.7650	4/23/2009 2:28:11 PM	Incomplete			
6	ION.7650	4/24/2009 9:08:48 AM	Transient	V1	0.000032	107.32
7	ION.7650	4/24/2009 9:12:42 AM	Transient	V1	0.000032	102.44
8	ION.7650	4/24/2009 9:14:27 AM	Transient	V1	0.000032	110.57
9	ION.7650	4/24/2009 3:14:07 PM	Sag * Exceeds Tolerance	V2	0.075	61.47
10	ION.7650	4/25/2009 12:55:37 AM	Incomplete			
11	ION.7650	4/25/2009 12:56:28 AM	Incomplete			
12	ION.7650	4/27/2009 11:50:00 PM	Transient	V1	0.000032	104.07
13	ION.7650	5/1/2009 9:59:16 AM	Incomplete			

NAVAL STATION GREAT LAKES, IL

Energy Cost Report

7/1/2010 12:00:00 AM - 8/1/2010 12:00:00 AM (Server Local)

Source: NRH.Bld166

Energy Cost

	Total	Unit Cost ($)	Cost for Tariff ($)
Real Energy (kWh)	2,993.25	0.08525	255.17
		SubTotal ($)	255.17
		Energy Cost Total ($)	255.17

Demand Cost

	Timestamp of Peak	Max Value	Unit Cost ($)	Cost for Tariff ($)
Real Demand (kW)	7/10/2010 2:15:00 PM	13.24	2.50	33.11
			SubTotal ($)	33.11
			Demand Cost Total ($)	33.11
			Electric Total ($)	288.29

WAGES Cost

Name	Source	Measurement	Total	Unit Cost ($)	Cost for Tariff ($)
Water	NRH.Bld166	Gallons	642.81	0.01	6.43

Extra Fee

Facility Charge ($)	10.00
Total ($)	**304.71**

SQUARE D

PowerLogic

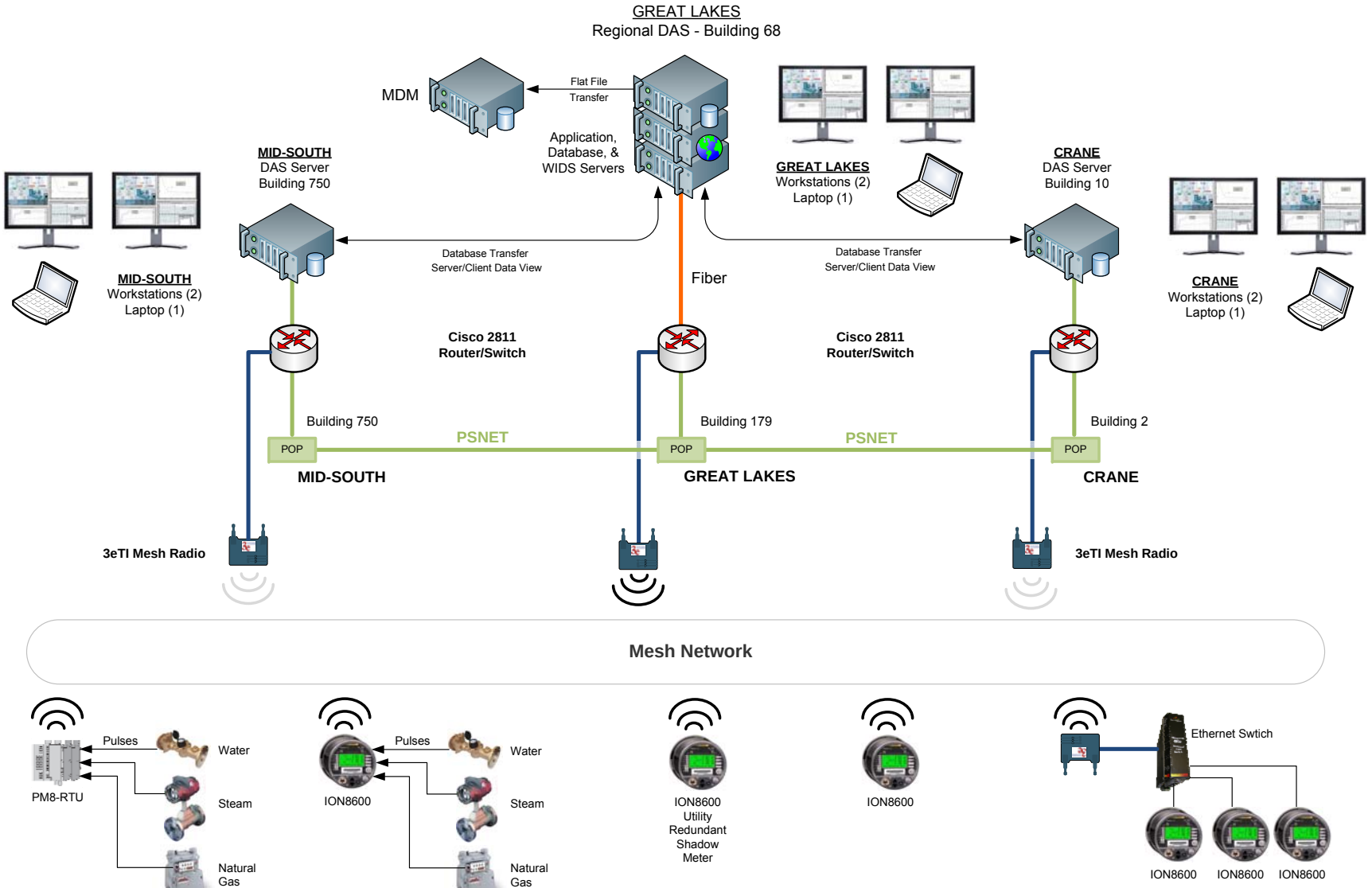
AMI Network Communication Requirements

- PSNET:
  - NAVFAC CONUS AMI installations are required to integrate the communications onto the Navy Public Safety Network (PSNET).

- Wireless Technology:
  - Wireless Ethernet communications are approved for PSNET. The radios must operate in the 2.4 or 5.8 GHz frequency band and utilize 802.11 wireless Ethernet protocol. The wireless network must be fully compliant will all IA requirements, FIPS 140-2 requirements and NIAP Common Criteria validation to meet US Government protection profiles. A wireless Intrusion Detection System (WIDS) and a network disable/enable feature are also required for wireless technology. The mesh network must be self healing and have no more than 25 nodes in a single mesh.

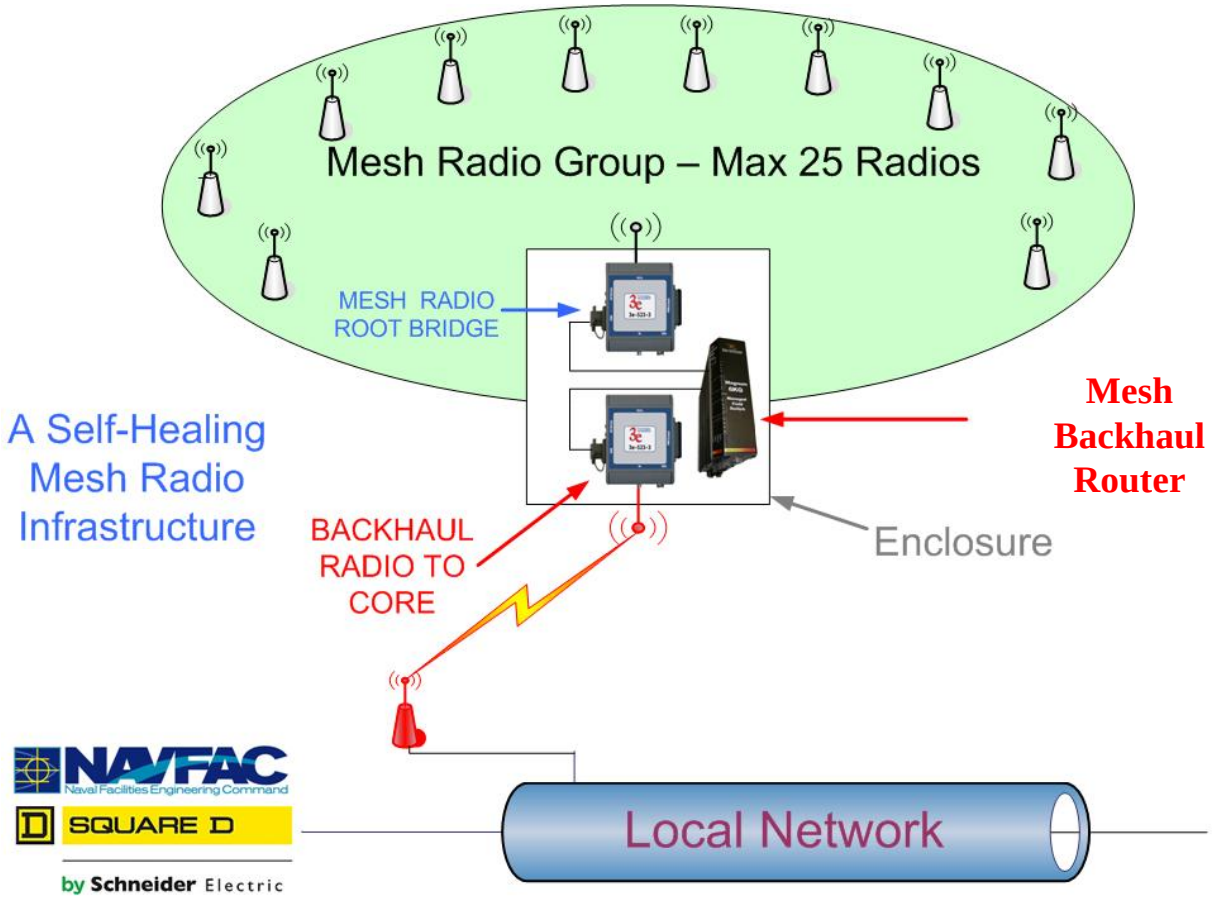
- IA and DIACAP:
  - The AMI systems are required to comply with Information Assurance (IA) and DIACAP accreditation. The accreditation includes obtaining approvals for Platform IT (PIT), Information Assurance and from the regional Spectrum Frequency Manager for wireless technology.

Regional AMI System Architecture



Possible Radio Endpoint Meter Configurations

Wireless Communications



The Schneider Electric solution utilizes AirGuard Ethernet radios from EF Johnson / 3e Technologies International (3eTI) and are fully compliant will all IA requirements, FIPS 140-2 requirements and NIAP Common Criteria validation. The AirGuard radios support several topologies that provide a cost effective wireless network deployment, including Access Point/Client (point-to-multipoint), Point-to-Point Bridging and self-healing mesh.

Wireless Intrusion Detection System (WIDS)

AirDefense Enterprise Appliance – Model 1250

AirDefense Model 520 Sensor

- Intrusion detection is accomplished using Motorola AirDefense remote sensors installed throughout the network and tied back to an AirDefense appliance server.
- The sensors passively observe and collect all wireless traffic and extract key data required for intrusion detection.
- The Schneider Electric solution is designed to meet the Department of Defense Directive Number 8100.2 which establishes policy and assigns responsibilities for the use of commercial wireless devices, services, and technologies in the DoD Global Information Grid (GIG).

Wireless Network Control

ION Enterprise
Radio Communications
Control Screen

Remote Radio Disable/Enable Control Steps:

Step 1: Open the HomeScreen diagram and select the "Radio Comms" button for the base/region (Group). The Radio communication status is indicated for all radios.

Step 2: In the "Group Control box", select the desired set of radios to be shutdown. Enter the date and time for the radios to deactivate and the outage duration.

Step 3: Verify the individual radio displays the entered date/time/duration as each value is entered into the group control box in real time.

Step 4: With the radios now programmed to the correct radio transmit deactivation date/time/duration, click the "Schedule" button in the group control box.

Step 5: Verify the radio Transmitter Status has updated from "Idle" to "Scheduled"

Through two-way communications and utilizing ION logic and control, the Schneider Electric AMI system provides an efficient method to shutdown radio transmitters (individual, groups, or every RF transmitter in the system network). The radio self-deactivation and timed auto-reactivation sequence can be aborted by selecting the "Cancel" button in the group control box at any stage of the schedule or after the radios have been disabled.

AMI Project Challenges

- **Information Assurance:**
  - DIACAP Accreditation
  - Risk Mitigations
  - Controlled Interface
- **Installation:**
  - Scheduled Utility Outages
  - Environmental and Special Location Compliance
- **Network Communications:**
  - Approval for Wireless Technology
- **Transition:**
  - New System to Learn / Manage / Leverage

QUESTIONS?