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· August 15-18, 2010 · Dallas, Texas ·
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EMCS – So Much Data…So Many Uses!

August 16, 2010

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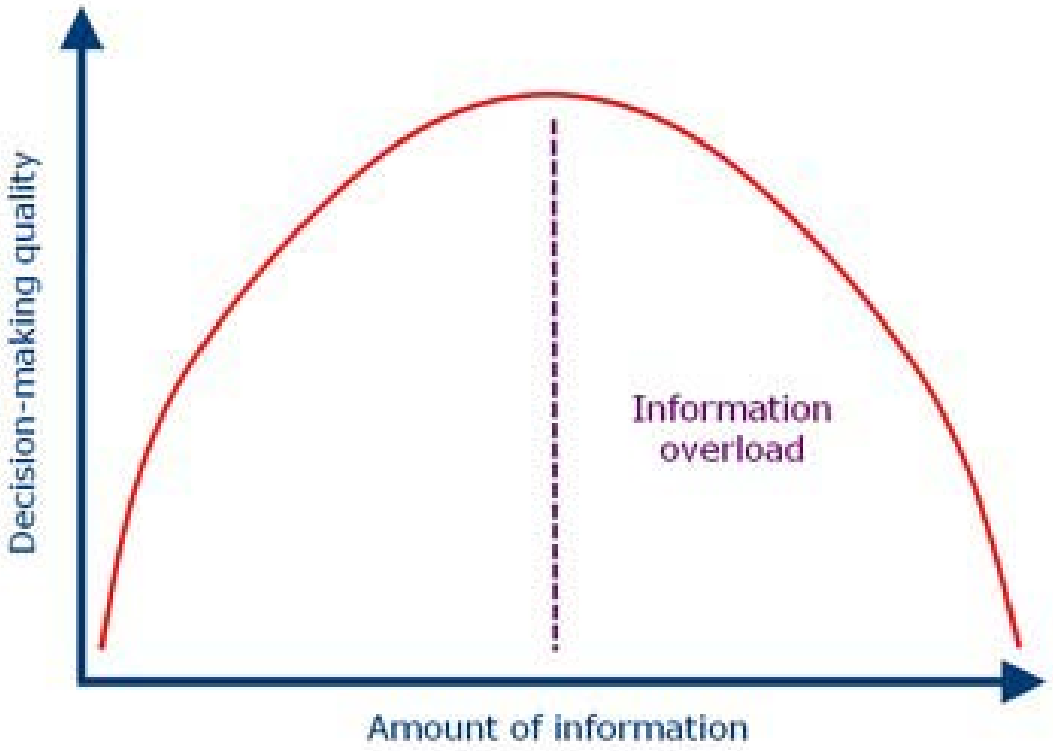

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What is an EMCS?

*"A system composed of various hardware and software components used to **monitor, control**, and optimize the performance of building and distribution systems"*

- **Features**
  - Scalable, flexible architecture
  - Open protocol
  - Commercial Off-The-Shelf (COTS)
  - User-defined dashboards
  - System-wide data acquisition and interoperability
  - Real-time monitoring through a secure, multi-user web portal
  - Preconfigured and custom reports
  - Trending, graphing, and aggregation
  - Power quality compliance, monitoring, and analysis
  - Alarming and event logging
  - Manual or automated control

- **Purposes**
  - Improve efficiency and cut energy-related costs
  - Assure reliability and reduce downtime
  - Safety (Equipment and Personnel)
  - Optimize equipment utilization and reduce the cost of operations
  - Promote behavior change
  - Identify and prioritize savings opportunities
    - Non-capex savings (Operation & Maintenance (O & M) program)
    - Capital projects (Energy Conservation Measures (ECM))
  - Audit savings to ensure long term persistency
  - Part of an energy focused Operation & Maintenance (O & M) program

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Data Acquisition

- Combined metering: electricity, gas, steam, air, water
- Monitor your distribution system, including:
  - Advanced Electric meters
  - Circuit breakers
  - Protective relays
- Interface with third-party meters, transducers, PLCs, RTUs, power distribution or mitigation equipment
- Scalable platform, add devices as you need them
- Integrate with other systems:
  - Energy management, SCADA, BAC, DCS, ERP
  - Use ODBC, XML, OPC, email, FTP, CSV, PQDIF, web services

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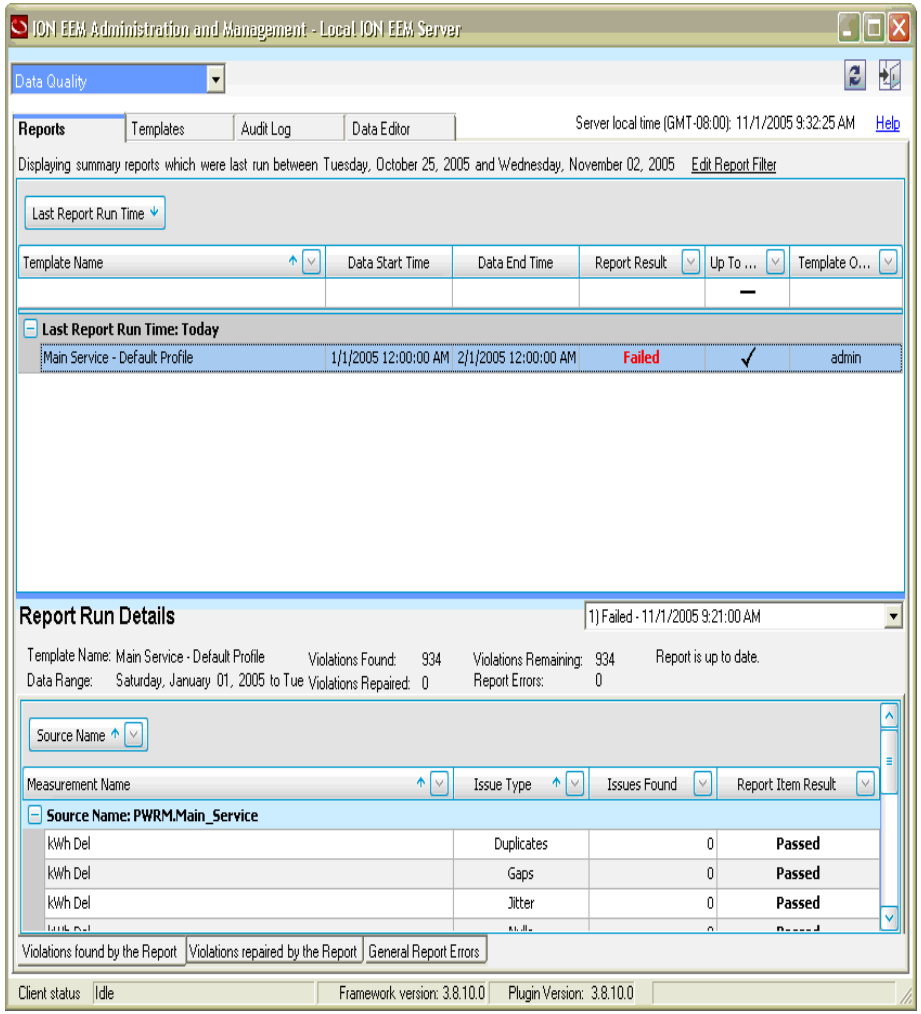
Data Quality



- Automatic Correction
  - Automatic Jitter correction
  - Detection and correction of duplicates
  - Automatic straight-line interpolation over a range of gaps.
- Measurement Validation/Validation Schedules
  - Any parameter in the system can be validated
  - Data quality routines can be set to run on an hourly , daily, weekly, or monthly schedule
- Data Quality Reporting & Editing
  - The Data Quality Engine reports indicate the overall success or failure of a data quality run
  - Every data quality action needs to be logged in the audit trail

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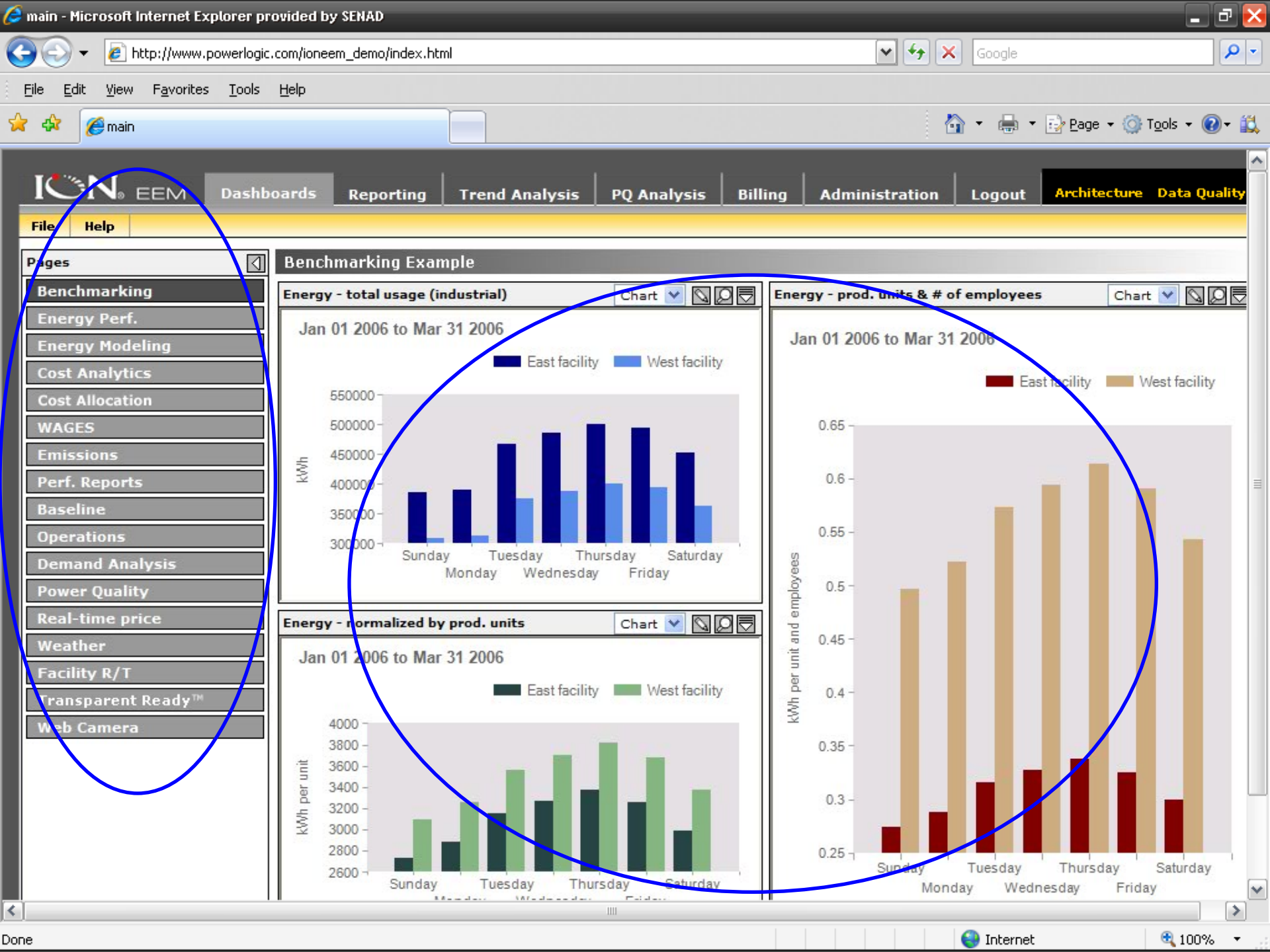
main - Microsoft Internet Explorer provided by SENAD
http://www.powerlogic.com/ioneem_demo/index.html
File Edit View Favorites Tools Help
main
ION EEM
Dashboards
Reporting
Trend Analysis
PQ Analysis
Billing
Administration
Logout
Architecture
Data Quality
File
Help
Pages
Benchmarking
Energy Perf.
Energy Modeling
Cost Analytics
Cost Allocation
WAGES
Emissions
Perf. Reports
Baseline
Operations
Demand Analysis
Power Quality
Real-time price
Weather
Facility R/T
Transparent Ready™
Web Camera
Benchmarking Example
Energy - total usage (industrial)
Chart
Jan 01 2006 to Mar 31 2006
East facility
West facility
kWh
550000
500000
450000
400000
350000
300000
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Energy - normalized by prod. units
Chart
Jan 01 2006 to Mar 31 2006
East facility
West facility
kWh per unit
4000
3800
3600
3400
3200
3000
2800
2600
Sunday
Tuesday
Thursday
Energy - prod. units & # of employees
Chart
Jan 01 2006 to Mar 31 2006
East facility
West facility
kWh per unit and employees
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0.25
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Done
Internet
100%

What Do You Do With the Data?

- **Manage Energy Costs**
  - Cost Allocation
  - Procurement Optimization
  - Power Factor Correction
- **Energy Conservation Measures**
  - Measurement and Verification
  - Infrastructure Optimization
  - Demand Response/Load Curtailment
- **Emission Reporting**
- **Energy Security/Reliability**
  - Energy Quality Monitoring
  - Enhanced Maintenance Capabilities

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Energy Costs

-Cost allocation

- Automatically collect, calculate, and report costs for buildings, tenants, etc.
- Compare efficiencies
- Determine the true impact of energy prices
- Identify opportunities to better balance consumption
- Remove utility budgeting guesswork
- Minimize administrative costs and reduce data entry errors

Campus Recharge by Source

Monday, January 01, 2007 to Wednesday, January 31, 2007

Administration Buidling

Commodity	Consumption		Cost
	Actual	Adjusted	
Electricity	575,495.31	575,495.31	$32,661.54

Computer Science Building

Commodity	Consumption		Cost
	Actual	Adjusted	
Chilled Water	3,696,350.39	3,696,350.39	$32,166.12
City Water	43,922.35	43,922.35	$481.56
Electricity	457,544.82	457,544.82	$25,967.40

Demasson School of Art

Commodity	Consumption		Cost
	Actual	Adjusted	
Electricity	50,302.20	50,302.20	$2,854.84

Engineering Building

Commodity	Consumption		Cost
	Actual	Adjusted	
Chilled Water	2,962,544.30	2,962,544.30	$25,780.45
City Water	3,601.38	3,601.38	$39.49
Electricity	1,213,857.81	1,213,857.81	$68,891.03
Gas	1,366.90	1,366.90	$96.87

Library

Commodity	Consumption		Cost
	Actual	Adjusted	
Electricity	638,362.50	638,362.50	$36,229.49

Campus Recharge by Commodity

Monday, January 01, 2007 to Wednesday, January 31, 2007

Chilled Water

Description	Consumption		Cost
	Actual	Adjusted	
Computer Science Building	3,696,350.39	3,696,350.39	$32,166.12
Engineering Building	2,962,544.30	2,962,544.30	$25,780.45

City Water

Description	Consumption		Cost
	Actual	Adjusted	
Computer Science Building	43,922.35	43,922.35	$481.56
Engineering Building	3,601.38	3,601.38	$39.49

Electricity

Description	Consumption		Cost
	Actual	Adjusted	
Administration Buidling	575,495.31	575,495.31	$32,661.54
Computer Science Building	457,544.82	457,544.82	$25,967.40
Demasson School of Art	50,302.20	50,302.20	$2,854.84
Engineering Building	1,213,857.81	1,213,857.81	$68,891.03
Library	638,362.50	638,362.50	$36,229.49
Stanlake School of Business	401,842.12	401,842.12	$22,806.06
Student Services Building	592,607.37	592,607.37	$33,632.72

Gas

Description	Consumption		Cost
	Actual	Adjusted	
Engineering Building	1,366.90	1,366.90	$96.87

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Energy Costs

-Procurement Optimization

Use EMCS information to negotiate bulk energy purchases to reduce price volatility and lower energy costs:

- Consolidate cost information into easy to understand reports
- Track real-time Internet pricing
- Automatically start generators or shed loads at cost thresholds
- Integrate costs for fuel, maintenance environmental levies, and interconnection

- Participate in a spot energy market programs
- Compare which purchasing options provide the most benefit

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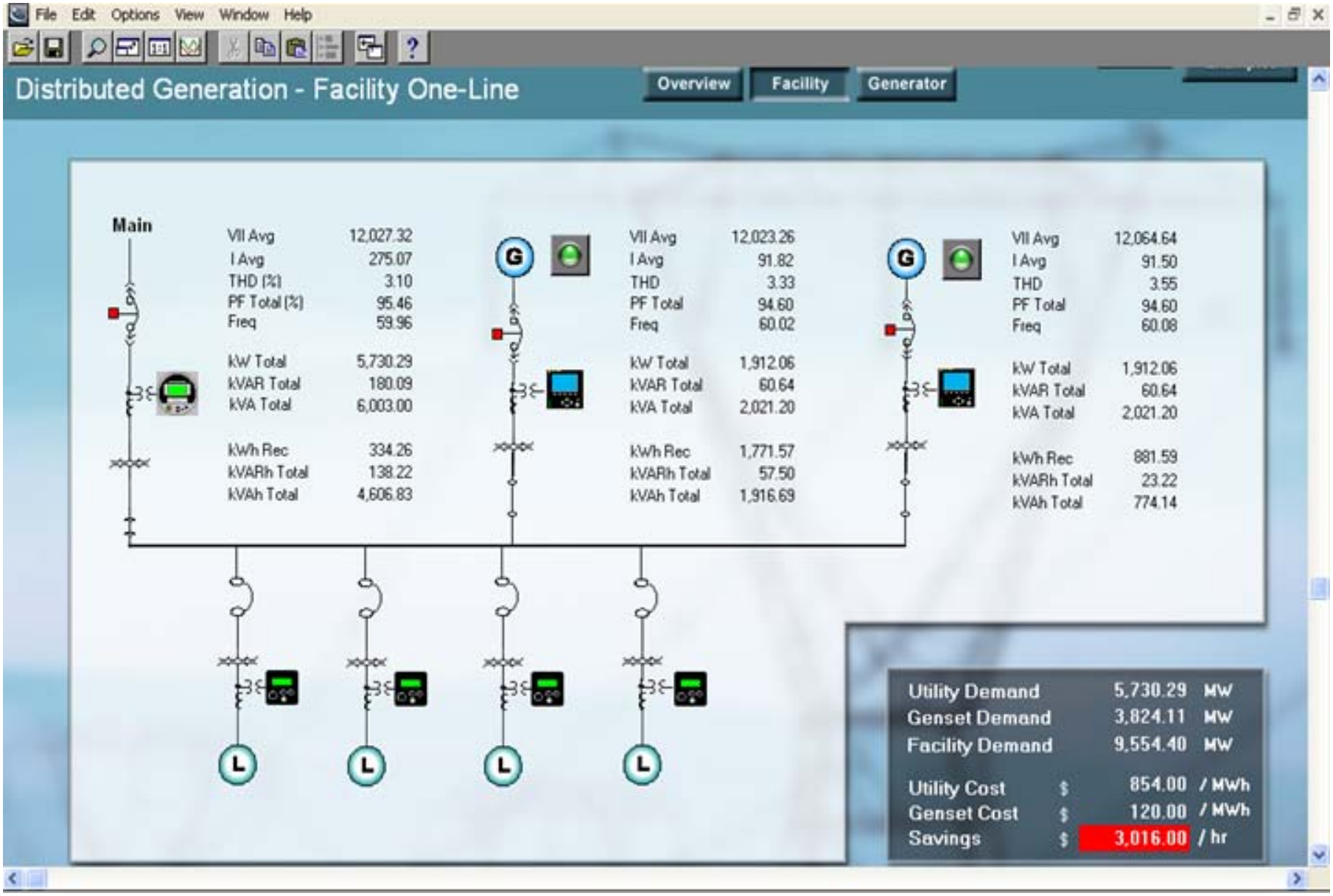

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Energy Costs

-Power Factor Correction

An EMCS alerts you to adverse trends so you, or your EMCS, can take corrective action to eliminate penalties.

Use your EMCS to monitor power factor and control:

- Capacitor banks
- Load tap changers
- Filter banks

Control energy costs

Target energy efficiencies

Allocate costs

Minimize capital expenses

Maximize uptime

Centralize facilities management

Optimize maintenance

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Energy Efficiency

-Measurement and Verification

Assure your energy efficiency investments are sustainable, adjustable and realize maximum long term payback with an EMCS.

- Benchmark against other facilities
- Validate performance to EE Mandates (EPACT, EISA, EOs)
- Forecast results to compare with different benefit scenarios
- Document results so you can verify efficiency program financial benefits
- Validate ESPC/UESC savings
- Validate utility bills, document errors and identify false penalty charges

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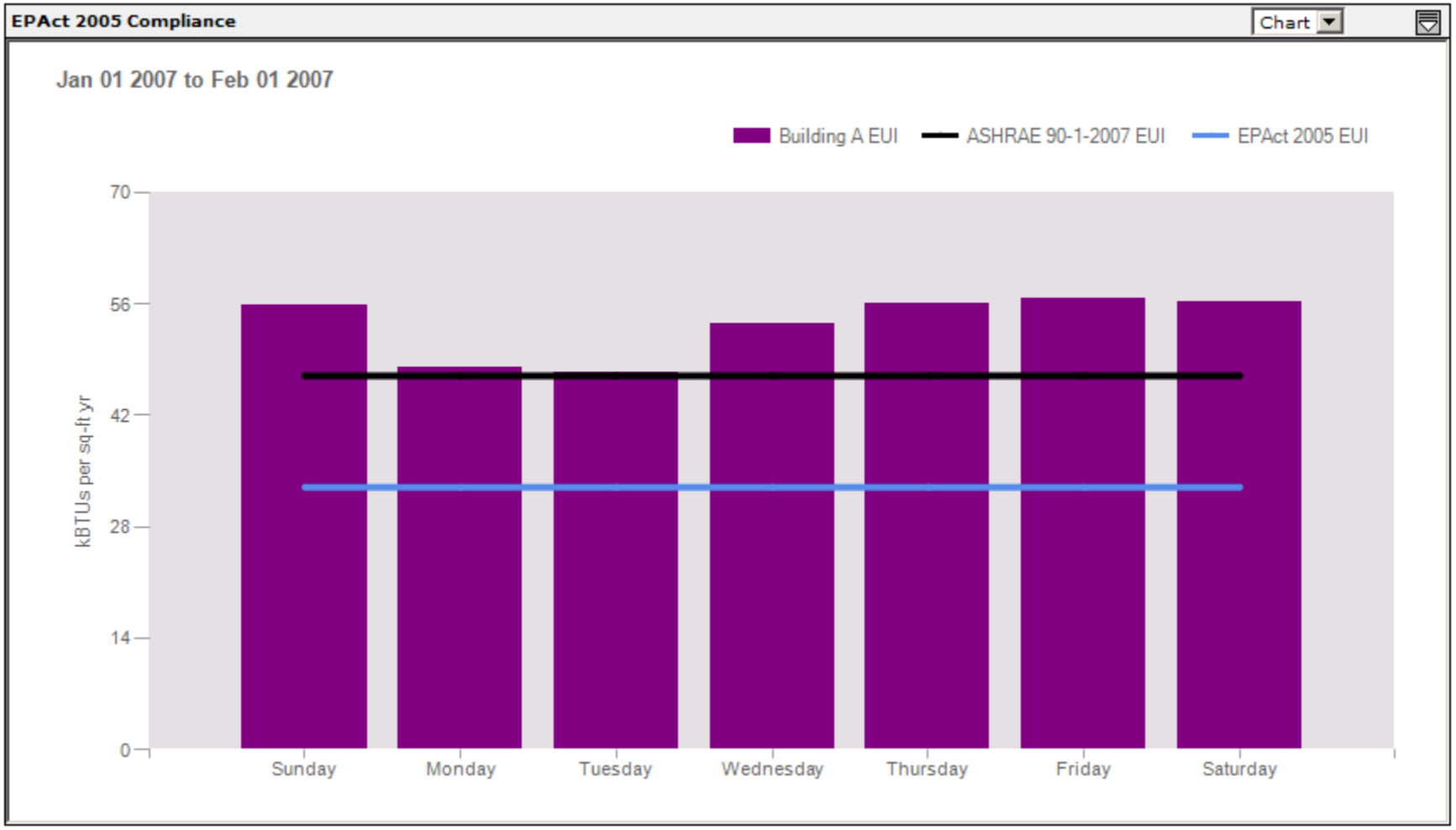
EPAct 2005 Compliance



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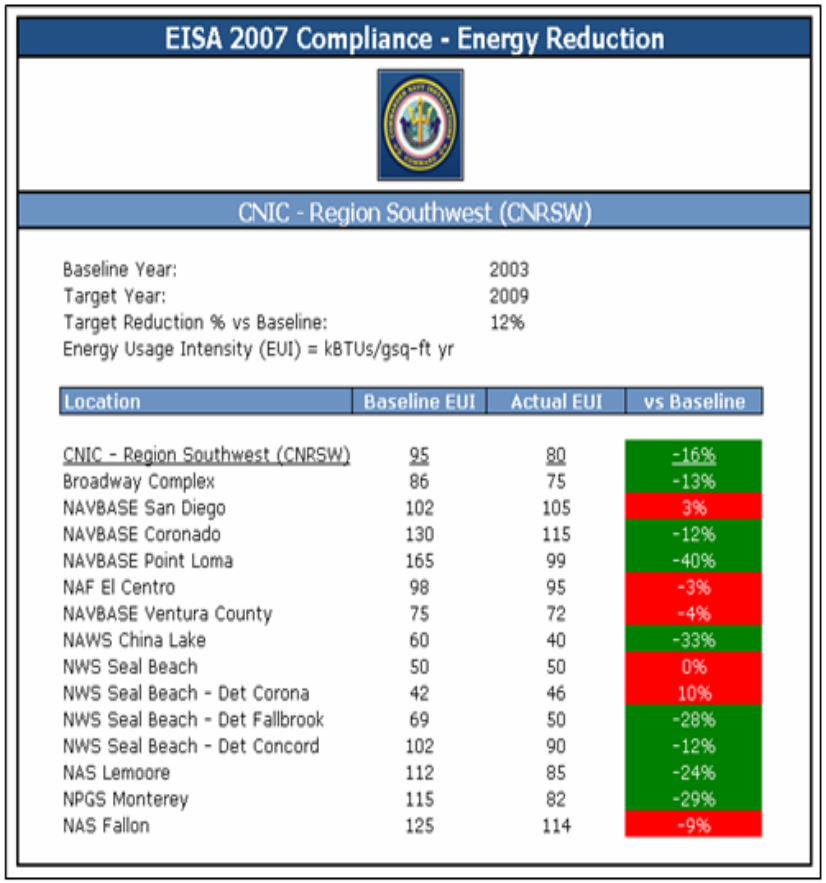
Federal Mandate Compliance

EISA 2007 Compliance



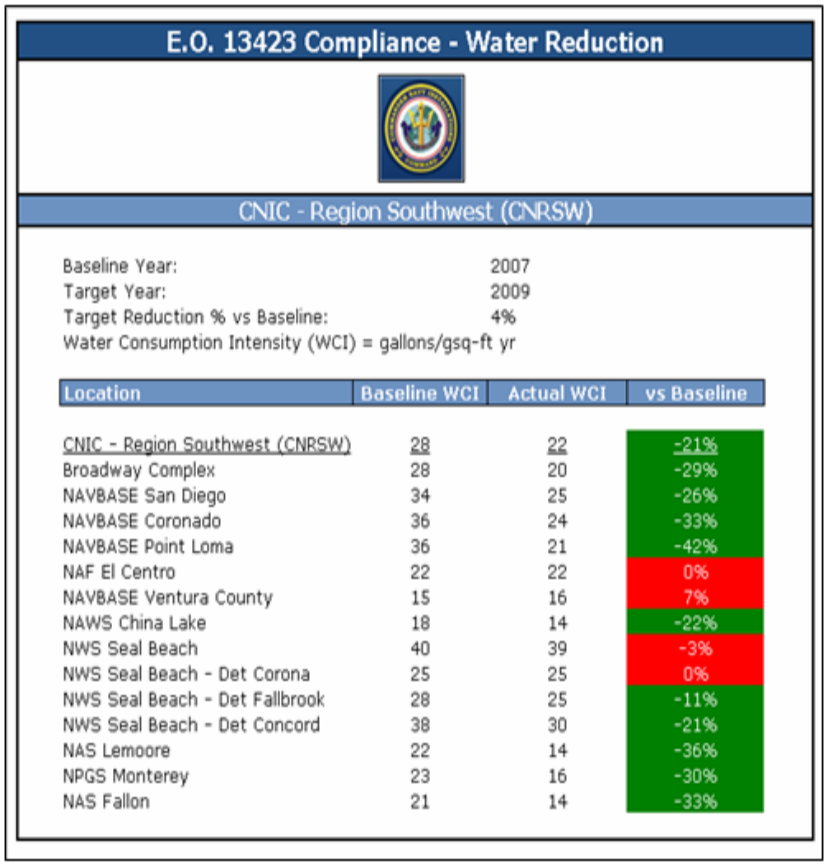
EISA 2007 Compliance - Energy Reduction

CNIC - Region Southwest (CNRSW)

Baseline Year: 2003
Target Year: 2009
Target Reduction % vs Baseline: 12%
Energy Usage Intensity (EUI) = kBTUs/gsq-ft yr

Location	Baseline EUI	Actual EUI	vs Baseline
CNIC - Region Southwest (CNRSW)	95	80	-16%
Broadway Complex	86	75	-13%
NAVBASE San Diego	102	105	3%
NAVBASE Coronado	130	115	-12%
NAVBASE Point Loma	165	99	-40%
NAF El Centro	98	95	-3%
NAVBASE Ventura County	75	72	-4%
NAWS China Lake	60	40	-33%
NWS Seal Beach	50	50	0%
NWS Seal Beach - Det Corona	42	46	10%
NWS Seal Beach - Det Fallbrook	69	50	-28%
NWS Seal Beach - Det Concord	102	90	-12%
NAS Lemoore	112	85	-24%
NPGS Monterey	115	82	-29%
NAS Fallon	125	114	-9%

E.O. 13423 (Water) Compliance



E.O. 13423 Compliance - Water Reduction

CNIC - Region Southwest (CNRSW)

Baseline Year: 2007
Target Year: 2009
Target Reduction % vs Baseline: 4%
Water Consumption Intensity (WCI) = gallons/gsq-ft yr

Location	Baseline WCI	Actual WCI	vs Baseline
CNIC - Region Southwest (CNRSW)	28	22	-21%
Broadway Complex	28	20	-29%
NAVBASE San Diego	34	25	-26%
NAVBASE Coronado	36	24	-33%
NAVBASE Point Loma	36	21	-42%
NAF El Centro	22	22	0%
NAVBASE Ventura County	15	16	7%
NAWS China Lake	18	14	-22%
NWS Seal Beach	40	39	-3%
NWS Seal Beach - Det Corona	25	25	0%
NWS Seal Beach - Det Fallbrook	28	25	-11%
NWS Seal Beach - Det Concord	38	30	-21%
NAS Lemoore	22	14	-36%
NPGS Monterey	23	16	-30%
NAS Fallon	21	14	-33%

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Energy Efficiency

-Infrastructure Optimization

Extend equipment life with preventive and proactive maintenance

- Match maintenance with equipment specifications
- Automatically track relay or breaker trips, UPS operations or charge remaining in batteries
- Alarm on temperatures, performance parameters and wear indicators
- Reduce maintenance related labor costs

Distribution system optimization

- Reduce capital expenses associated with poor power distribution system utilization
- Design power systems according to actual usage patterns
- Automatically generate load profiles
- Determine if your existing infrastructure will accommodate new processes

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Energy Efficiency

-Demand Response/Load Curtailment

Curtailing loads at your utility's request helps you negotiate lower electricity rates and provides additional funds for mission critical needs. An EMCS provides the tools to help you:

- Evaluate the economic advantage of participation
- Evaluate where, when and how much load should be shed
- Verify curtailment activities in real time
- Coordinate backup systems
- Manage loads remotely or automatically
- Verify contract compliance by all parties

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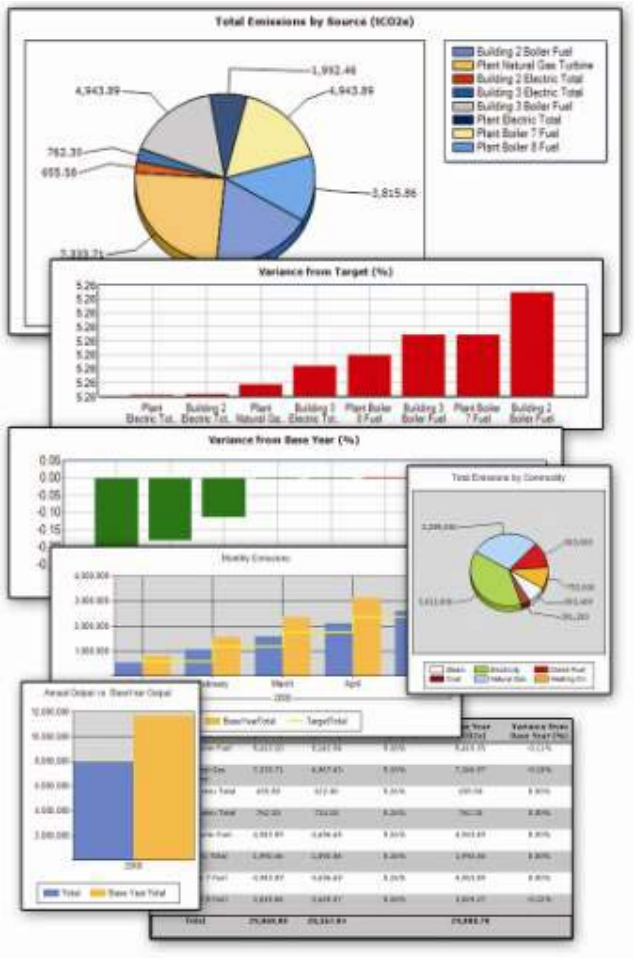
Energy Emissions

-Emission Reporting

- Convert energy data into GHG emissions by applying CO2-equivalent (CO2e) factors
- Accurately report on emissions from:
  - Direct & indirect sources (International GHG Protocol Scope 1, 2, & 3)
- Track success of reduction projects:
  - Compare monthly CO2e to targets
  - Break down CO2e by commodity
- Compare different regions, buildings, departments, etc.
- Compare emissions to energy consumption, temperature variations, etc.



Emissions Reporting

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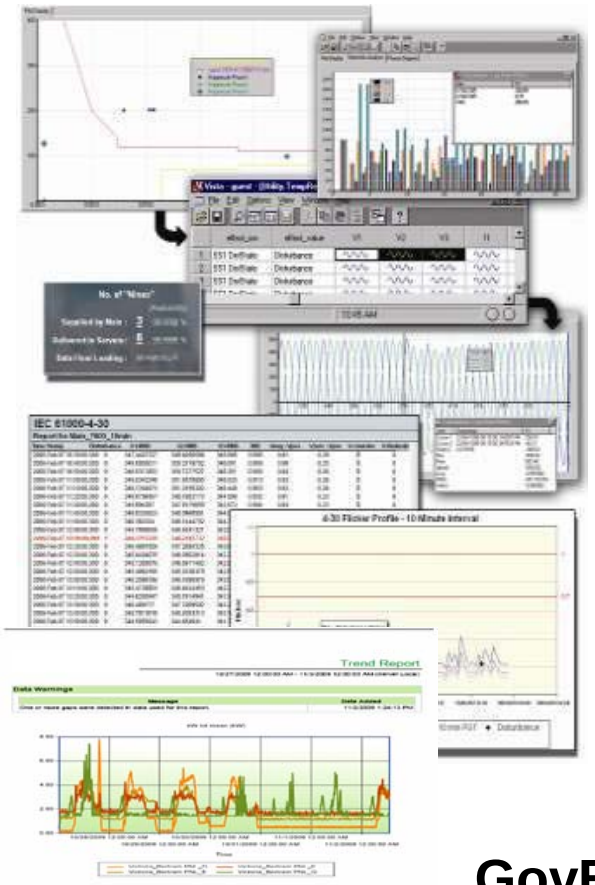
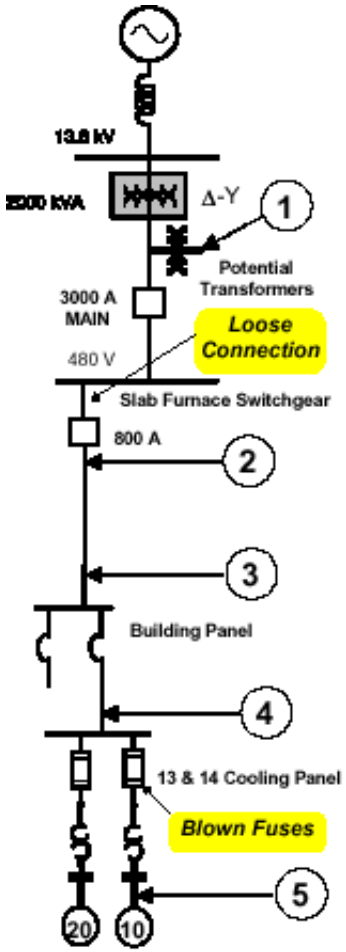
Energy Security/Reliability

-Energy Quality Monitoring

Minimize Systems Downtimes

- Proactively assess power quality trends and conditions to identify vulnerabilities
- Analyze power distribution system performance during an event
- Modify the power system to prevent similar problems in the future
- Accurately detect and capture magnitude and duration of power quality events
- Verify reliable operation of power distribution and mitigation equipment
- Baseline power quality conditions and verify improvements as a result of equipment upgrades





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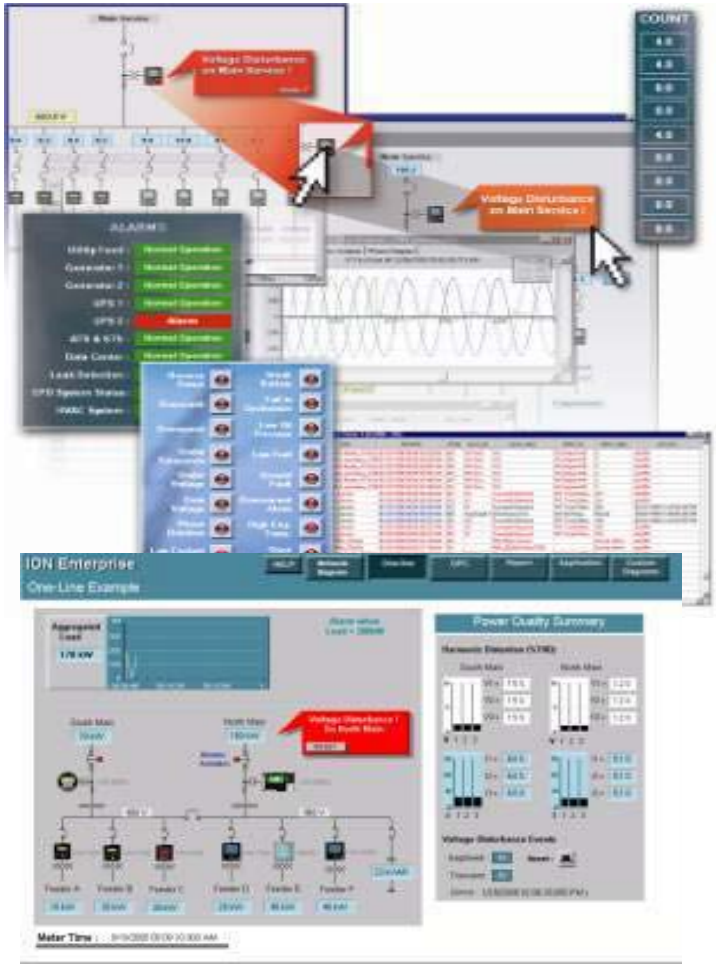
Energy Security/Reliability

-Enhance Maintenance Capabilities

Alarms and events

- Sequence of events analysis
- Root cause analysis
- Receive alerts to outages or impending problems
- Trigger on PQ events, thresholds or equipment conditions
- Trigger on complex/summary conditions
- Alarms from meters are immediately pushed to the system level
- Automatically:
  - Send signals to other building systems for corrections
  - Send out customized notifications to workstations, email, cell phone, PDA
  - Upload all associated event data
  - Generate a report
  - Log complete information (coincident conditions, waveforms, timestamps)



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Questions???

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