

# *Emergency Power Supply Systems*

*Codes, Standards, and Compliance Issues*

**Merlin Gerin**

**Square D**

**Telemecanique**

***Jim Taufer***

***Square D Company***

***October 2006***



*Building a New Electric World*



*Building*  
a New Electric  
World

## *Introductions*

### ***Jim Taufer***

**Power Management Specialist  
Schneider Electric**

- ⇒ **BSEE, University of Florida, 1986**
- ⇒ **19 years experience with power equipment, distribution systems, automation & motor control, communications, & networking**
- ⇒ **Expert in power monitoring & controls**
- ⇒ **Home: Orlando, FL**
- ⇒ **Territory = Florida, S. GA, Nashville**



*Building*  
a New Electric  
World

## *Square D – Power Management Overview*

- **Global Leader in Power Monitoring & Control Systems (PMCS)**
- **HQ in LaVergne, TN**
- **Providing complete system solutions – hardware, software, networking, application engineering, custom solutions, installation & commissioning, training, and support services**
- **Major Markets:**
  - ⇒ Industrial
  - ⇒ Commercial
  - ⇒ Government
  - ⇒ Utility
- **Power Monitoring Lines:**  
**PowerLogic & Power Measurements (ION)**



*Building*  
a New Electric  
World

## *Presentation Outline*

- ***Emergency Power Supply Systems (EPSS)***
  - ⇒ Applications
  - ⇒ Applicable Codes & Standards
  - ⇒ EPSS Components
  
- ***EPSS Testing & Reporting***
  - ⇒ Why the EPSS Needs to be Tested
  - ⇒ Testing Procedures
  - ⇒ Documentation/Reports
  
- ***How to Improve EPSS Testing & Reporting***
  - ⇒ Training
  - ⇒ EPSS Monitoring Systems
  - ⇒ EPSS Automated Testing & Reporting



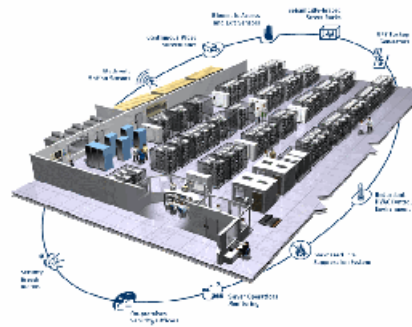
*Building*  
a New Electric  
World

## Critical Power Applications

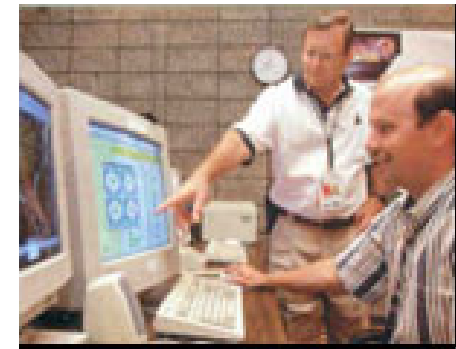
### Where are Emergency & Standby Power Systems Used ?



Hospitals



Data Centers



Telecom / Internet

- Government
- Water/Waste Water
- Banking & Financial
- Universities
- Military Bases
- Industry

## Codes & Standards - Organizations



*Building*  
a New Electric  
World



**National Fire  
Protection Association**

The authority on fire, electrical, and building safety

- ***National Fire Protection Association (NFPA)***
  - ⇒ International codes & standards organization
  - ⇒ Influences every building, process, service, design, and installation in the U.S.
  - ⇒ 300 Codes & Standards
  - ⇒ When an NFPA Standard refers to another document or portion, that referenced document is considered to be part of the requirements
  - ⇒ Not an enforcer of code compliance

## *Codes & Standards - Organizations*



*Building*  
a **New Electric**  
World



**Joint Commission**  
*on Accreditation of Healthcare Organizations*  
Setting the Standard for Quality in Health Care

### ***Joint Commission on Accreditation of Healthcare Organizations (JCAHO)***

- ⇒ **Evaluates and accredits over 15,000 healthcare organizations and programs in the U.S.**
- ⇒ **Provides standards that focus on patient safety and quality of care**
- ⇒ **Accreditation process evaluates compliance with these and other standards**

## Codes & Standards - Enforcers



*Building*  
a New Electric  
World



***The Authority Having Jurisdiction (AHJ) is the organization or individual responsible for enforcing the requirements of the codes and standards***

- ***Local***
- ***State***
- ***Federal***





*Building*  
a New Electric  
World

## *EPSS – Applicable NFPA Codes & Standards*

- ***NFPA 70 - National Electric Code***
- ***NFPA 70E - Standard for Electrical Safety in the Workplace***
- ***NFPA 99 - Standard for Healthcare Facilities***
- ***NFPA 101 - Life Safety Code***
- ***NFPA 110 - Standard for Emergency and Standby Power Systems***
- ***NFPA 111 - Standards for Stored Energy Power Systems***



*Building*  
a **New Electric**  
**World**

## *EPSS - Applicable JCAHO Standards*

### **JCAHO EC 7.40**

### ***Emergency Electrical Power System inspection, maintenance, and testing***

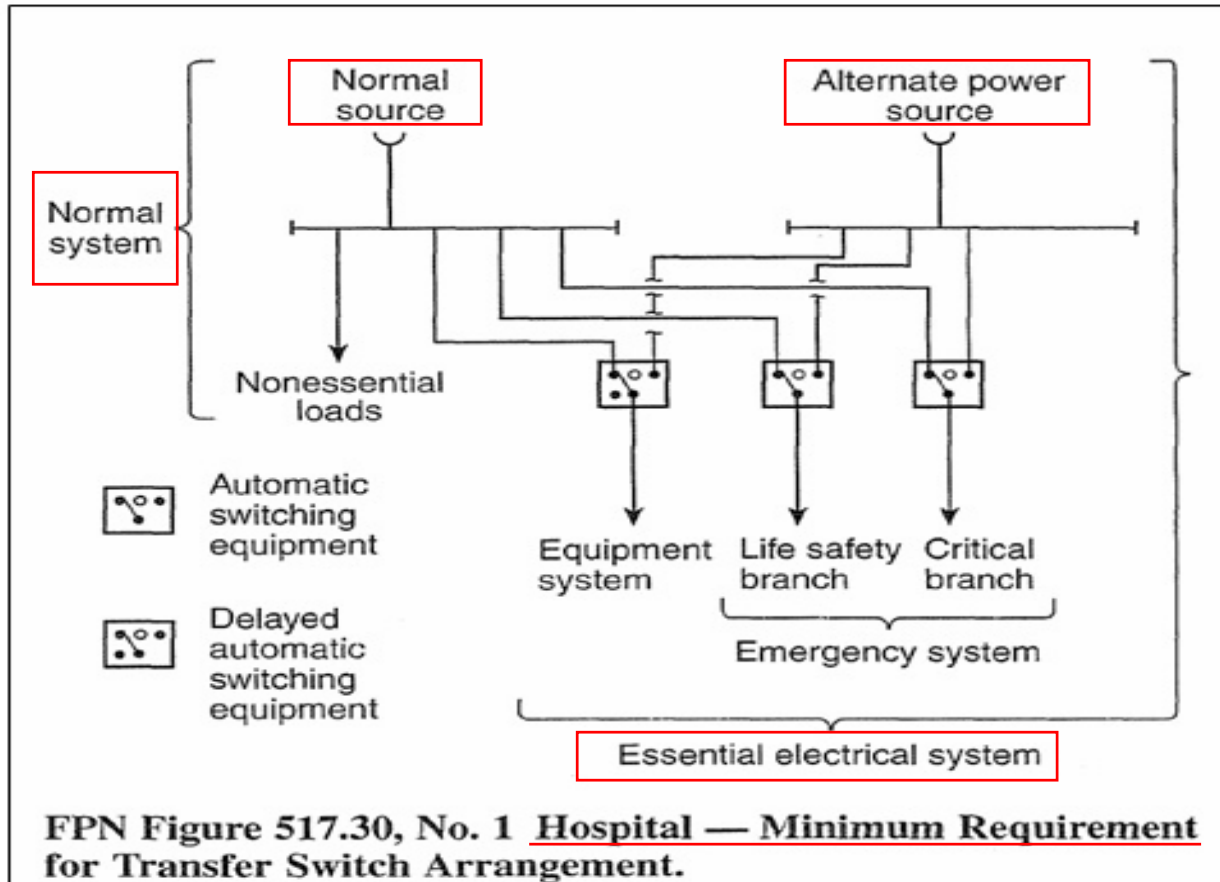
- ***Incorporates NFPA 110-2005 requirements***
- ***New 2006 additions to the standard that address testing and maintenance***

# NFPA 99 – Standard for Healthcare Facilities



Building  
a New Electric  
World

## Electrical Systems for Hospitals



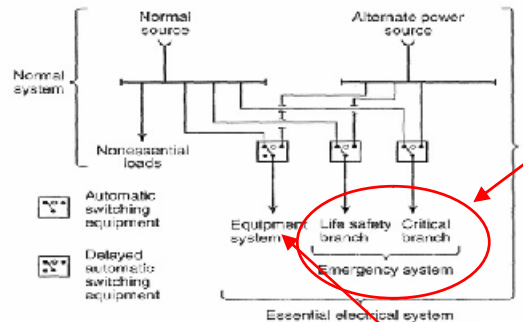
# NFPA 99 – Standard for Healthcare Facilities



*Building*  
a New Electric  
World

**Essential Electrical System (EES) – Required system of alternate power sources and all distribution systems designed to provide continuity of electrical power to designated areas and functions of a healthcare facility**

**Electrical Systems for Hospitals**



FPN Figure 517.30, No. 1 Hospital — Minimum Requirement for Transfer Switch Arrangement.

- **Emergency System – Circuits and equipment used to supply alternate power to loads vital to the protection of life and safety**
  - ⇒ Critical Branch Circuits
  - ⇒ Life Safety Branch Circuits
- **Equipment System - Circuits used to supply specific equipment**



*Building*  
a New Electric  
World

## *NFPA 99 – Standard for Healthcare Facilities*

- ***Emergency System Circuits***

- ⇒ **Life Safety Branch Circuits** – Egress illumination, exit signs per NFPA 101, Fire alarms, and Hospital communications systems
- ⇒ **Critical Branch Circuits** – Task illumination, fixed equipment, and selected circuits serving areas and functions related to patient care

- ***Equipment System Circuits***

- ⇒ **Nondelayed Circuits** – Generator Accessories
- ⇒ **Delayed Circuits** – Specific medical systems, elevators, heating equipment, and ventilation.



*Building*  
a New Electric  
World

## *NFPA 99 – Standard for Healthcare Facilities*

### **Types of Essential Electrical Systems (EES)**

- ***Type 1 – Applies to Hospitals & Healthcare Facilities where Life Support Equipment is Required***
  - ⇒ Onsite Generator(s) required to provide standby power if the normal source is interrupted
  - ⇒ Generator classified as NFPA Type 10, Class X, Level 1
- ***Type 2 – Applies to Nursing Homes (per Sec. 17.3.4.2)***
  - ⇒ Onsite Generator(s) required to provide standby power if the normal source is interrupted
  - ⇒ Generator classified as NFPA Type 10, Class X, Level 1
- ***Type 3 – Limited Care Facilities***
  - ⇒ Alternate power source required and may be a generator, battery system, or battery integral to the equipment.



*Building*  
a New Electric  
World

## *NFPA 99 - Essential Power System*

### **Uses for the Essential Electrical System (EES)**

- ***The EES generating equipment shall be normally reserved exclusively for emergency standby operation or...***
- ***The EES generating equipment may be used for other normal purposes such as peak demand control, load relief, cogeneration, etc. provided that...***
  - ⇒ **Two or more generator sets are installed**
  - ⇒ **The maximum demand of the emergency system + other required equipment loads be met with the largest generator out-of-service**
- ***Other loads may be added to the EES provided that they can be shed if the system is overloaded***



*Building*  
a New Electric  
World

## *Standard for Emergency & Standby Power Systems*

### **NFPA 110**

- ***Standard covers performance requirements of emergency power supply systems (EPSS) for loads in the event that the normal power source fails. This includes:***
  - ⇒ **System Installation**
  - ⇒ **System Maintenance**
  - ⇒ **System Operation**
  - ⇒ **System Testing Requirements**
- ***The standard does not specify where an EPSS is required – see NFPA99***
- ***The standard is applicable for healthcare facilities, but is often used by other industries as well***





*Building*  
a New Electric  
World

## *NFPA 110 – Standard for Emergency Power Systems*

### **EPSS Classifications:**

- ⇒ **EPSS Type – Determines the maximum time (seconds) that essential ATS load terminals can be without power**
  - \* - **Type 10: Ten seconds to restore power**
  - **Type 60: Sixty seconds to restore power**
  
- ⇒ **EPSS Class – Determines the minimum time (typically in hours) that the EPSS can operate without being refueled**
  - **Class 6: 6 Hours operation**
  - **Class 48: 48 Hours operation**
  - \* - **Class X: X = Hours as required by application, code, or user**
  
- ⇒ **EPSS Level – Defines the loads powered and the risk to human life and safety**
  - \* - **Level 1: Failure of equipment could result in loss of life or serious injury**
  - **Level 2: Failure of equipment less likely to result in loss of life or serious injury**



# Emergency Power Supply Systems

Building  
a New Electric  
World

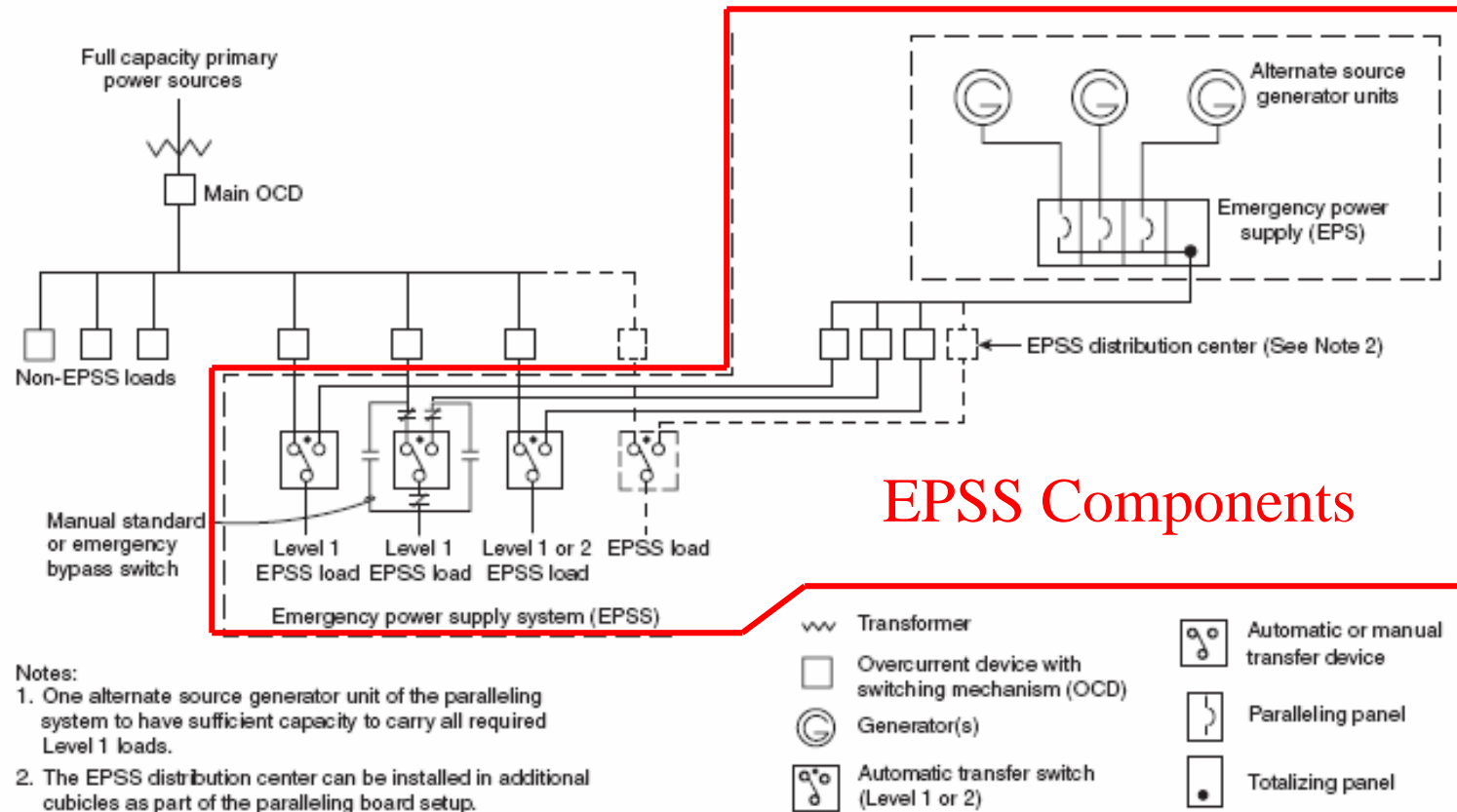


FIGURE B.1(b) Typical Multiple-Unit Emergency Power Supply System.

# EPSS Components



*Building*  
a New Electric  
World



- **Emergency Power Supply (EPS)**
  - ⇒ Typically a diesel or gas powered generator set
  - ⇒ Sized to carry the essential electrical system
  - ⇒ Dedicated fuel source
  - ⇒ Electrical starter system
  - ⇒ Prime mover cooling system
  - ⇒ Remote starting & alarm indication
  - ⇒ Operator controls
- **Transfer Switches**
  - ⇒ Automatic transfer
  - ⇒ Delayed transfer
- **Protection**
  - ⇒ Circuit Breakers



*Building*  
a New Electric  
World

## *EPSS Testing & Documentation*

### **EPSS Administration**

- ***Maintenance shall be performed in accordance with NFPA110, Chapter 8 & JCAHO 7.40***
- ***Testing conducted 12 times annually every 20-40 days***
- ***4 hour testing required every 36 months (per NFPA110-2005 & JCAHO 7.40 2006)***
- ***Simulated cold start test conditions***
- ***Testing conducted by competent personnel***
- ***A written record of EPSS inspection, performance, testing, and repairs shall be maintained and available for AHJ(s).***



*Building*  
a New Electric  
World

## *EPSS Testing & Documentation*

### **EPSS Maintenance & Testing (NFPA 110 & JCAHO 7.40)**

- **The operational testing shall include all EPSS components:**
  - ⇒ **(EPS) Generators**
    - Weekly inspection
    - Monthly exercised under 30% nameplate loading or at required exhaust temperature for 30 minutes
    - Exception available if monthly EPS load is less than 30%
      - Additional annual EPSS exercise with 25% for 30 min, 50% for 30 min, 75% for 60 min for a total of 2 continuous hours
  - ⇒ **Automatic Transfer Switches**
    - Complete operation monthly
  - ⇒ **Circuit Breaker**
    - Main and feeder breakers between the EPS and ATS shall be exercised annually
    - MV breakers shall be exercised every 6 months



*Building*  
a New Electric  
World

## *EPSS Testing & Documentation*

### ● **EPSS Maintenance & Testing**

- ⇒ **The test is initiated from an ATS test switch or opening a branch circuit breakers**
- ⇒ **All ATS switches supplying power to the EPSS shall be included in the test**
- ⇒ **The test shall be for a period of not less than 30 minutes while at operating temperature**
- ⇒ **Standby or peak shaving duty may be substituted for scheduled operations and testing if all requirements and documentation are satisfied**
- ⇒ **Failed Tests require interim measures until repairs and retesting after repairs are completed (JCAHO 7.40 2006)**

## Critical Power Systems



*Building*  
a New Electric  
World

**Why all the attention on emergency  
power systems???**  
**The Emergency Power System  
reliability must be better than the  
normal power source !**



**2003 Major Power Blackout**



**2004 Four Major Hurricanes Hit Florida**



*Building*  
a New Electric  
World

## *EPSS Testing & Documentation*

### **Why Proper EPSS Testing is Necessary**

- ***Exercising a generator below 30% can actually reduce the Emergency Power Supply reliability***
- ***ATS switches and circuit breakers need to be exercised to assure correct mechanical lubrication***
- ***Proper testing and monitoring identifies EPSS problems during testing rather than experiencing failures under emergency situations***
- ***Joint Commission and the AHJs require testing, maintenance, and documentation per NFPA110***





## EPSS Testing Guidelines

### Suggested Operation and Testing Procedures

Item Number	Function	Item Number	Function
1.	Perform maintenance per Figure A.8.3.1(a).	8.	Record initial oil pressure and battery-charging rate.
2.	Record running time meter reading at start and end of test.	9.	Record oil pressure, battery-charging rate, and water or air temperature after 15 minutes running time.
3.	Simulate normal power failure from a "cold start" by use of the test switch in automatic transfer switch or by opening normal power supply to EPSS.	10.	Return test switch to normal or reestablish normal power supply at such time to cause a minimum running time of 30 minutes under load.
4.	Observe and record time delay on start.	11.	Record prime mover and ac instruments just prior to transfer.
5.	Record cranking time (terminates when engine starts).	12.	Record time delay on retransfer.
6.	Transfer load to EPS. (See 8.4.1 and 8.4.2.)	13.	Record time delay on shutdown for units so equipped.
7.	Record ac voltage, frequency, amperage.	14.	Place unit in automatic operation mode.

FIGURE A.8.4.1(b) Operation and Testing Procedures Suggested for Level 1 and Level 2 Rotating Equipment.

# EPSS Test Documentation



*Building*  
a New Electric  
World



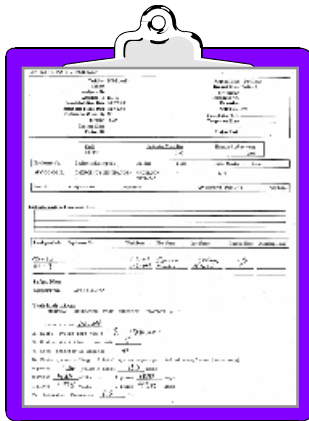
## Typical EPSS Reports Information:

- ⇒ Operator name
- ⇒ Test time/date
- ⇒ Gen crank time
- ⇒ Transfer time
- ⇒ Generator Electrical Measurements
  - AC Voltage
  - Frequency
  - Amperage
  - Power
- ⇒ Engine Parameters
  - Oil Pressure
  - DC Amperage
  - Water Temperature
  - Exhaust Temperature
- ⇒ Gen run time
- ⇒ Cool down time
- ⇒ End of test time

# EPSS Testing & Documentation



*Building*  
a New Electric  
World



## Manual Recording Issues

- **Manpower removed from normal duties to conduct test**
- **Difficult to manually monitor EPSS load levels during entire test**
- **Not able to manually record precise timing of transfer switches**
- **Actual generator operating temperatures ignored. Could result in possible development of “wet-stacking” condition**
- **Additional trending and analysis requires data to be transferred manually to a PC**
- **Reduced EES loading during testing (typically)**
- **Limited value for profiling EPSS loads**



*Building*  
a New Electric  
World

## *EPSS Testing & Documentation*

# ***How to Improve EPSS Testing & Documentation***

- ***Personnel Training***
- ***Incorporate a Power Monitoring System***
- ***Automate the EPSS Testing & Reporting***



*Building*  
a New Electric  
World

## *EPSS Maintenance Certification*

### **Personnel Training**



#### **Emergency Power Supply Systems**

Maintenance, Testing & Compliance 2005-2007 Certificate Course

- ***Weekly Maintenance & Monthly Testing Procedures***
  - ⇒ includes cooling, lubrication, fuel, and battery & charging subsystems
- ***Ensuring Personnel Safety During the Testing***
- ***Self Paced, Independent Course Study***

## *EPSS Monitoring Systems*



*Building*  
a New Electric  
World



### **Key Monitoring Points**

- **Generator Main Breakers**
- **ATS Switch Load Connections**
- **Engine Controller**

### **Other Considerations:**

- **Normal Service Mains**
- **Critical Loads – MRI, X-Ray, Data**
- **Cost Allocation – MOBs, etc.**

# *Incorporating a Power Monitoring Systems*



*Building*  
a New Electric  
World

## **Power Monitoring Systems provide continuous real-time monitoring & logging of EPSS data**



**Circuit Monitor**



**Power Meter**

- **EPS Generators**
  - ⇒ Circuit Monitors (CM) installed on Main Breakers
  - ⇒ CM I/O to Circuit Monitor the Gen Run status
  - ⇒ Interface to Gen Controller
- **Automatic Transfer Switches**
  - ⇒ Power Meters (PM) installed on ATS load terminals
  - ⇒ Power Meter I/O to monitor ATS position, test & source available contacts & optional remote test command
- **Gen Engine Controllers**
  - ⇒ Gen Vendors Engine Controllers with remote communications capabilities – EMCP3, PCC, D550, etc.

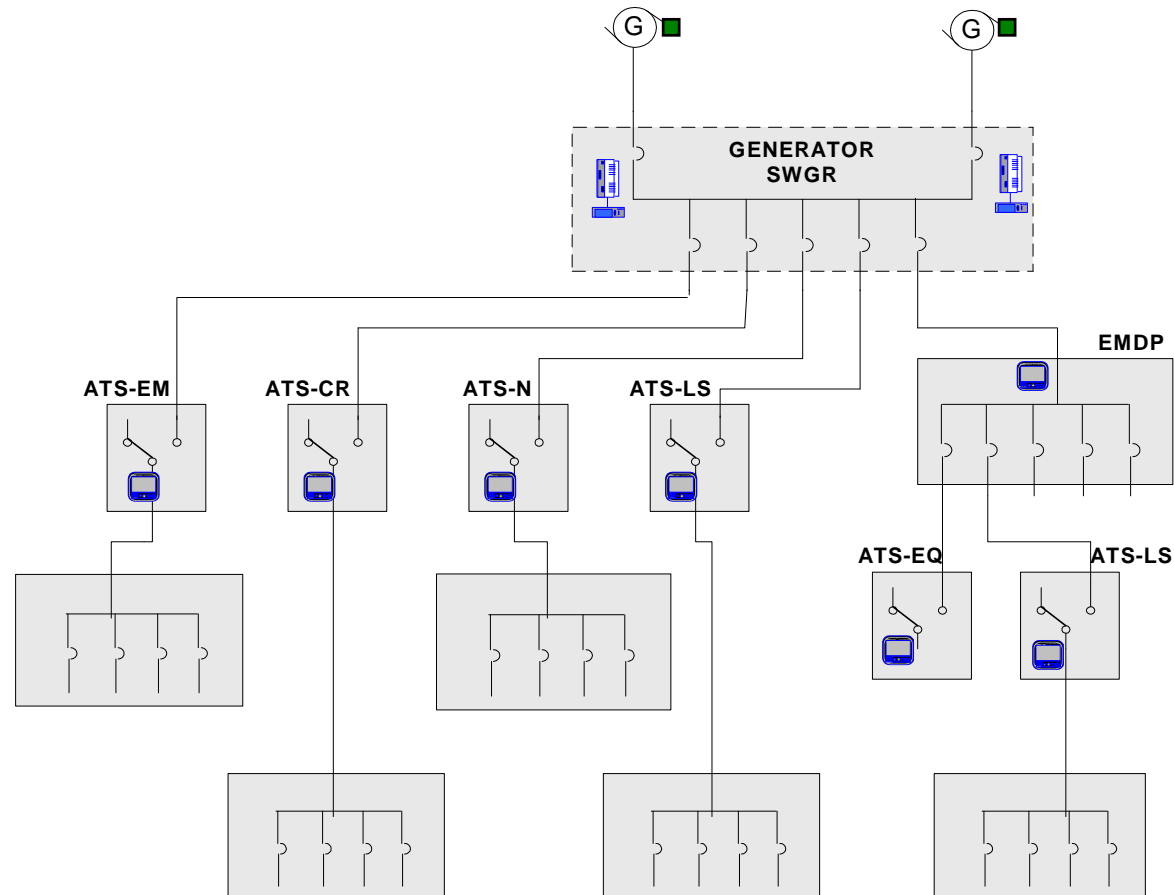


# Power Monitoring Systems

*Building*  
a New Electric  
World

## Power Monitoring Implementation

Meters can be provided in new equipment or retrofit into the existing EPSS equipment. Other existing vendors equipment can be integrated if only basic monitoring is needed.



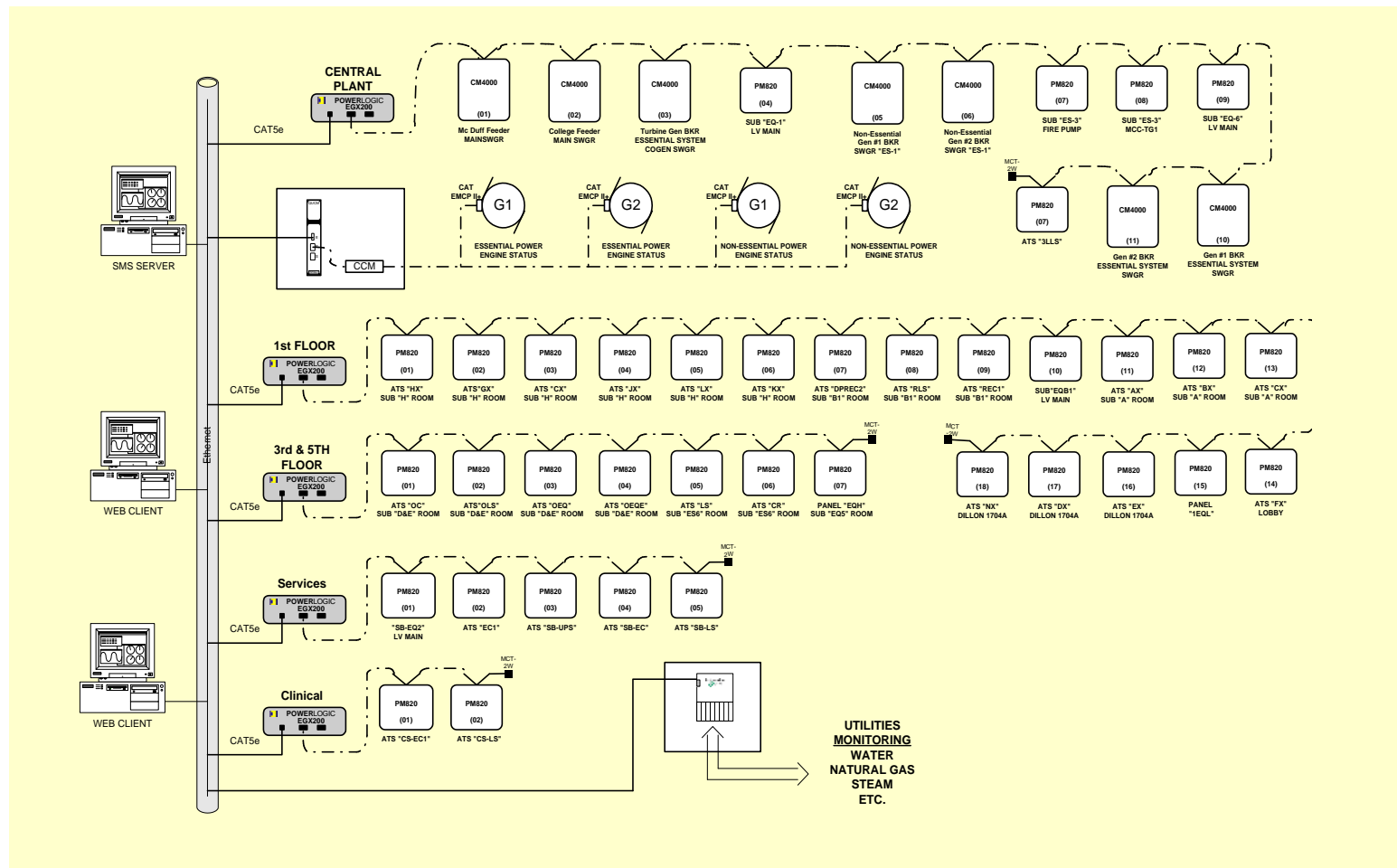




# Power Monitoring Systems

## Typical System Layout

Building  
a New Electric  
World



# PMCS Software – Real-Time Information

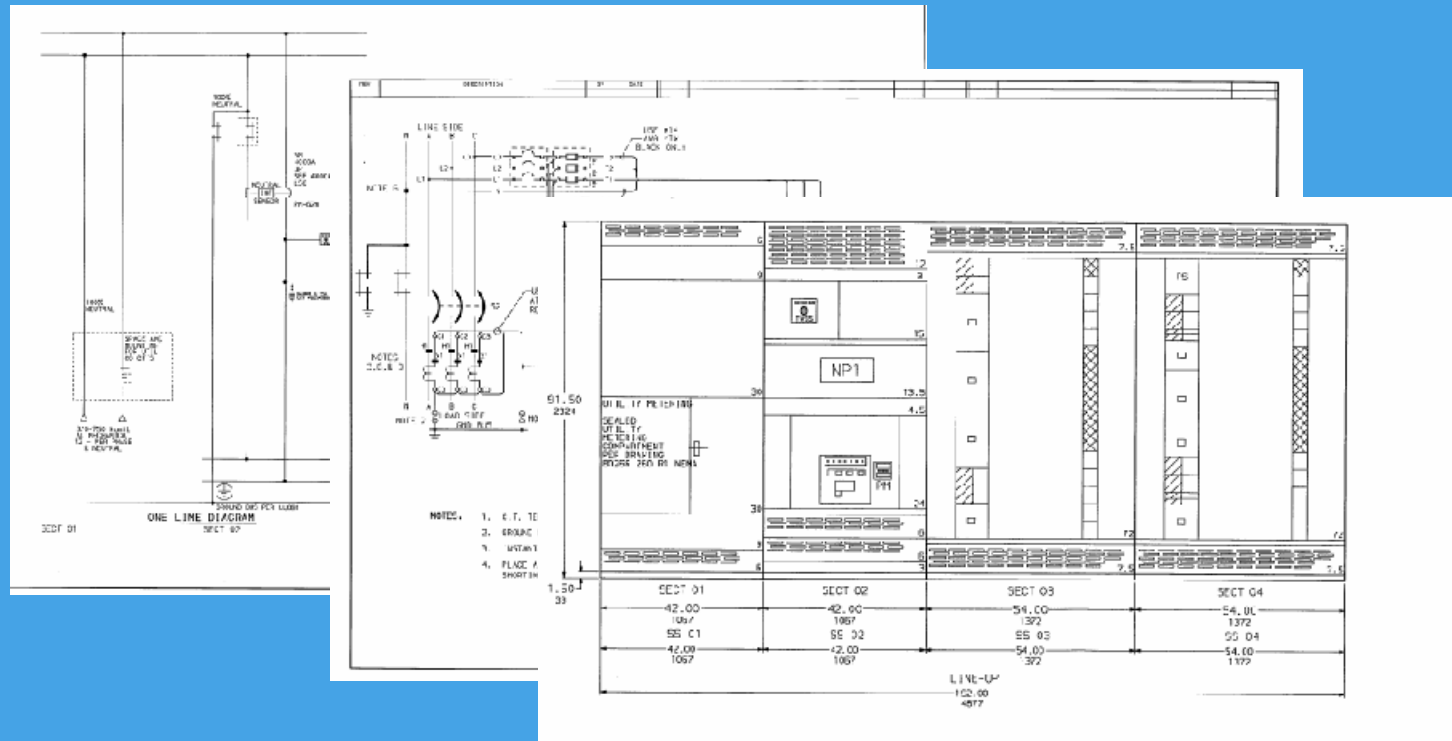


**Meters with  
Alarm  
Banding**

# PMCS Software – System Information



Building  
a New Elec  
World

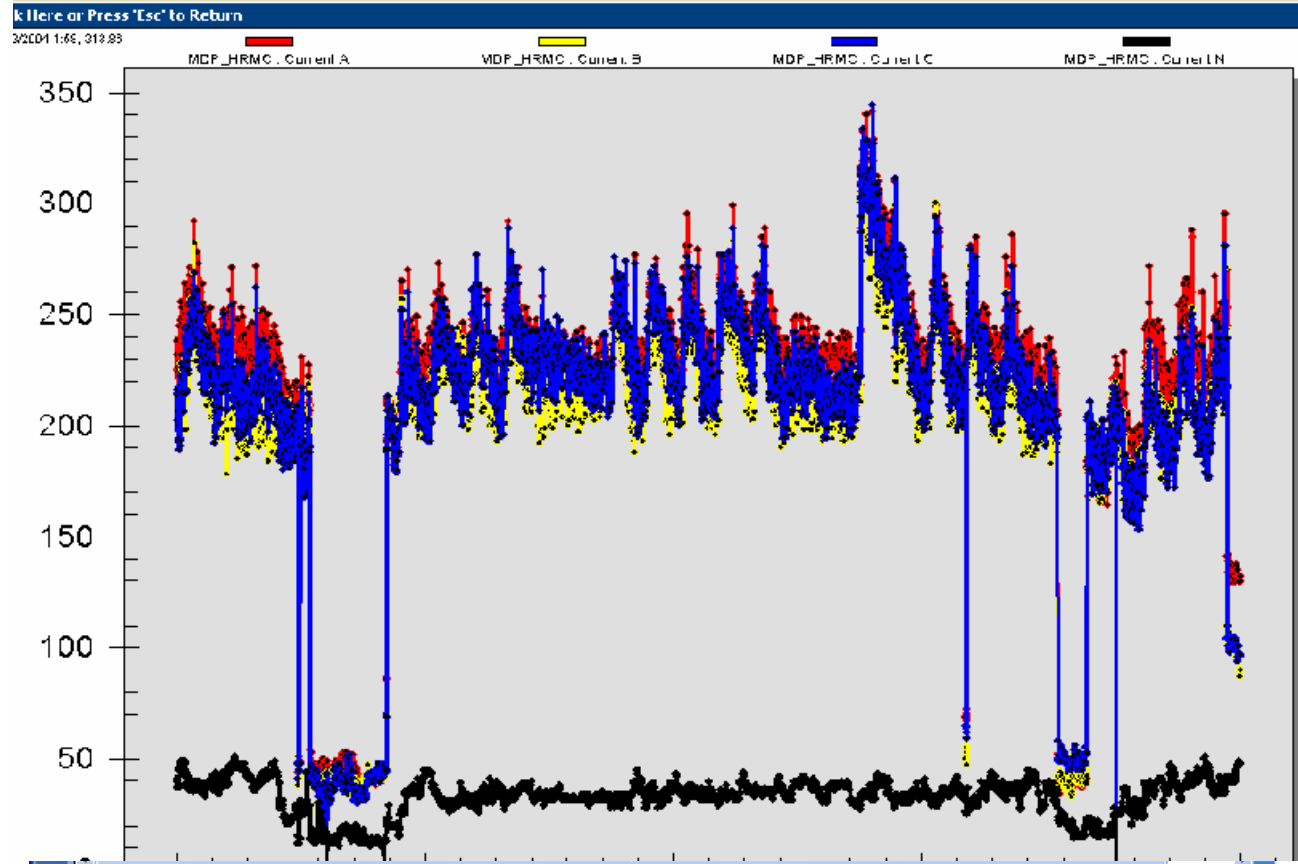


**Embedded O&M Manuals, As-Built Drawings, Floor Plans, Web Links, etc.**



*Building*  
a **New Electric**  
**World**

## *PMCS Software – Asset Management*



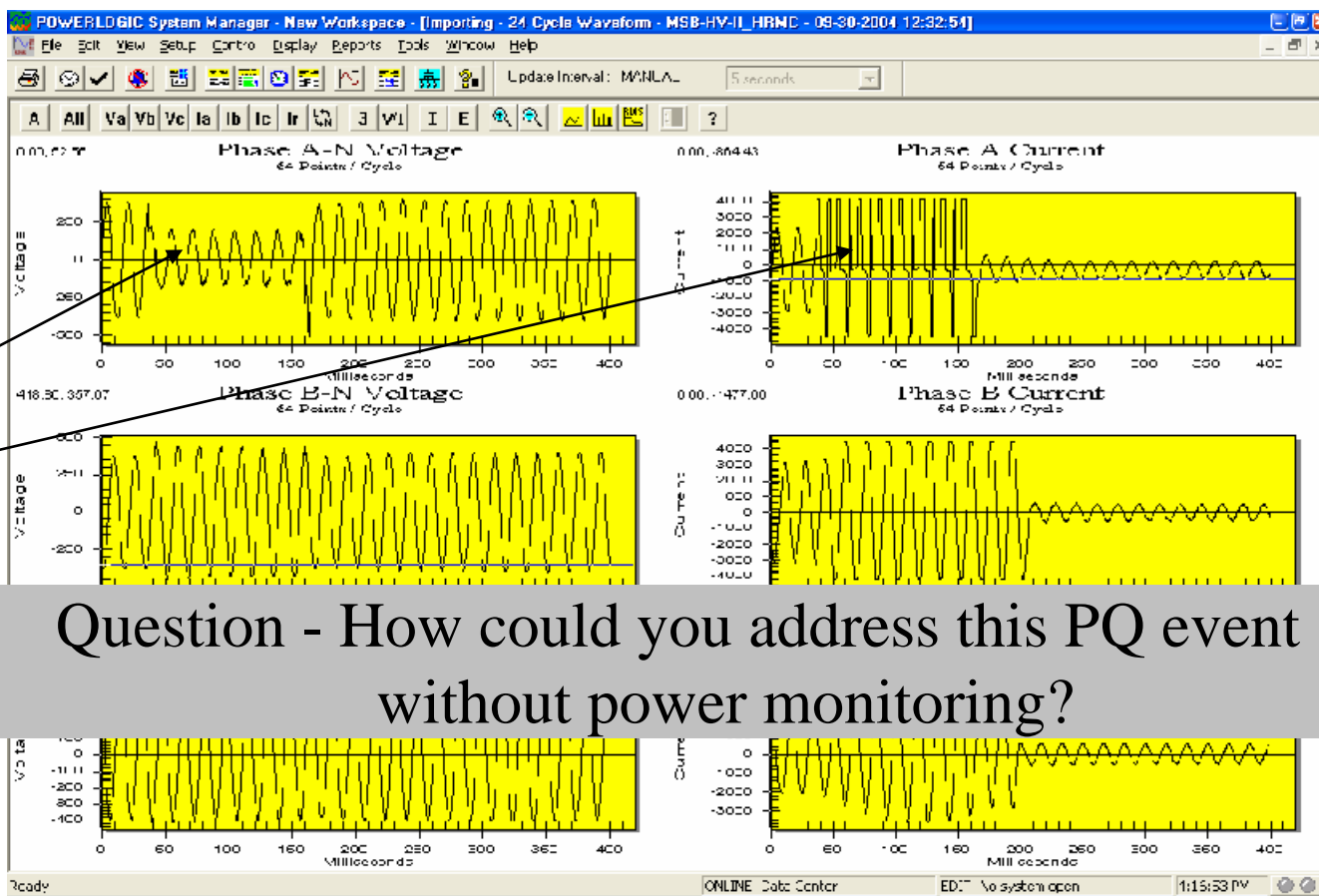
### **Circuit Utilization (Historical)**

# PMCS Software – Event Capture



Building  
a New Electric  
World

Identify  
Cause  
&  
Effect



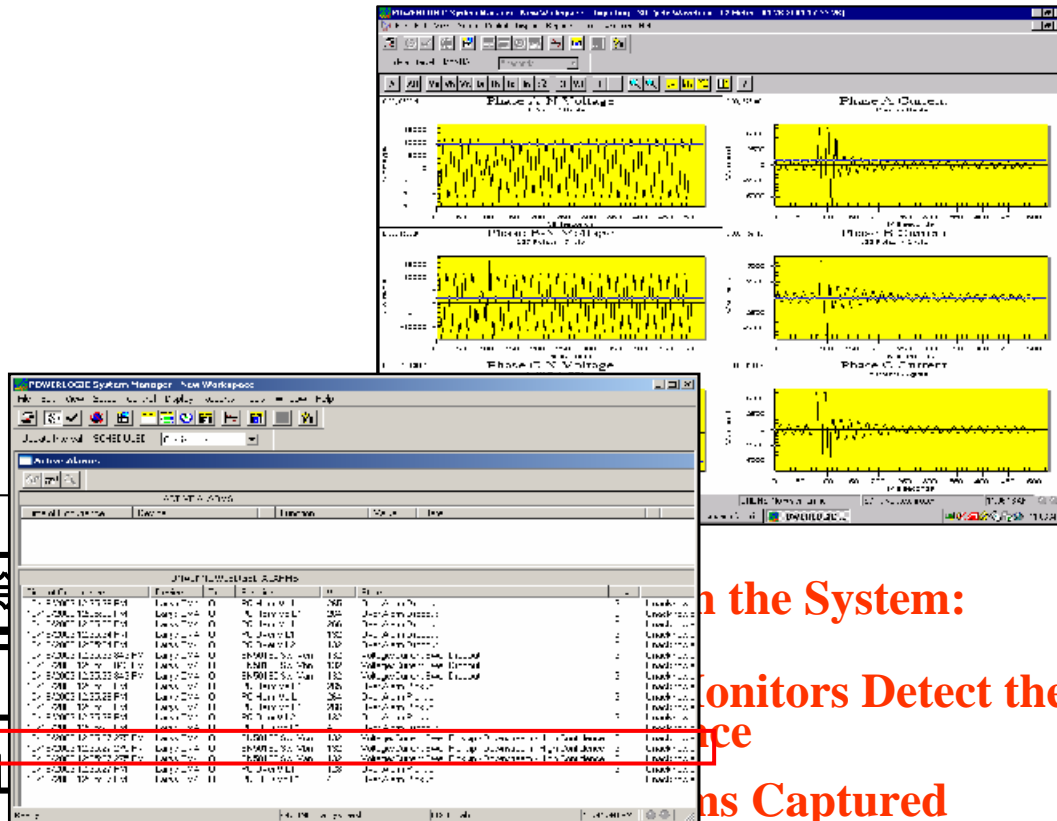
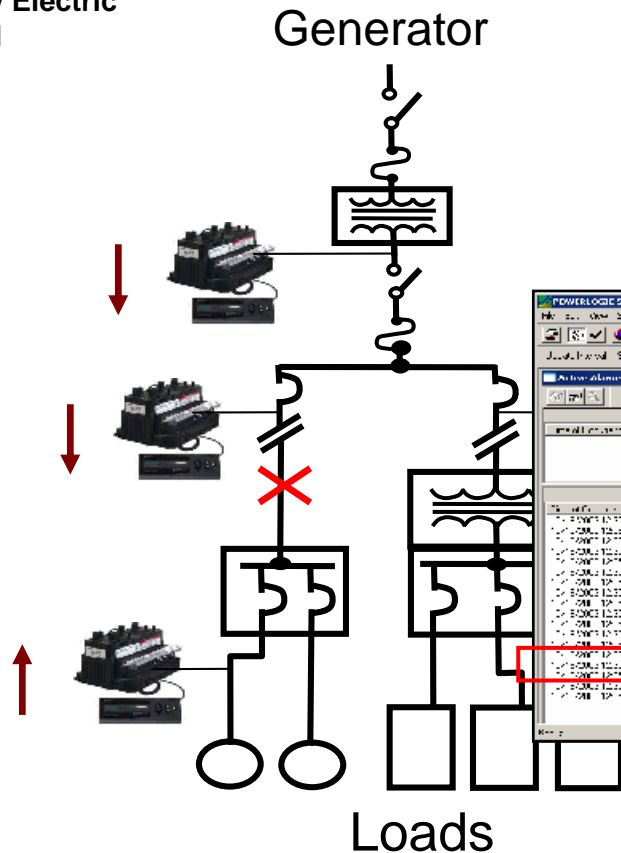
Question - How could you address this PQ event without power monitoring?

## Event Waveform Capture & Analysis

# PMCS Software - Disturbance Analysis



Building  
a New Electric  
World

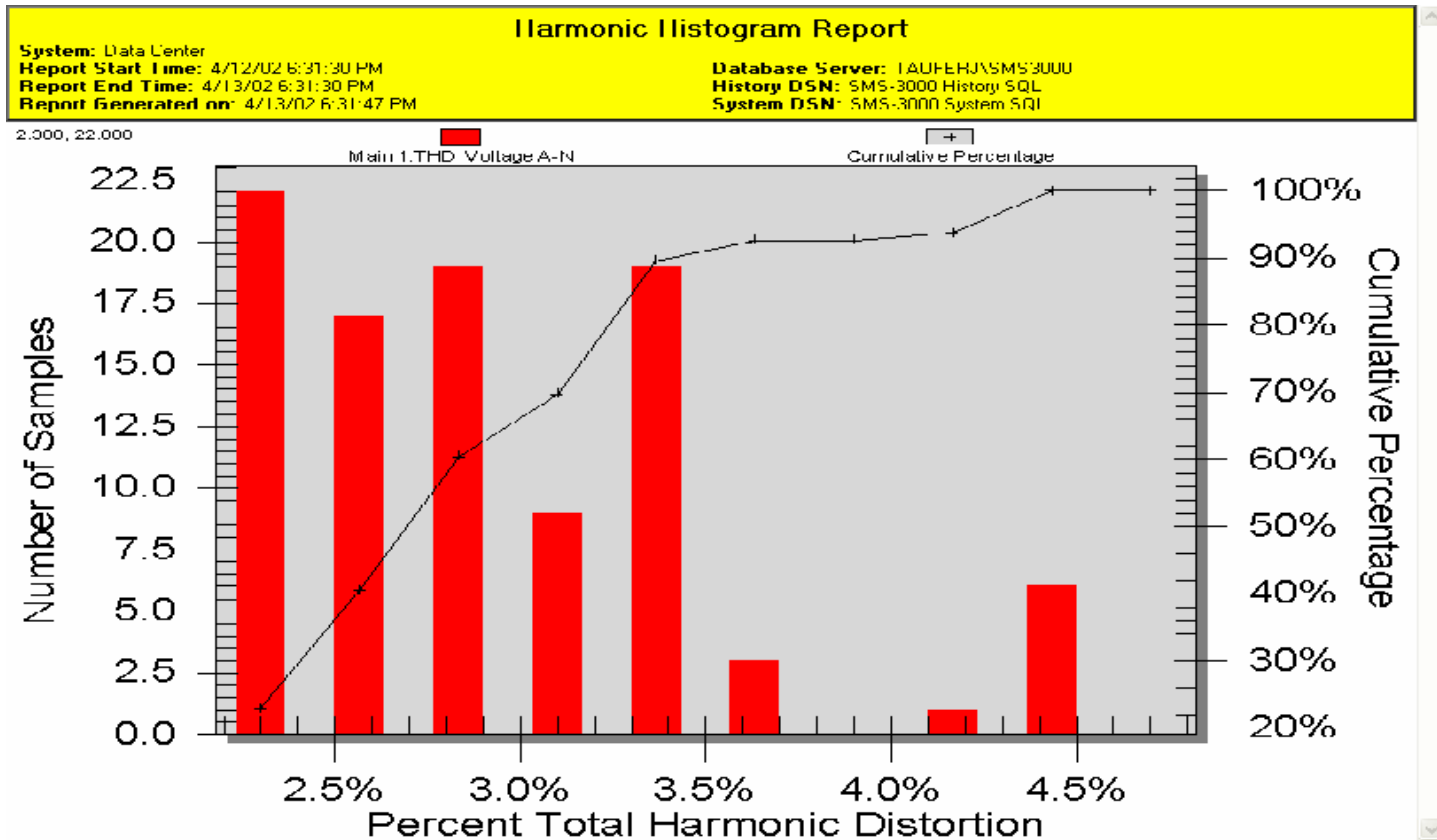


- in the System:  
Monitors Detect the  
Event  
as Captured
- Direction Identified
  - Event Documented



Building  
a New Electric  
World

## PMCS Software – Harmonic Analysis

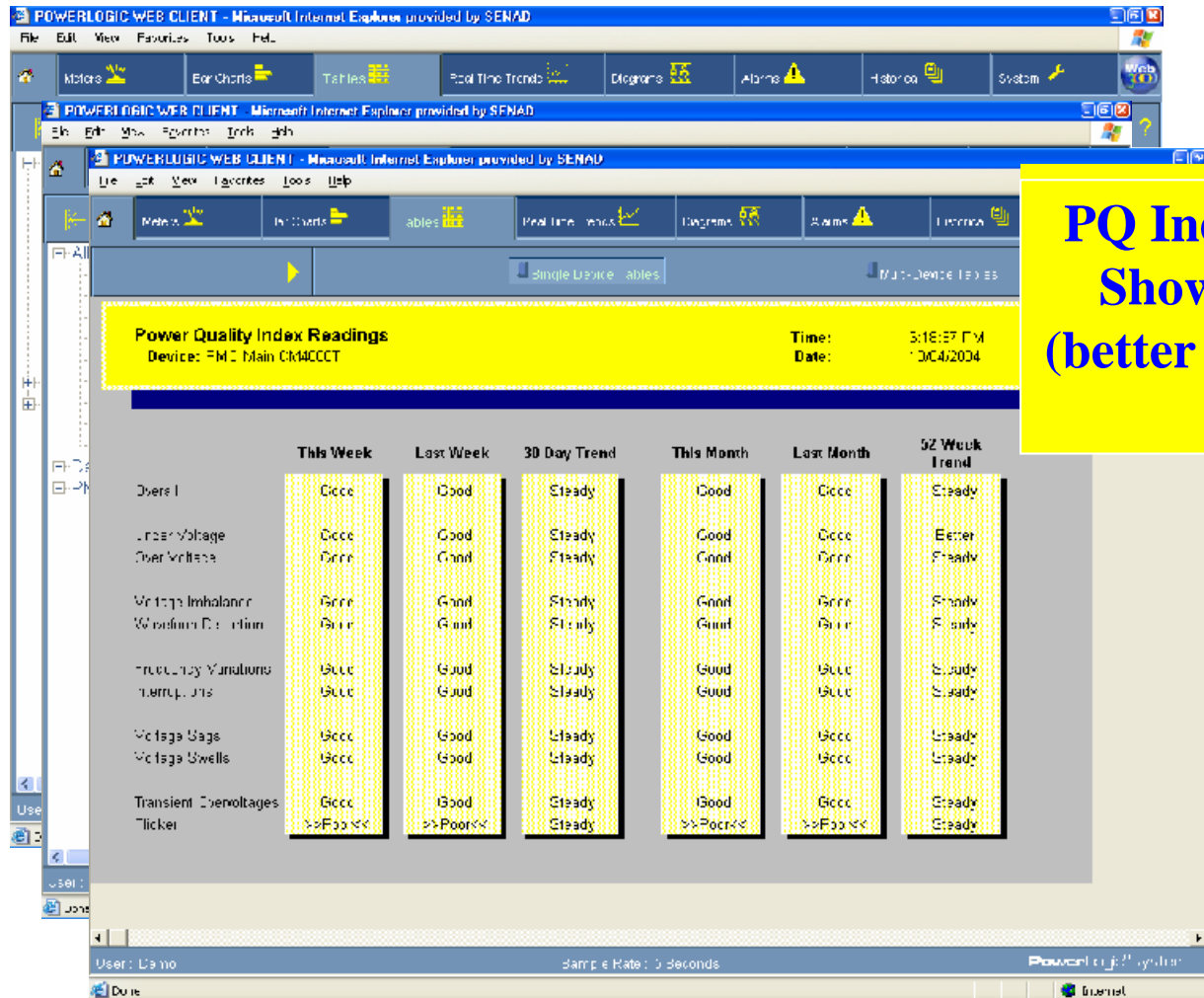


### Harmonic Histogram

# PMCS Software - Power Quality Analysis



Building  
a New Electric  
World



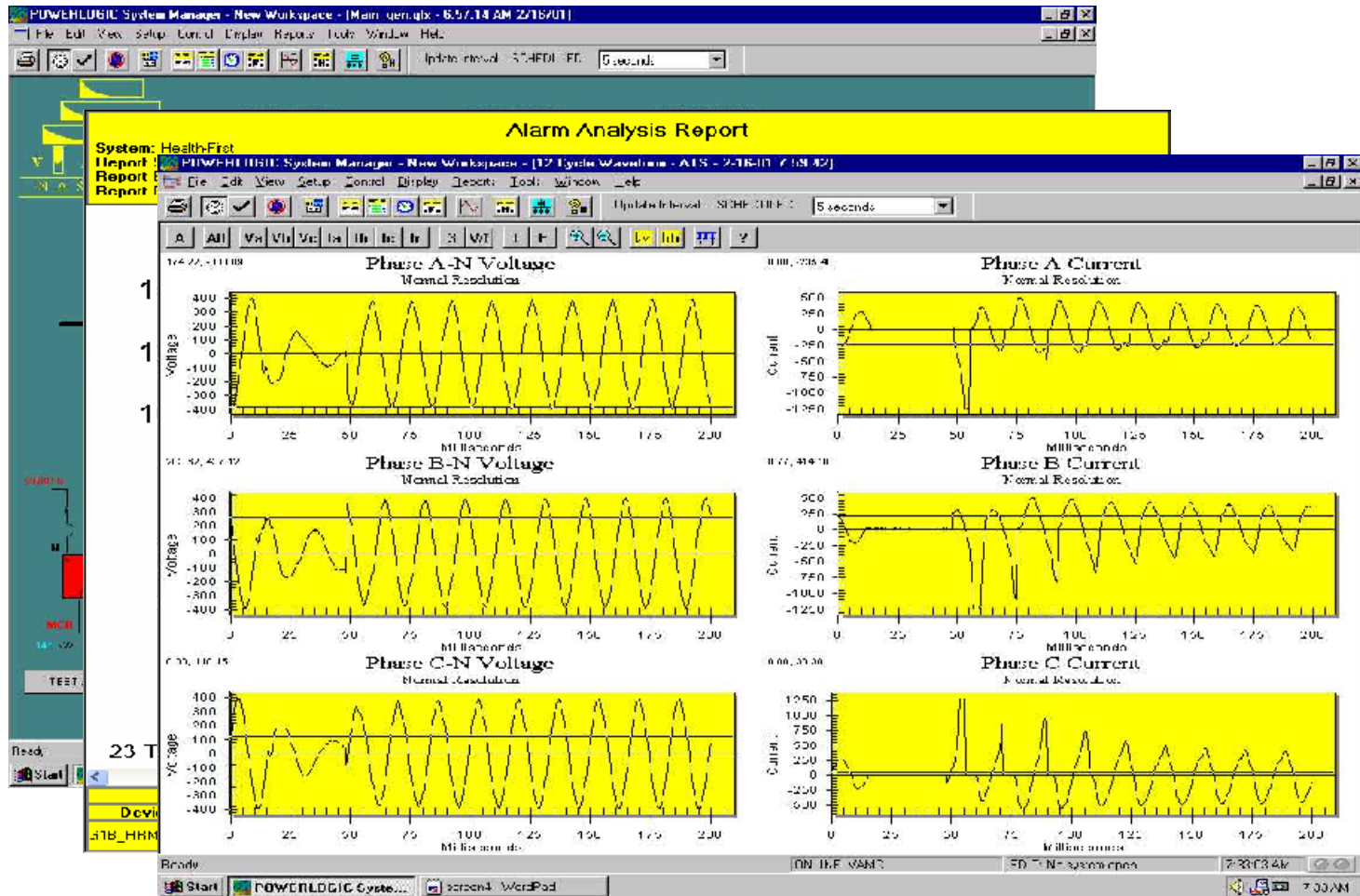
**PQ Index Summary Shows the Trend (better or worse) over time**



# PMCS Software – Emergency Power System Status



Building  
a New Electric  
World

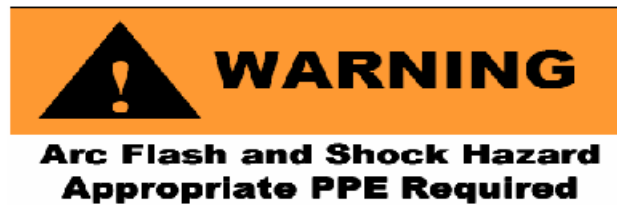


## ATS Transfer Waveforms

## Power Monitoring Systems – Safety Benefits



*Building*  
a New Electric  
World

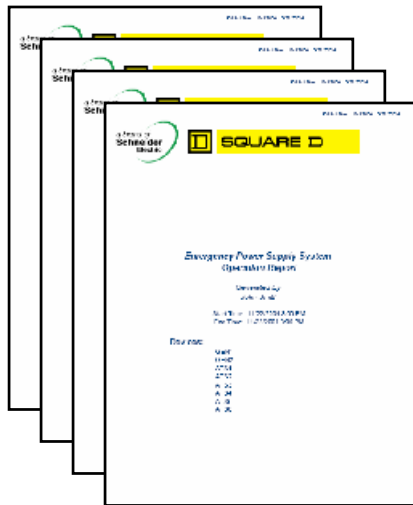


- Capture and analyze power events using permanently installed monitors
- Eliminate the need to open energized gear to take measurements and troubleshoot problems
- Provide the worker PPE requirements at equipment as monitoring system pages
- Improve overall facility safety by reducing the risk of electrical accidents



*Building*  
a New Electric  
World

## EPSS Reporting Module



- *U verify EPSS monthly tests or standby operation and generates a summary report*
- *Reports are printed out, viewed as web pages, and e-mailed to all effected parties for review and action.*
- *Uses information that is captured from the power monitoring system meters and stored in the software database.*
- *Compares EPS loading with nameplate to assure that kVA load remains above 30% for 30 minutes (minimum)*
- *Verify EPSS restoration time (10 seconds)*
- *Wizard driven user report interface to enter nameplate ratings, manually read data, & test observations – Monthly EPSS Testing Report is Published !*

# EPSS Reporting Module – Typical Report



Building  
a New Electric  
World

Printed Date: 12/1/2004 3:50:58PM

a brand of  
**Schneider**  
Electric

**SQUARE D**

*Emergency Power Supply System  
Operation Report*

Generated By  
*John Smith*

Start Time: 11/22/2004 3:00 PM  
End Time: 11/22/2004 8:00 PM

Devices:

- GEN1
- GEN2
- ATS1
- ATS2
- ATS3
- ATS4
- ATS6
- ATS8

**Technician Name**

**Test Time/Date**

**EPSS Equipment Involved**

Report Title Page



Building  
a New Electric  
World

# EPSS Reporting Module – Typical Report

Page 2 of 7

### Emergency Power Supply System Automatic Transfer Switches Summary

Transfer Time (< 10 seconds): PASS

Transfer Switch	To Emergency hr:mm:ss	Time In Emergency
ATS1	7	0:31:20
ATS2	8	0:31:9
ATS3	9	0:31:29
ATS4	7	0:31:20
ATS5	8	0:31:9
ATS6	9	0:31:29

Event Log:

TIME	MS	DEVICE NAME	STATUS
11/22/2004 3:44:12PM	462	GEN1	Start
11/22/2004 3:44:19PM	860	ATS1	Emergency
11/22/2004 3:44:20PM	790	ATS2	Emergency
11/22/2004 3:44:21PM	132	ATS3	Emergency
11/22/2004 4:15:29PM	961	ATS2	Normal
11/22/2004 4:15:39PM	345	ATS1	Normal
11/22/2004 4:15:50PM	879	ATS3	Normal
11/22/2004 4:45:01PM	930	GEN1	Stop
11/22/2004 5:44:12PM	462	GEN2	Start
11/22/2004 5:44:19PM	860	ATS4	Emergency
11/22/2004 5:44:20PM	790	ATS5	Emergency
11/22/2004 5:44:21PM	132	ATS6	Emergency
11/22/2004 7:15:29PM	961	ATS5	Normal
11/22/2004 7:15:39PM	345	ATS4	Normal
11/22/2004 7:15:50PM	879	ATS6	Normal
11/22/2004 7:45:01PM	930	GEN2	Stop

## ATS Information

- Transfer Time
- Time in Emergency

## EPSS Device Status Changes Time/Date Stamped

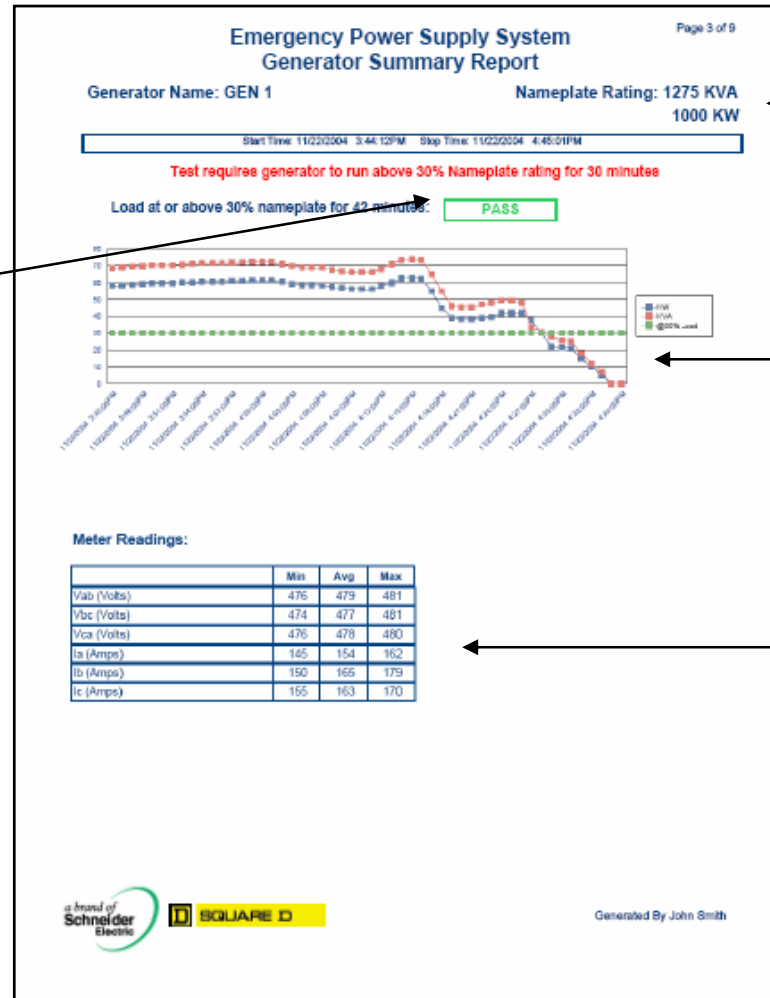
### Report Event Log



Building  
a New Electric  
World

# EPSS Reporting Module – Typical Report

Test Verification  
(Pass/Fail)



Gen Nameplate  
Rating

Trend of  
Generator KVA  
& KW vs 30%  
Nameplate

Min/Max/Ave Voltage  
& Current Readings  
During Test

Generator Trend/Profile

# EPSS Reporting Module – Typical Report



Building  
a New Electric  
World

Engine Readings are  
Recorded  
Automatically from  
the Engine  
Controller or  
Manually by the  
Operator



Emergency Power Supply System  
Generator Summary Report

Page 4 of 9

Generator Name: GEN 1      Nameplate Rating: 1275 KVA  
1000 KW

Engine Data:

ENGINE DATA (AUTOMATIC)		
Quantity	Sample Time	Sample
<b>Engine Hours</b>		
	11/22/2004 3:45 PM	143
	11/22/2004 4:00 PM	143
	11/22/2004 4:15 PM	144
	11/22/2004 4:30 PM	144
<b>Oil Pressure</b>		
	11/22/2004 3:45 PM	89 psi
	11/22/2004 4:00 PM	74 psi
	11/22/2004 4:15 PM	72 psi
	11/22/2004 4:30 PM	73 psi
<b>Water Temperature</b>		
	11/22/2004 3:45 PM	140 F
	11/22/2004 4:00 PM	179 F
	11/22/2004 4:15 PM	181 F
	11/22/2004 4:30 PM	181 F
<b>Battery Volts</b>		
	11/22/2004 3:45 PM	13.3 V
	11/22/2004 4:00 PM	13.2 V
	11/22/2004 4:15 PM	13.2 V
	11/22/2004 4:30 PM	13.3 V
<b>Battery Amps</b>		
	11/22/2004 3:45 PM	28 A
	11/22/2004 4:00 PM	39 A
	11/22/2004 4:15 PM	40 A
	11/22/2004 4:30 PM	40 A

  Generated By John Smith

Gen RTM  
Readings

Oil Pressure  
Readings

Water  
Temperature

Battery Charge  
Data

Engine Test Information







*Building*  
a **New Electric**  
**World**

## EPSS Reporting Module – Typical Report

**Emergency Power Supply System  
Generator Summary Report**

Page 9 of 9



Comments:

Gen 1  
Test Initiated at ATS-1 via TEST switch.  
All Panel Lamps tested – OK  
No Alarms  
All Switches Returned to AUTO  
Test completed

Gen 2  
Test Initiated at ATS-4 via TEST switch.  
All Panel Lamps tested – OK  
No Alarms  
All Switches Returned to AUTO  
Test completed

**Test observations, the ATS or  
breaker where the test was  
initiated, any repairs made,  
action items, etc. are...**

**Documented Here**

  Generated By (Technician Name)

**Operator's Comments**

# EPSS Reporting



*Building*  
a New Electric  
World

**Good**



**Power  
Monitoring  
System**

**Better**



**Power  
Monitoring  
System + EPSS  
Reporting**

**Best**



**Power Monitoring  
System + EPSS  
Reporting +  
Automated Testing**

## *EPSS Automated Testing*



*Building*  
a New Electric  
World

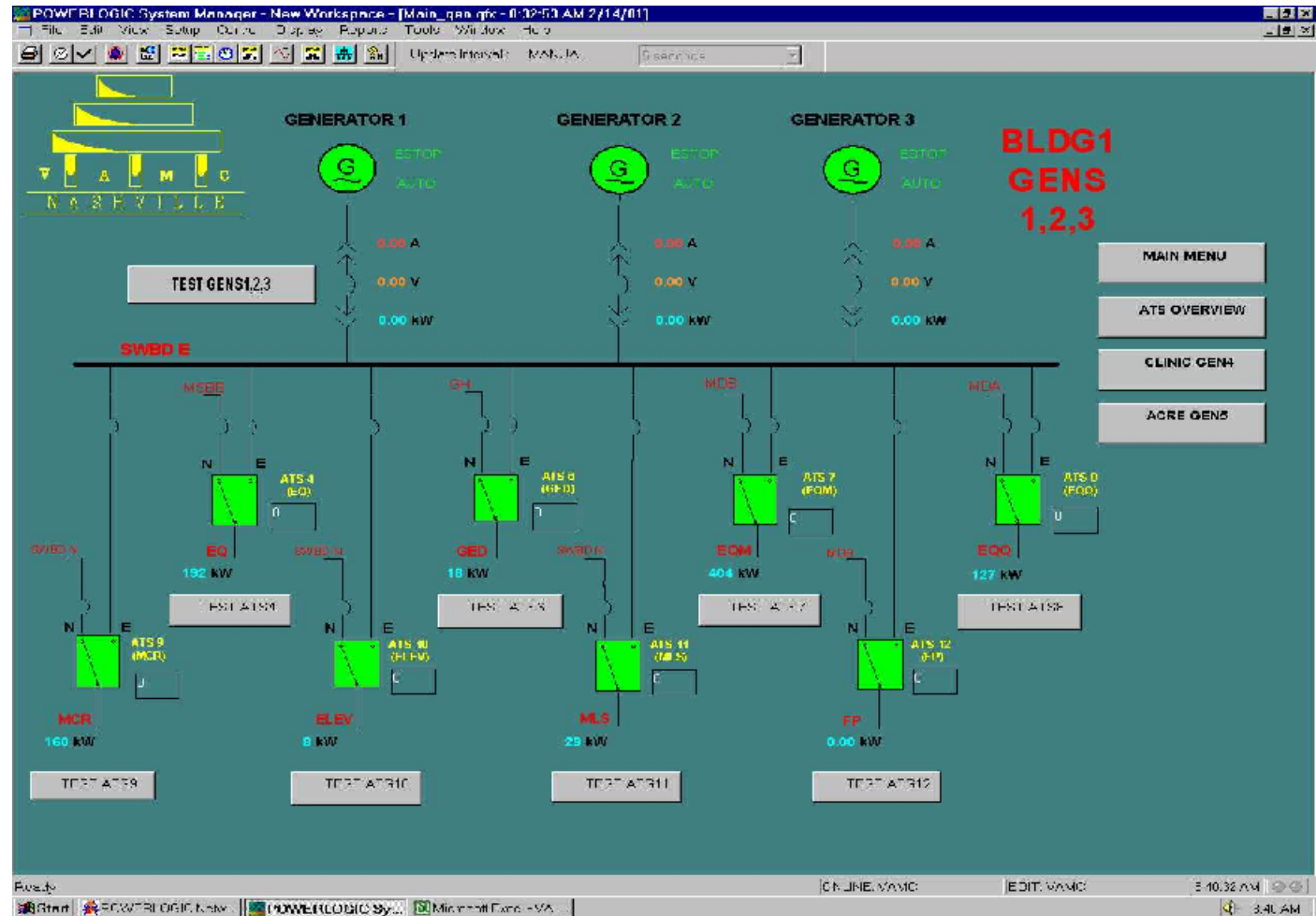


- ***Incorporates a industrial PLC to supervise and control EPSS testing***
- ***Includes interactive graphic screens to allow operators to remotely monitor and control the EPSS test***
- ***Testing can be initiated at ATS (test switch) or via remotely from the power monitoring PC***
- ***EPS load monitored and test time extended (if necessary) to assure compliance with NFPA110***
- ***Interfaces with Gen control & alarms via I/O or communications interface***
- ***Does not effect the EPS start contacts, paralleling controls, load-shedding, etc***



Building  
a New Electric  
World

# EPSS Automated Testing

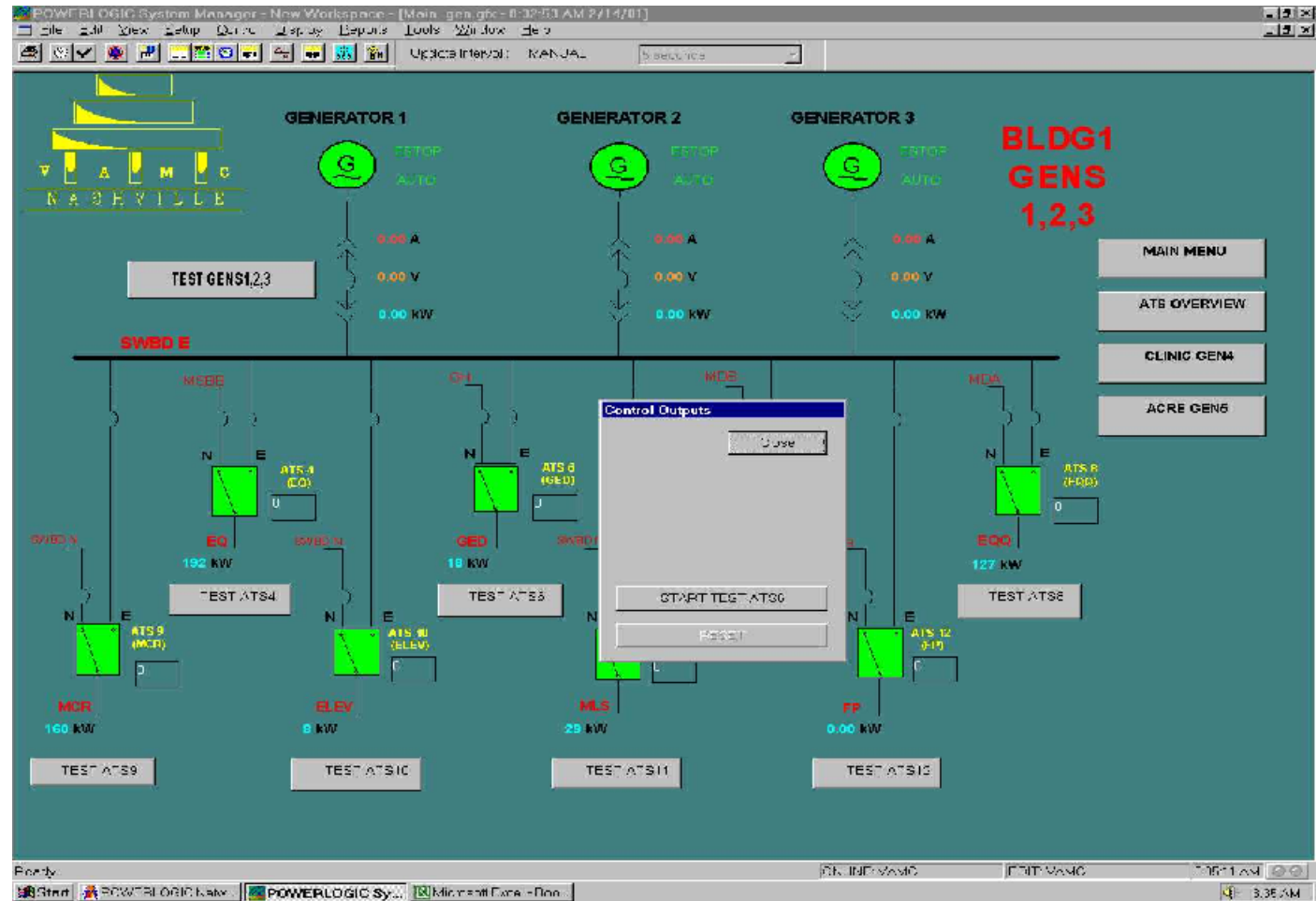


## Essential Power - Status Screen



Building  
a New Electric  
World

## EPSS Automated Testing

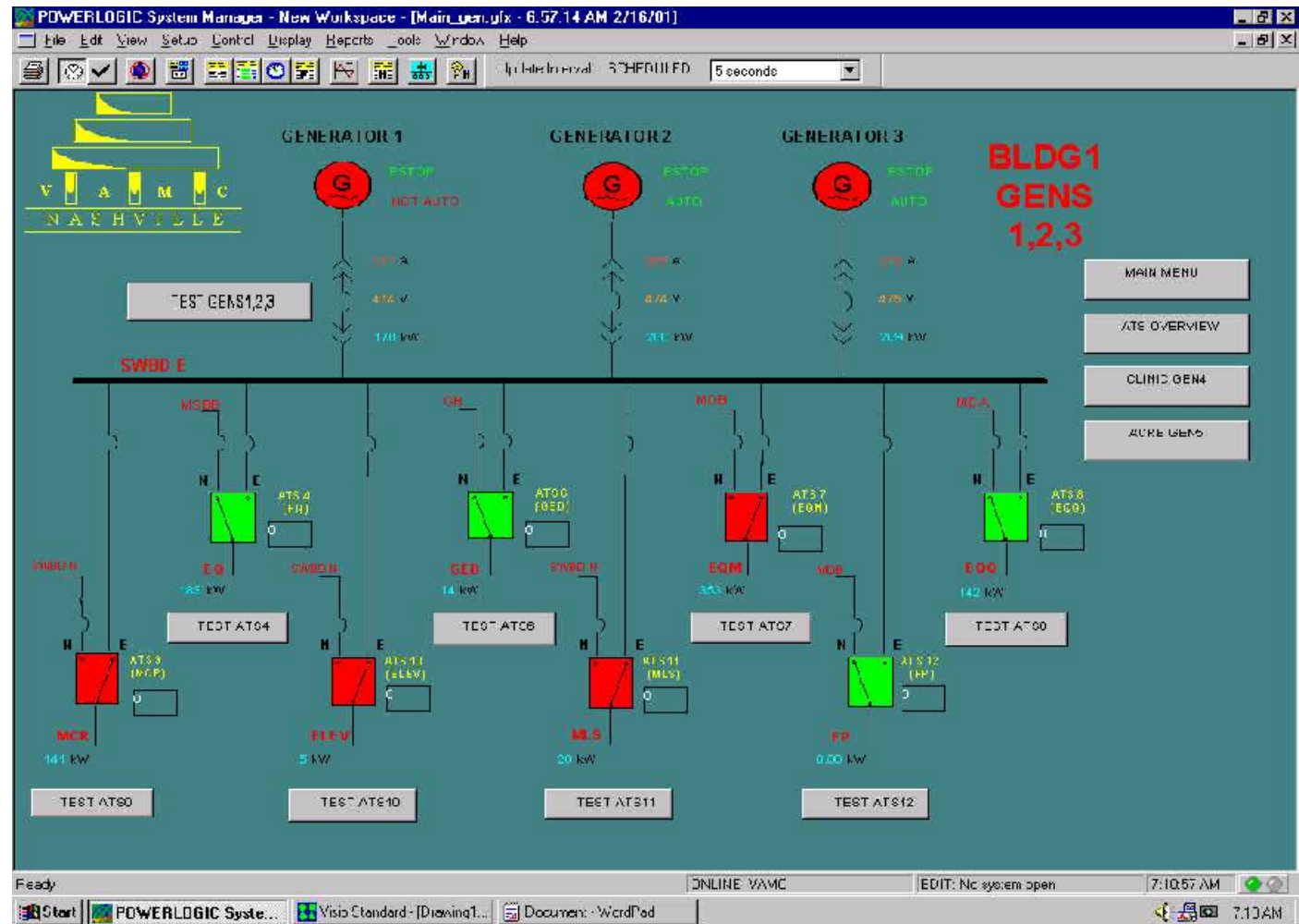


### EPS Test Initiated Remotely via ATS



Building  
a New Electric  
World

## EPSS Automated Testing



### Generators Started and Essential Load Transferred



Building  
a New Electric  
World

## EPSS Automated Testing

**POWERLOGIC System Manager - New Workspace**

Update Interval: SCHEDULED 5 seconds

Acric qon.qix 2/16/01 7:24:41 AM 2/16/01

**GENERATOR 5**

AUTO

TEST GEN5

ACRE GEN5

MAIN MENU

BLDG1 GEN5

**Active Alarms**

ACTIVE ALARMS						
Time of Occurrence	Device	Function	Value	State	Priority	
2/16/01 5:21:06 AM	ACRE_GEN5_PLC	D GEN5_ON_LOAD		GEN5_ON_LOAD	7	
2/16/01 5:21:02 AM	ACRE_GEN5_PLC	D ATS14_ELEV_EMERG		EMERGENCY	2	acknowledged
2/16/01 5:20:50 AM	ACRE_GEN5_PLC	D ATS15_FP_EMERG		EMERGENCY	2	acknowledged
2/16/01 5:20:40 AM	ACRE_GEN5_PLC	D ATS13_FP_EMERG		EMERGENCY	2	acknowledged
2/16/01 5:05:21 AM	MAIN_BLDG_PLC	D ATS10_ELEV_NORM		NORMAL	7	
2/16/01 5:01:10 AM	MAIN_BLDG_PLC	D ATS9_MCH_MURM		NORMAL	7	
2/16/01 5:00:36 AM	MAIN_BLDG_PLC	D ATS11_MLS_NORM		NORMAL	7	
2/16/01 5:00:26 AM	MAIN_BLDG_PLC	D ATS7_EOM_NORM		NORMAL	7	
2/16/01 4:48:25 AM	PLN1_GEN4_PLC	D ATS2_FC_NORM		NORMAL	7	
2/16/01 4:48:21 AM	MAIN_BLDG_PLC	D ATS4_CO_NORM		NORMAL	7	
2/16/01 4:48:33 AM	LLN1_GEN4_PLC	D ATS3_EUA_NORM		NORMAL	7	
2/16/01 4:38:33 AM	LLN1_GEN4_PLC	D ATS7_EA_NORM		NORMAL	7	
2/16/01 4:32:56 AM	MAIN_BLDG_PLC	D ATS8_EOC_NORM		NORMAL	7	
2/16/01 4:32:10 AM	MAIN_BLDG_PLC	D ATS12_FP_NORM		NORMAL	7	
2/16/01 4:31:32 AM	PLN1_GEN4_PLC	D ATS5_FP_NORM		NORMAL	7	
2/16/01 5:11:56 AM	MAIN_BLDG_PLC	D GEN3_STOP		STOPPED	7	
2/16/01 5:12:04 AM	MAIN_BLDG_PLC	D GEN2_STOP		STOPPED	7	
2/16/01 5:12:07 AM	MAIN_BLDG_PLC	D GEN1_STOP		STOPPED	7	
2/16/01 4:52:45 AM	CLN1_GEN4_PLC	D GEN4_STOP		STOPPED	7	
2/16/01 5:20:38 AM	ACRE_GEN5_PLC	D GEN5_RUN		GEN5 IS RUNNING	2	acknowledged
2/16/01 6:04:42 AM	MAIN_BLDG_PLC	D ATS6_FD_NORM		NORMAL	7	

Main Menu | Alarm Log

7:41:19 AM

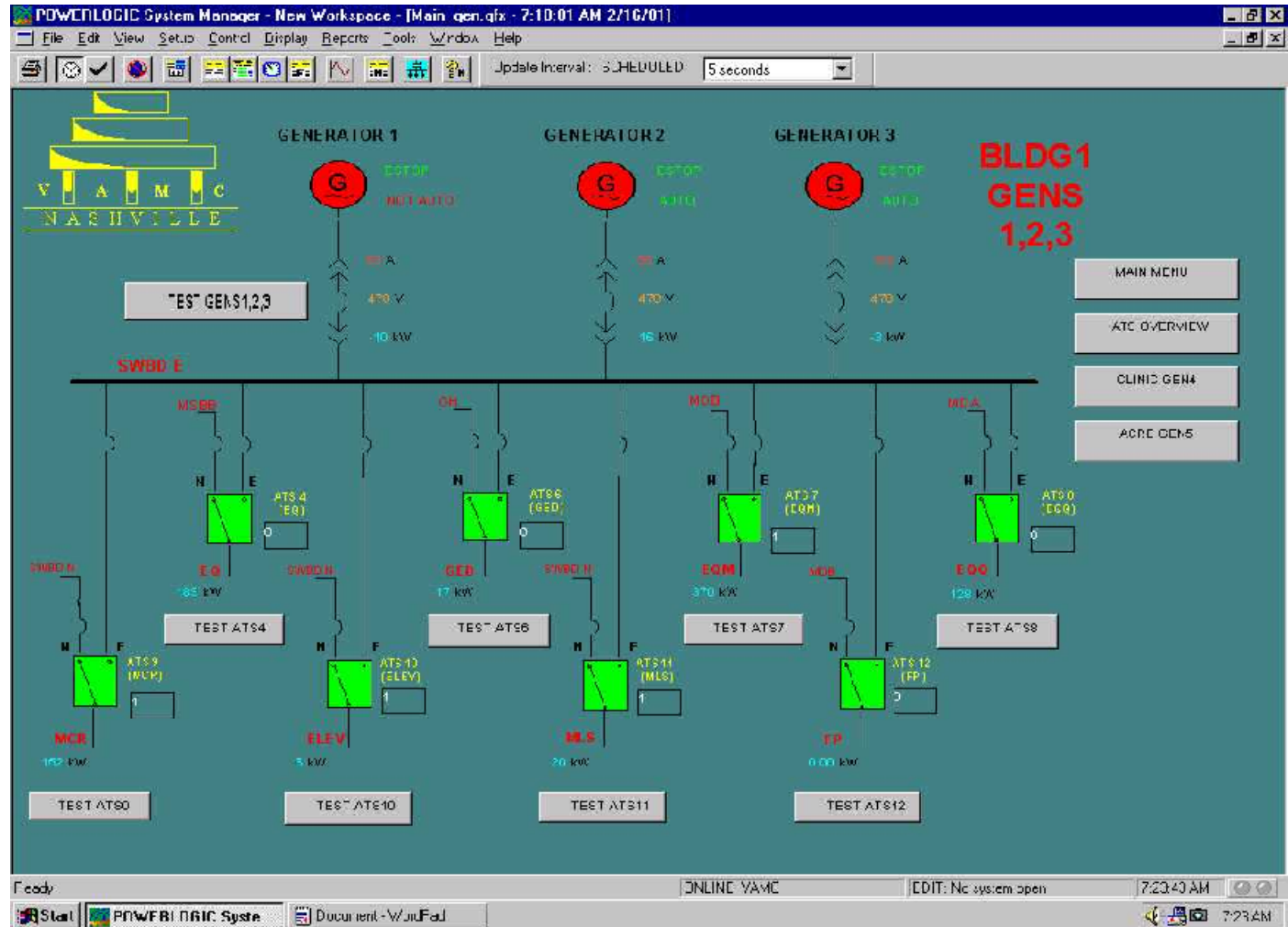
## Testing Monitored and Information Recorded System



Building  
a New Electric  
World

Upon Test  
Completion  
System  
Returns to  
the  
“Normal”  
Source and  
Generators  
Cool Down

# EPSS Automated Testing



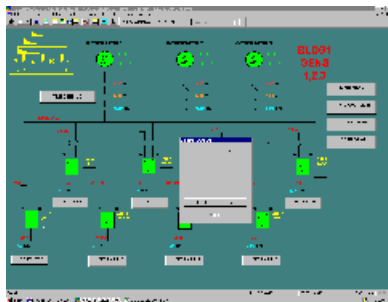
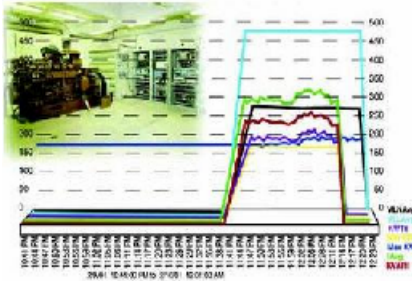




## System Considerations

*Building*  
a New Electric  
World

# Emergency Power Monitoring Solutions



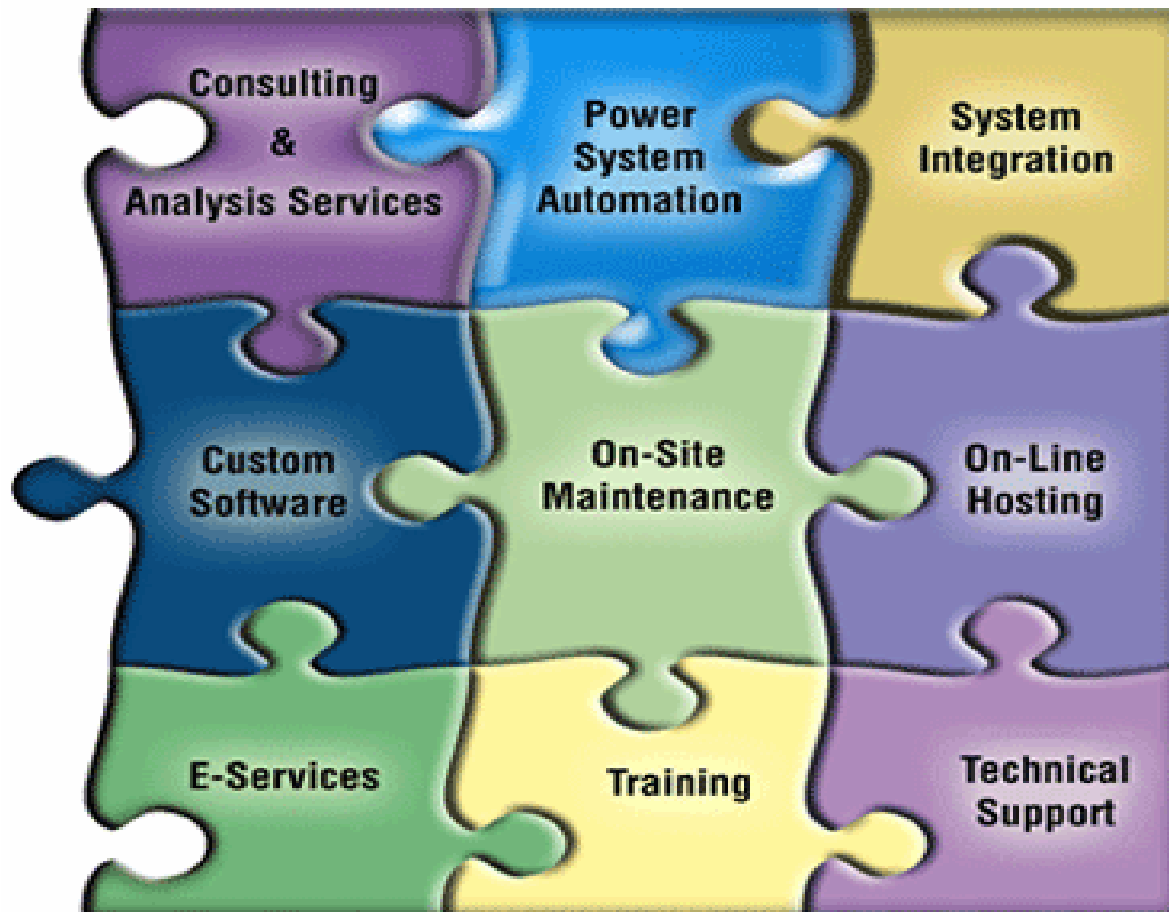
### System Criteria:

- *Provide JCAHO / AHJ test documentation*
- *Factory Installed or Retrofit into existing SWGR*
- *Separate Enclosed Equipment Available*
- *Integration to multiple Vendors (ATS, GENs)*
- *Real-Time + Historical Trending + Alarming*
- *Web Based Interfaces*

## Summary



*Building*  
a New Electric  
World





*Building*  
a **New Electric**  
**World**

## *EPSS Testing & Reporting*

# *Questions ?*