

Industrial<sup>IT</sup> EMS  
Power Management Module



**Power Management  
for the Oil & Gas,  
Petroleum and  
Chemical Industries**



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## Industrial<sup>IT</sup> EMS – Power Management Module

- \* Electrical Process
- \* System Configuration
- \* Power Management Functionality
- \* References
- \* Benefits



## Qualification Criteria for ABB Power Management

### Critical Loads

Limited In-plant Generation

Load Shedding

Insufficient Reliability of Public Grid

Several Generators

Power Control

Contracted Power Importation

Different Electrical Operational

Configurations possible

Mode Control

Complex Distribution Networks

“Local only” Control facilities

SCADA

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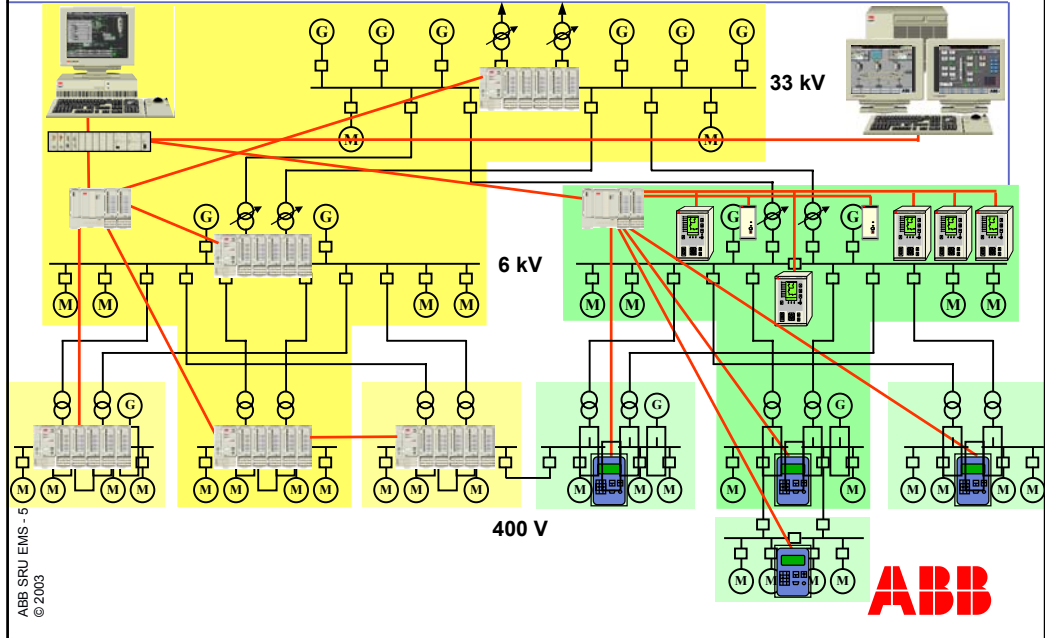
## Why ABB Power Management?

- Thorough understanding of the electrical process
- +15 years experience in implementing Power Management Systems in many projects (green- and brown-field plants)
- Standard software, well documented, tested, proven technology
- Fast Response Time for Load Shedding, Mode Control, Power Control, Re-acceleration
- High Resolution and Accuracy of Sequence of Event recording
- Solution complies with class 3 EMC immunity
- Single responsibility: One supplier for Power Management System integrated with Protection, Governor, Excitation, Tap Changer, Motor Control Centre, Variable Speed Drive, etc.

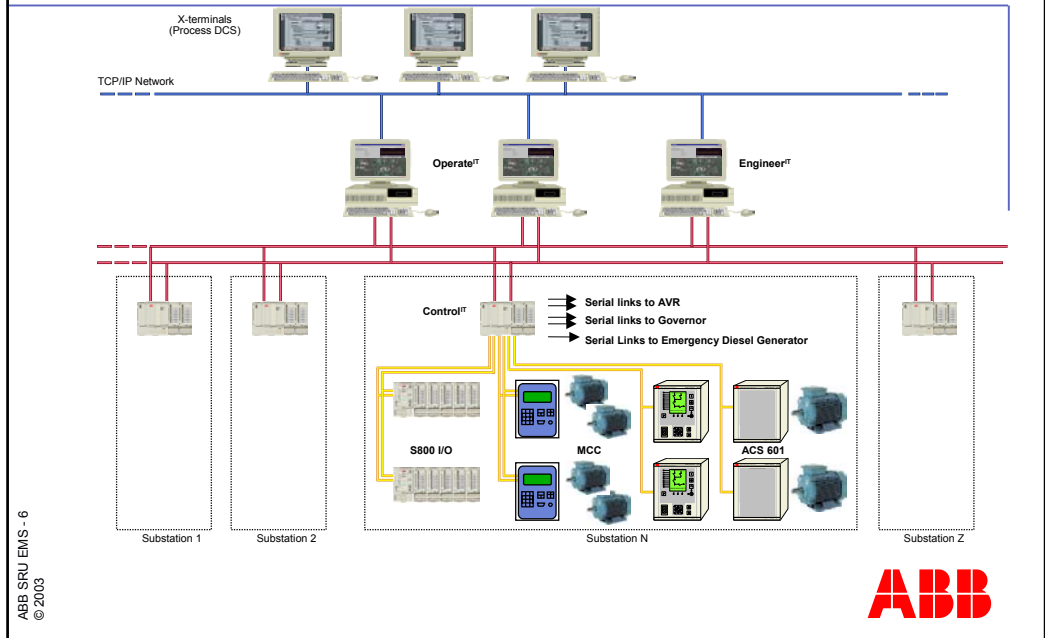
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# Typical Electrical Network of Industries



# Industrial<sup>IT</sup> EMS Power Management Overview



## Power Management Functionality

- Load Shedding
- Active and Reactive Power Control
- Mode Control
- Supervision, Control and Data Acquisition (SCADA)
- Re-Acceleration / Re-Starting
- Synchronisation

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## Load Shedding: the Types

- Fast Load Shedding on Loss of Power Resources
- Load Shedding on Frequency Drop
- Slow Load Shedding on Overload
- Slow Load Shedding for Peak Shaving
- Manual Load Shedding

## Load Shedding: Keywords

- Fast
- Exact
- Flexible
- Coordinated
- Deterministic
- Security and Reliability
- Accurate Event Logging
- Operator Guidance
- Independent Back-up System

# Load Shedding Example Displays

1. Load Shedding Control
2. Load Shedding Islands
3. Load Shedding Overview

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1997-09-19 10:15  
S22B1A10 S22B1A10 FDR K2411AB PosErr 10:15:08  
Elec. Ovr: EGAT Elec. Ovr: PEA  
Syn Ovr LS Ovr Gen Ovr Tr. Ovr

LSG\_S12C2 Loadshedding Control

LOADSHED GROUP:	LOAD (kW)	PRIORITY		STATUS	Underfrequency (Hz)						ACCEPT	RESET
		REQ.	ACT.		1	2	3	4	5	6		
					48.3	48.0	47.8	47.6	47.4	47.2		

TOC\_2

LSGz	LOAD (kW)	REQ.	ACT.	STATUS	1	2	3	4	5	6	Notes
LSGz 1	500	2	2	SHED	■	■	■	■	■	■	P1151AB/P1155AB/P1156
LSGz 2	200	19	20	INHIBIT	■	■	■	■	■	■	P1203/P1204
LSGz 3	0	3	3	NORMAL	■	■	■	■	■	■	P1301AB/K1304/K1305
LSGz 4	0	0	0	NORMAL	■	■	■	■	■	■	SPARE
LSGz 5	820	4	4	NORMAL	■	■	■	■	■	■	C2/C2-B All Connected Loads
LSGz 6	165	13	13	NORMAL	■	■	■	■	■	■	TC/TC-B All Connected Loads
LSGz 7	0	5	5	NORMAL	■	■	■	■	■	■	PH3-A/PH3-B All Connected Loads

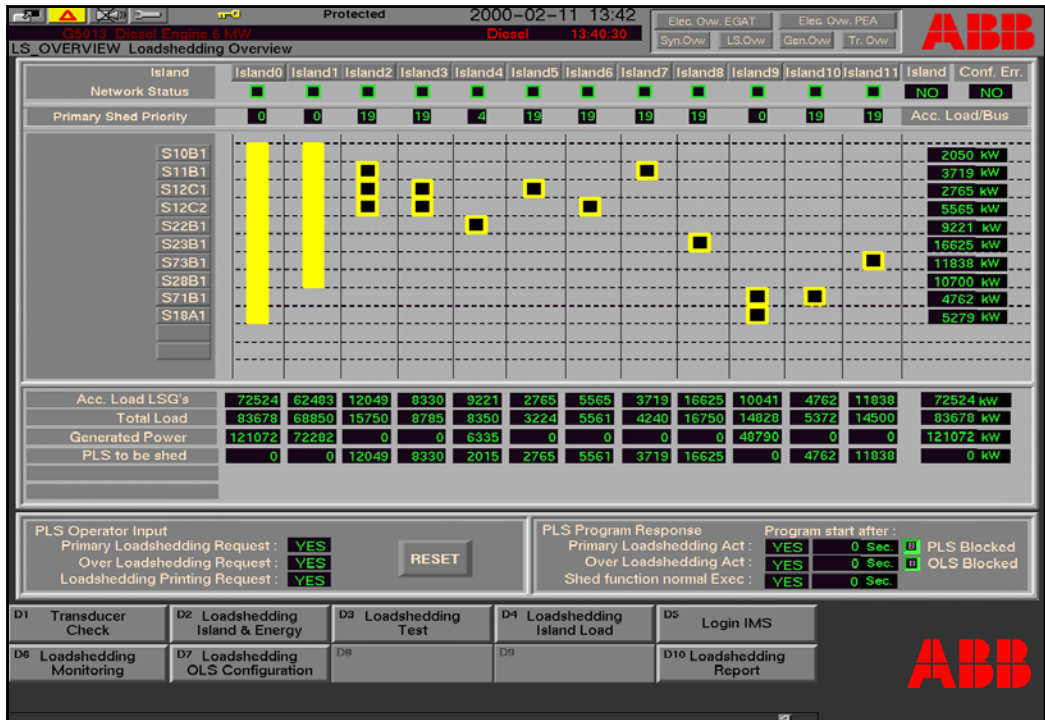
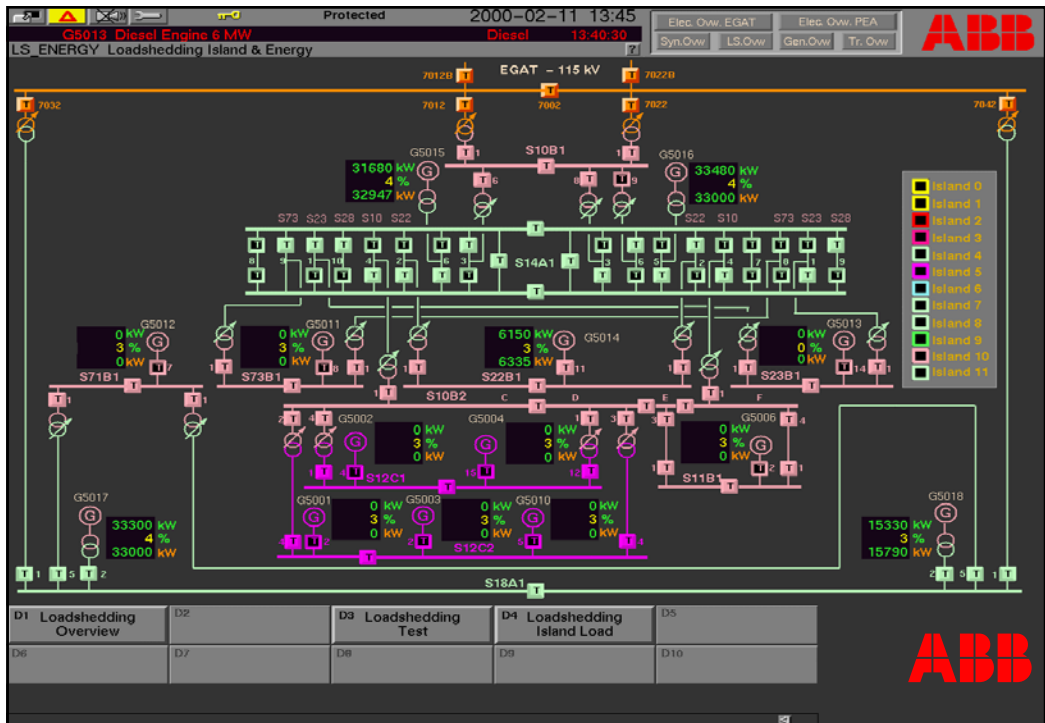
OFFSITES/OIL MOVEMENT

LSGO	LOAD (kW)	REQ.	ACT.	STATUS	1	2	3	4	5	6	Notes
LSGO 3	570	1	1	SHED	■	■	■	■	■	■	Y1 All Connected Loads
LSGO 4	820	1	1	SHED	■	■	■	■	■	■	A All Connected Loads

UTILITIES

LSGU	LOAD (kW)	REQ.	ACT.	STATUS	1	2	3	4	5	6	Notes
LSGU 6	35	1	1	SHED	■	■	■	■	■	■	UV6 All Connected Loads

D1 Loadshedding Overview D2 D3 D4 D5 Loadshedding Table  
D6 D7 D8 D9 D10



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# Display Generator Capability Diagram

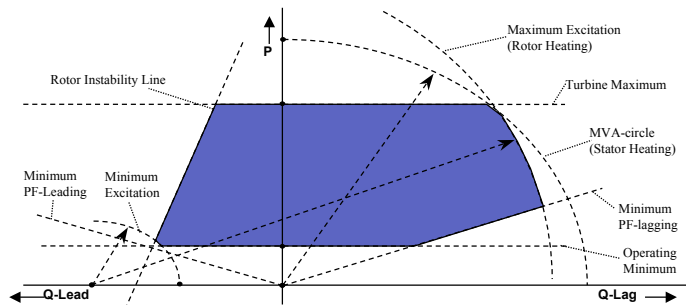


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## Active and Reactive Power Control

### ■ Active Power Sharing:

- Efficient Power Generation
- Power Exchange Optimization (Power Demand Control)
- Avoid Component Overloading
- Spinning Reserve Optimization
- Standby Optimization

### ■ Reactive Power Sharing:

- Achieve Stable Operation
- Power Factor Optimization

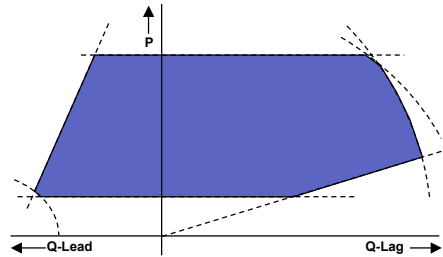


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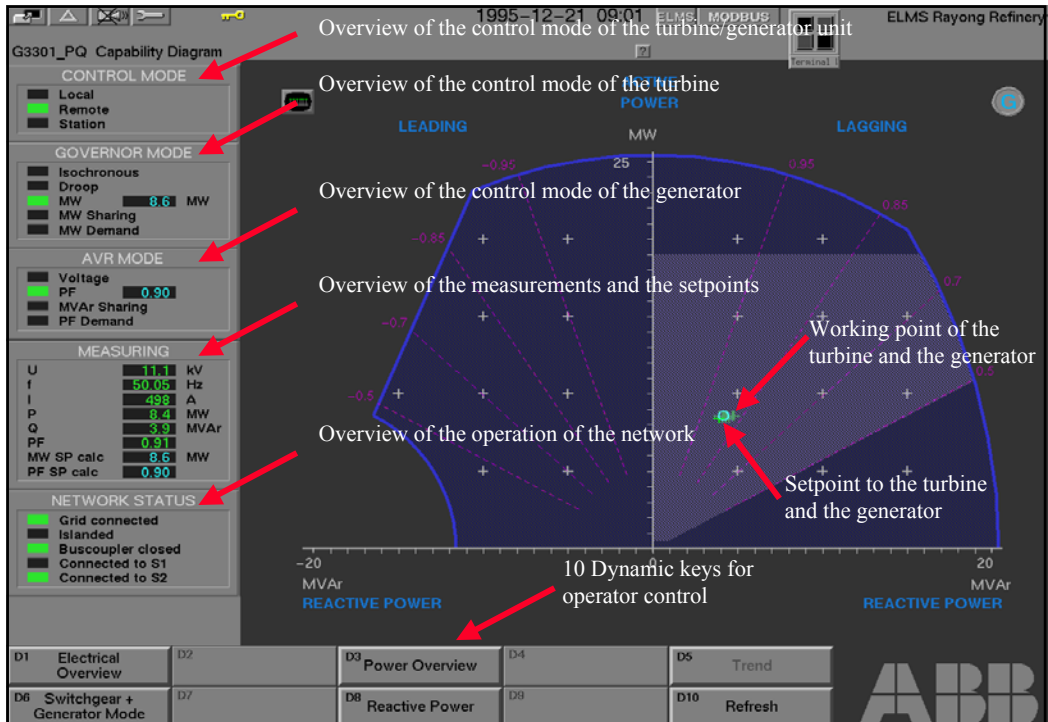
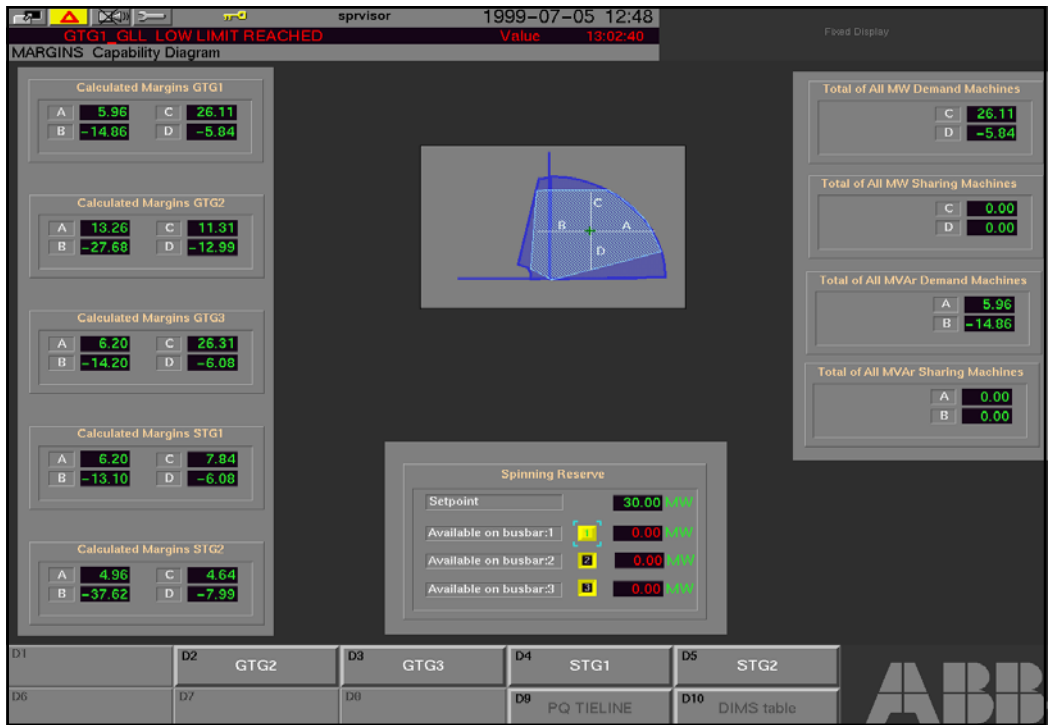
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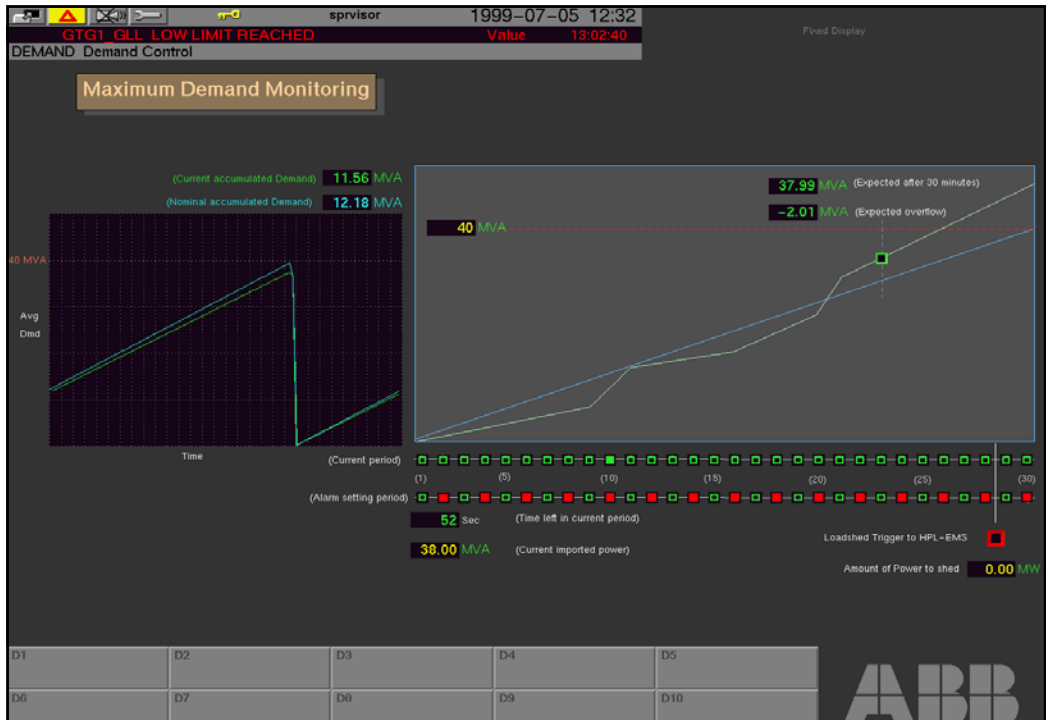
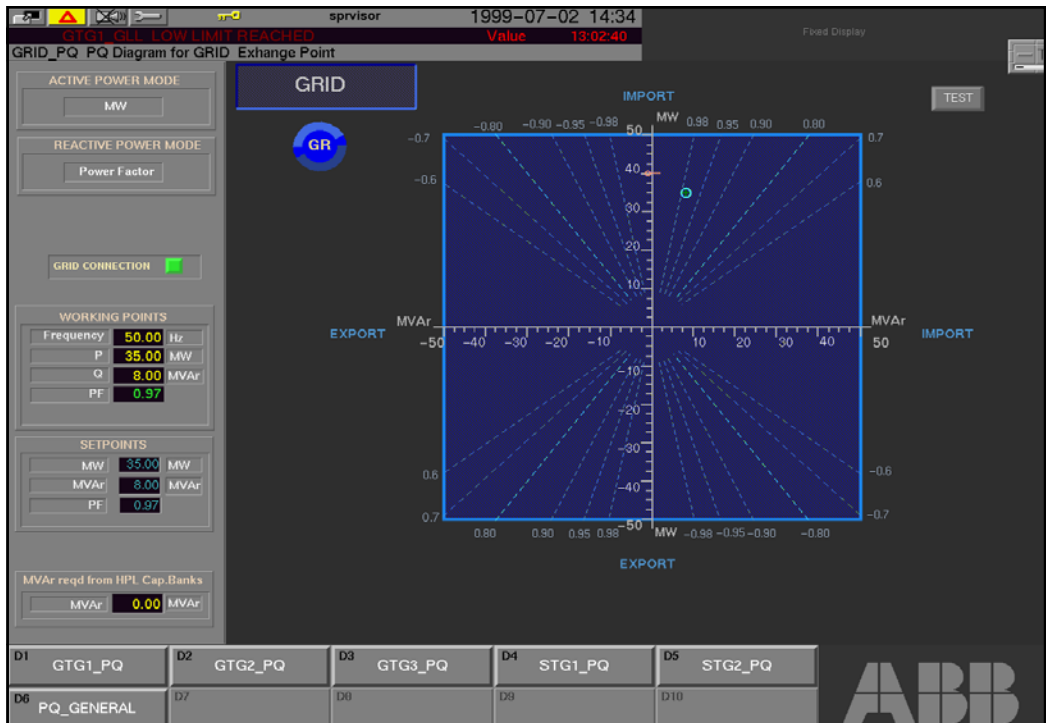
## Power Control Example Displays

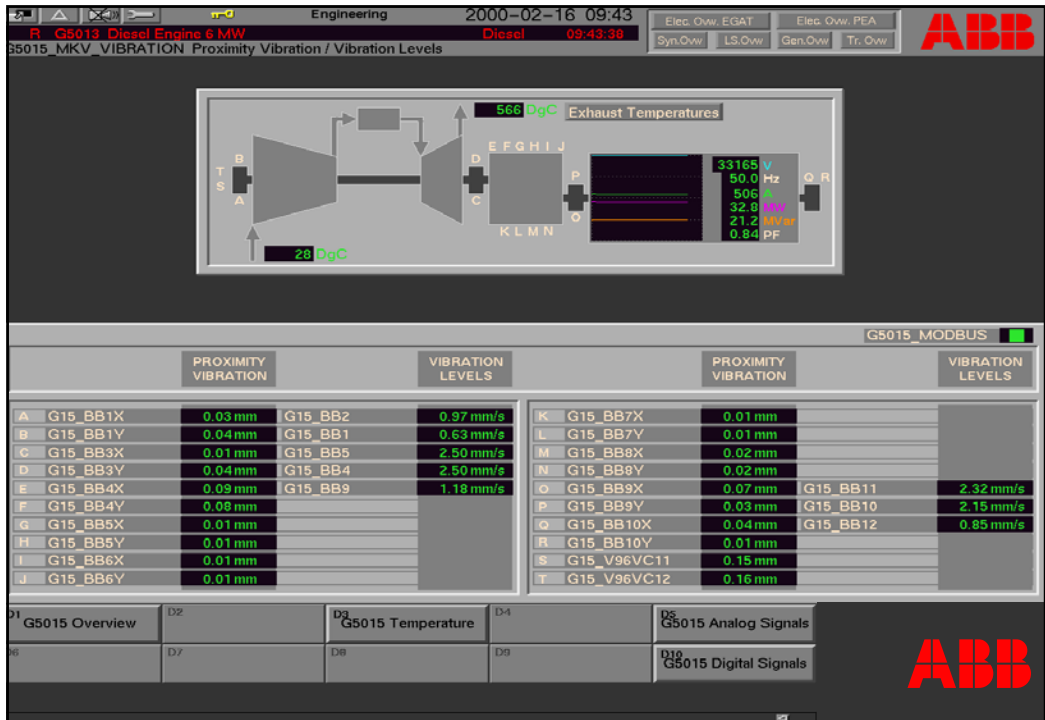
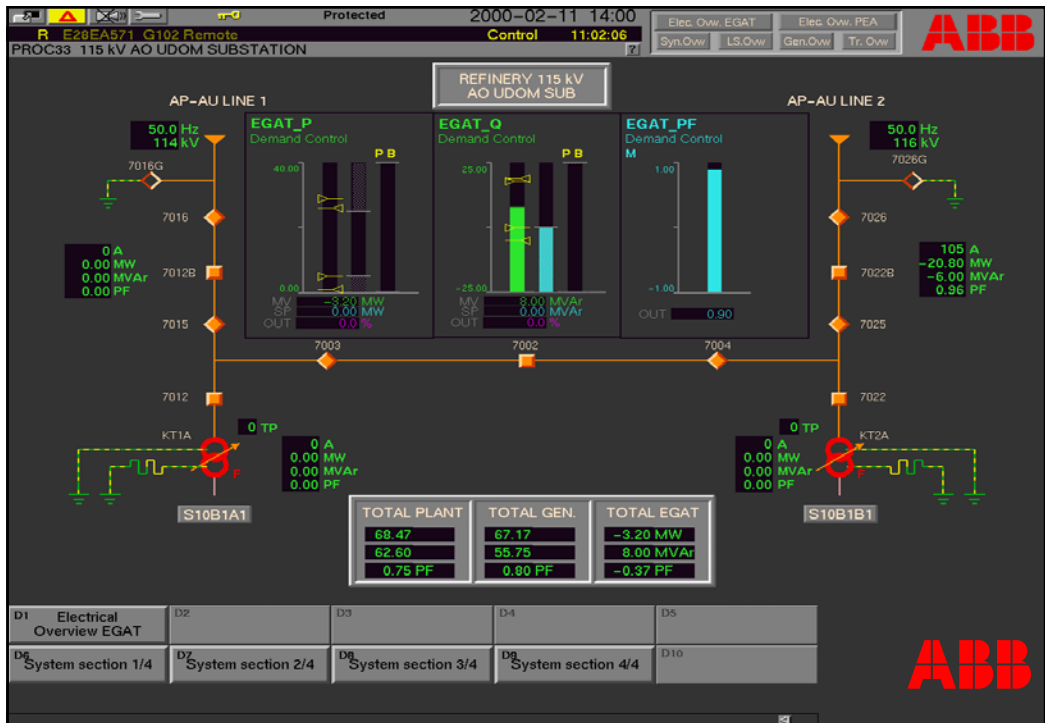
1. Calculated Control Margins
2. Generator Capability Diagram
3. Grid Capability Diagram
4. Maximum Demand Monitoring
5. Tie-line Monitoring
6. Mark V Vibration
7. Mark V Gas Turbine Generator Overview

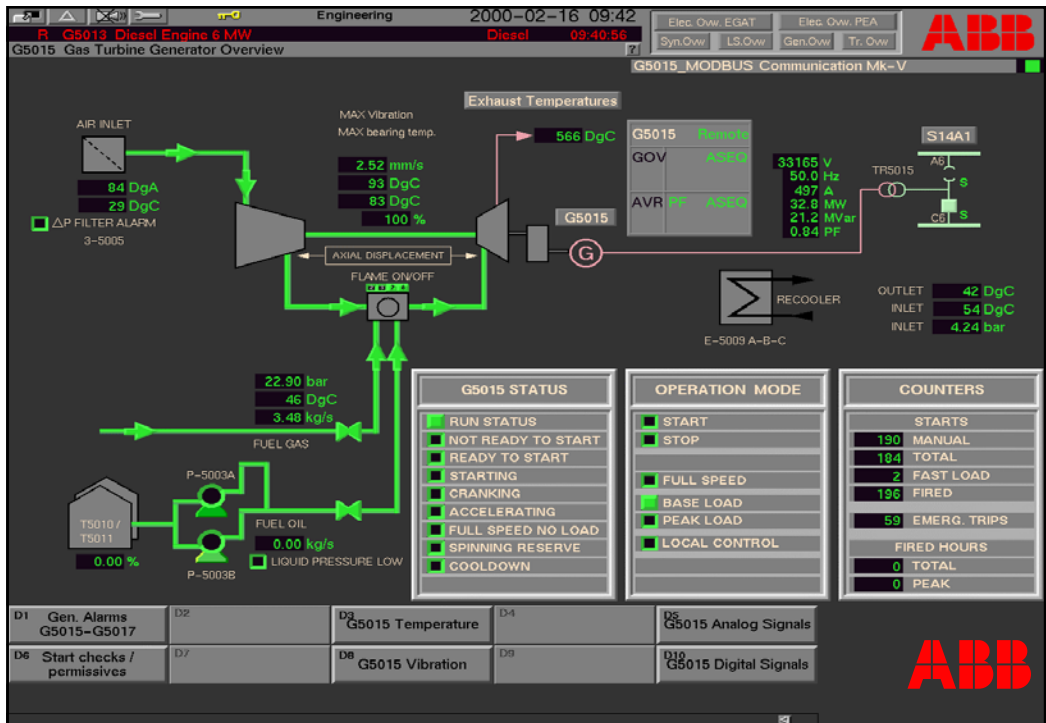
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## Power Management Functionality

- Load Shedding
- Active and Reactive Power Control
- **Mode Control**
- Supervision, Control and Data Acquisition (SCADA)
- Re-Acceleration / Re-Starting
- Synchronisation

## Mode Control

- for Generators
- for Turbines
- for Transformers
- for Switchboards



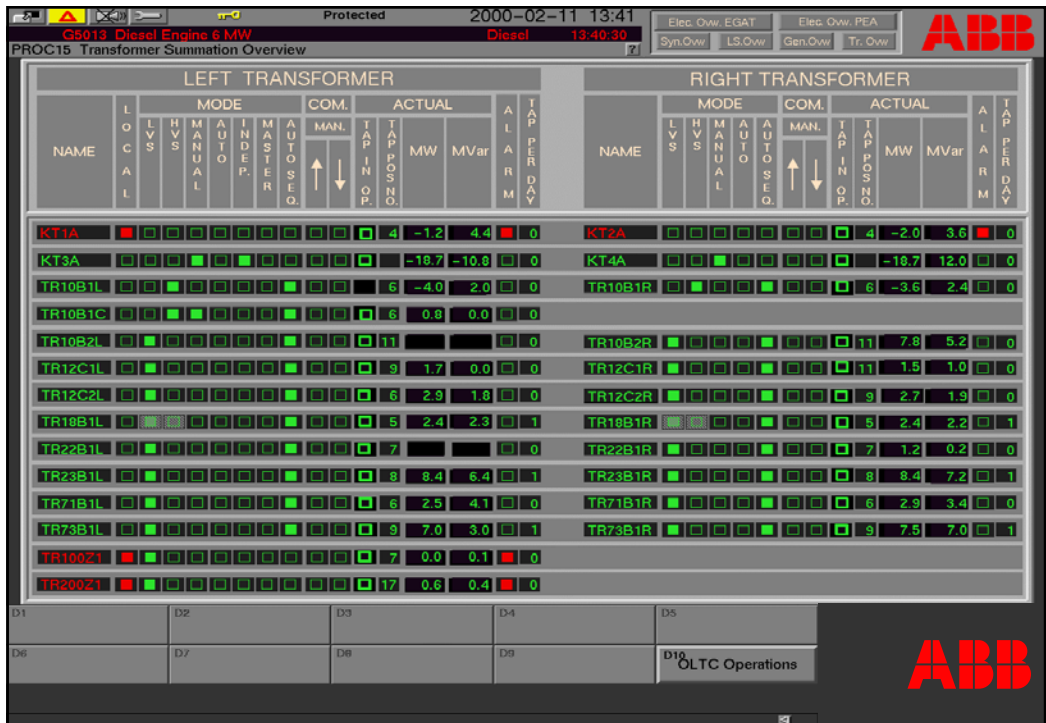
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## Mode Control Example Display

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- **Supervision, Control and Data Acquisition (SCADA)**
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## Supervision, Control and Data Acquisition

- Clearly Structured Presentation
- Controls - Select Before Execute
- Status Indications
- Consistency Analysis
- Time Tagged Events (1 ms resolution)
- Alarm Handling, Reports, Trends
- Supervision and Self Diagnostics
- Single Window concept

## Integration with Supervisory Systems

- Plant Information Systems - MIS
- Regional Dispatch Centres
- Power Generation Coordination Centres
- Energy Trading
- Utility Management Systems
- Process DCS



## Integration with Subordinated systems

- Satellite Time Receiver (GPS)
- Alarm Annunciators
- SF-6 Density Monitoring Units
- Motor Control Centres
- Battery Chargers
- Meteorological Stations
- Diesel Generators
- Generator- and Turbine controller
- Protection and Control Units

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## Integrated Protection & Control Units

- Protection
- Measuring of U,I,E,  
calculation of P & Q
- Monitoring & Control
- Interlockings
- Alarm Annunciation
- Event Time Tagging
- Disturbance Recording
- Local Storage of trip-events
- Serial Communication to Power Management System

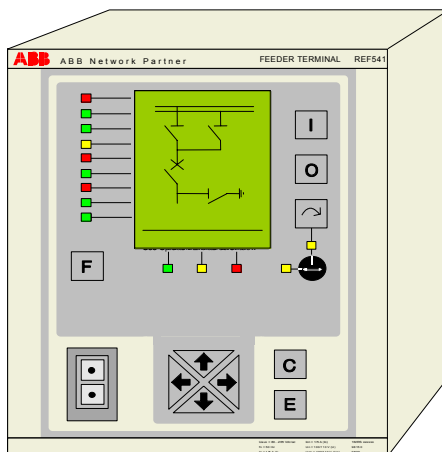


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- Synchronisation

## Re-Starting

- Triggered by Load Shedding or Undervoltage
- Individual Motors
- Priority per Motor
- Max. allowed Time Delay per Motor
- Network Configuration Check
- Network Restoration

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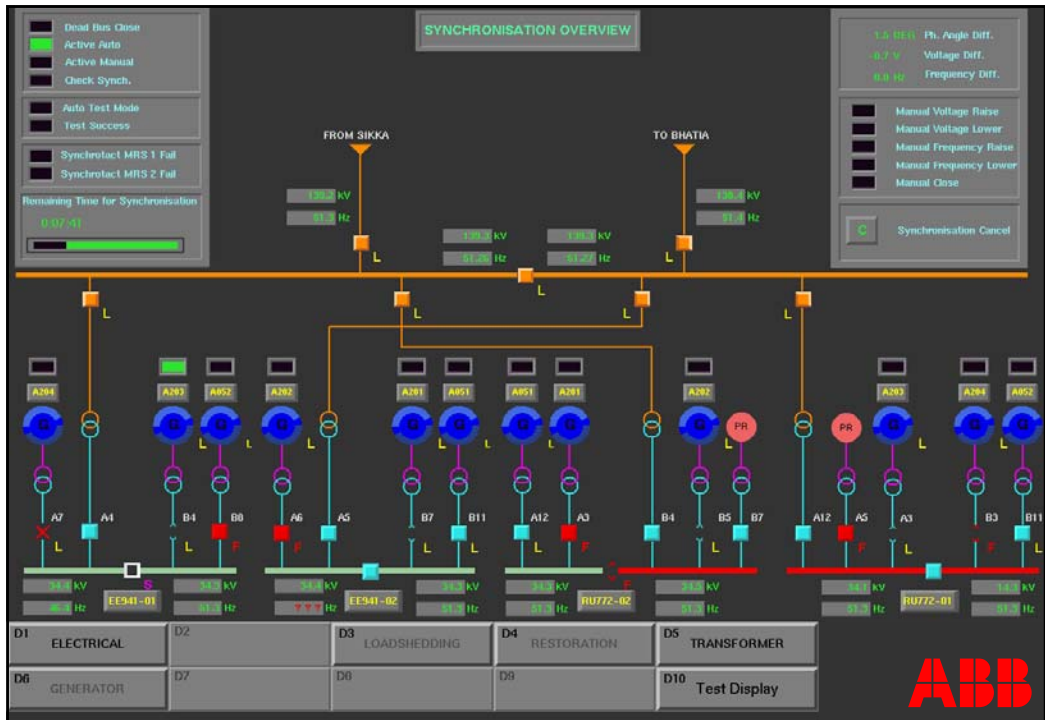
## Synchronisation

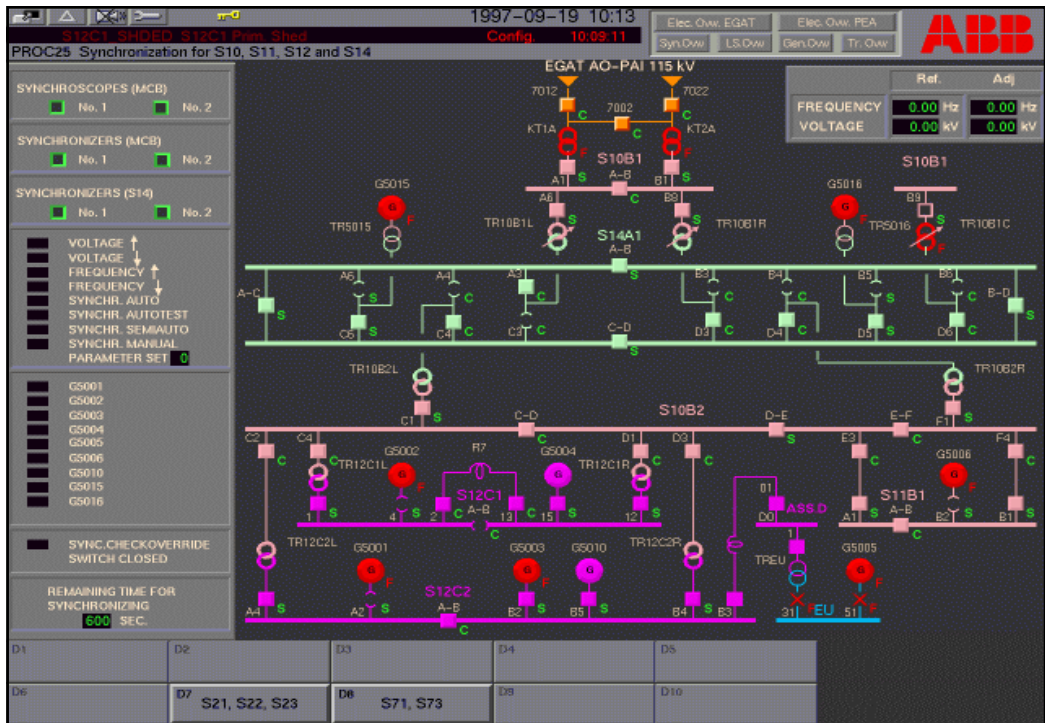
- Automatic Synchronisation after Boiler Trip
- Automatic Synchronisation initiated by Operator
- Semi Automatic Synchronisation
- Manual Synchronisation

# Synchronisation Example Displays

1. Synchronisation Overview
2. Synchronisation Display

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## Power Management Functionality: Summary

- Load Shedding
- Active and Reactive Power Control
- Mode Control
- Supervision, Control and Data Acquisition (SCADA)
- Re-Starting
- Synchronisation
- Circuit breaker Control
- Transformer Control
- Motor Control
- Generator Control
- Network Configuration Determination

## References



HAR, refinery in Greece



Shell Pernis refinery in the Netherlands



Shell BLNG in Brunei



Shell PDO in Oman



Hoogovens, steel-industry in the Netherlands



ThaiOil, ThaiLube, RRC refineries in Thailand



La Roche, CHP in UK



Petrobras: REPAR, REDUC, RLAM refineries in Brazil



Reliance: Hazira, Jamnagar & Haldia refineries in India



AFPC, Omar refinery in Syria



MLNG Satu, Dua & Tiga in Malaysia



StatOil Gullfaks & BP Amoco Valhall in Norway



## ABB Power Management allows you to:

- Avoid black-outs (up to 500 kUSD / hour)
  - Power control including voltage control, frequency control, sharing power among generators and tie-line(s).
  - High Speed Consistency Load Shedding (< 100 ms.)
- Reduce electricity costs
  - Peak-shaving
  - Re-active Power Control & Sharing
- Minimize operational costs
  - Decreased number of operators
  - Event driven maintenance
  - Single Window concept
- Reduce investment costs
  - Minimized cabling and engineering
  - Optimized network design

