
Plant Electrical Systems: Supply Reliability, Safety and Resilience Training Course

5 – 9 July 2027
Tokyo





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Programme Summary

Plant electrical systems are the subject of this one-week training course for plant, engineering and operations leaders at managerial level, ending in an electrical supply risk and resilience plan for one industrial site. Production, safety systems and utilities all depend on power, yet electrical weaknesses are often found only when a supply trips. The programme moves from supply architecture and load logic, through fault behaviour and reliability, to electrical safety, power quality and resilience, then applies the findings to a chosen site. Mars Training Centre UK delivers this programme in plant electrical systems.

The Business Case

An industrial site is only as dependable as its electrical supply. A single feeder fault, an overloaded transformer or poor power quality can stop a process, damage equipment and endanger people. Leaders who read the electrical system as a whole can decide where to invest in redundancy, protection and condition checks.

- Unplanned Power Interruptions: Fall as single points of failure are found and removed from the supply path.
- Electrical Incident Exposure: Declines as isolation, earthing and protection arrangements are reviewed against standards.
- Energy Cost per Unit of Output: Improves as load, losses and power quality are measured and managed.

Principles and Evidence Base

- IEC 61936-1: Its requirements for power installations exceeding 1 kV AC frame the supply architecture review in Session 1.
- IEC 60909: Its method for calculating short-circuit currents guides the fault level discussion in Session 2.
- IEC 60364: Its principles for low-voltage electrical installations shape the safety and earthing review in Session 3.
- ISO 50001: Its energy management system requirements structure the load and loss review in Session 4.



Intended Participants

- Leaders accountable for the availability of electrical supply on an industrial site.
- Plant and engineering managers who approve electrical investment and shutdown work.
- Operations managers who depend on power for continuous processes.
- Asset, risk and health and safety managers who review electrical hazards and insurance exposure.

The programme serves oil and gas, petrochemical, manufacturing and utility organisations.

Learning Outcomes

1. Participants will be able to interpret a single-line diagram and trace the supply path to critical loads.
2. Participants will be able to diagnose single points of failure and weak protection in a plant electrical system.
3. Participants will be able to evaluate electrical hazards and safety arrangements against recognised principles.
4. Participants will be able to assess power quality and energy losses from measurement data.
5. Participants will be able to prioritise resilience and reliability investments by risk and consequence.
6. Participants will be able to justify an electrical supply risk and resilience plan to senior management.

Programme Structure

Day 1: Plant Electrical Systems and Supply Architecture

How does power reach critical loads, and where does the supply depend on one path?

- Single-Line Diagram Reading
- Utility Incomer and On-Site Generation Arrangements
- Switchgear, Transformer and Cable Roles
- Critical Load Classification
- Installation Requirements From IEC 61936-1

Day 2: Supply Reliability and Fault Behaviour

What happens to the plant when a fault occurs, and how is the impact contained?

- Short-Circuit Level Review Under IEC 60909
- Protection Zones and Discrimination Principles
- Redundancy Options and N-1 Supply Tests
- Outage History and Failure Cause Analysis
- Single Point of Failure Register



Day 3: Electrical Safety and Power Quality

Are people protected, and is the supply clean enough for sensitive equipment?

- Earthing and Protective Measures Under IEC 60364
- Isolation, Permit and Lock-Out Practice
- Arc Flash Hazard Awareness and Mitigation
- Harmonics, Voltage Dips and Power Factor
- Power Quality Measurement Report Reading

Day 4: Resilience, Energy Management and Asset Condition

How does the plant ride through a supply loss, and what is the state of its electrical assets?

- Standby Power and Uninterruptible Supply Philosophy
- Restart and Load Shedding Sequence
- Transformer and Switchgear Condition Assessment
- Loss and Load Review Under ISO 50001
- Ageing Asset Replacement Prioritisation

Day 5: Applying Plant Electrical Systems to a Site

Which actions reduce supply risk the most, and is the plan ready for approval?

- Applying Day 1 Critical Load Classification to the Chosen Site
- Testing Day 2 Single Point of Failure Register Against Site Data
- Ranking Day 3 Safety Findings by Consequence
- Costing Day 4 Resilience Options
- Completing the Electrical Supply Risk and Resilience Plan

Methodology

The programme is built around case analysis and structured exercises. Participants work with simplified single-line diagrams, outage records and measurement summaries from industrial sites in different sectors and defend their ranking of actions in group review.

- Suggested activity: Marking single points of failure on a site single-line diagram.
- Suggested activity: Reading a power quality report and listing likely causes.
- Suggested activity: Presenting a resilience investment case to a simulated management committee.



Capstone Output

Each participant completes an electrical supply risk and resilience plan for one industrial site, real or case-based. It holds an annotated supply diagram, a single point of failure register, a safety and power quality findings list, resilience options with costs and a ranked action programme. It is used to brief management and to guide the next shutdown and investment cycle.

Frequently Asked Questions

Is this plant electrical systems course suitable for managers who are not electrical engineers?

Yes. It is set at managerial level for leaders who depend on or oversee electrical supply, and assumes plant experience rather than circuit design skills.

Which standards does plant electrical systems training rest on?

It rests on IEC 61936-1 for high-voltage installations, IEC 60909 for short-circuit currents, IEC 60364 for low-voltage installations and ISO 50001 for energy management. Each is applied to site case material.

How is the plant electrical systems risk and resilience plan used at work?

The plan briefs management on supply risk, ranks resilience and safety actions by consequence, supports shutdown scoping and guides the next electrical investment cycle.