



Insight & Expertise

A Guide to Power Systems Analysis

Contents

- 03 What is Power Systems Analysis?
- 04 How does it apply to me?
- 05 What are the benefits of Power System Analysis?
- 06 What should I be doing?
- 07 Can I do this myself?
- 08 Where Covol can help



What is Power Systems Analysis?

Network modelling and optimising electrical protection can further improve safety, asset protection, and reliability of supplies.

Studies undertaken as part of a Power Systems Analysis can include;

- > Arc Flash and Switchgear Risk Assessments
- > Load Flow and Motor Starting
- > Short Circuit / Fault Level Studies (ongoing Switchgear suitability)
- > Protection Coordination (Electrical System Network Integrity)
- > Application studies to consider existing or proposed systems

How does it apply to me?

Under the COMAH Regulations, the reliability and availability of utilities is of primary importance, alongside protection against large releases of electrical energy. Inspections of electrical power systems are concerned with the prevention of major accidents through fire and explosion initiated by loss or failure of electrical systems.

HSE Inspectors will review the management, design, installation and maintenance of electrical power systems to ensure they provide the necessary reliability and availability to prevent major accidents, and so that they prevent danger to personnel. In its inspections, the Competent Authority will make reference to a number of benchmark standards. These include;

- > **BS EN 61936-1** : Common rules for Power installations exceeding 1 kVac
- > **BS EN 7671**: IET Wiring Regulations, Requirements for Electrical Installations
- > **BS EN 50522**: Earthing of power installations exceeding 1 kVac
- > **BS 7430**: Code of practice for protective Earthing of electrical installations
- > **BS 6626 & BS 6867**: Codes of practice for the maintenance of electrical switchgear & control gear for voltages 1kV & above
- > **BS 6423**: Code of practice for maintenance of low-voltage switchgear and control gear

Compliance with the Electricity at Work Regulations and the Wiring Regulations is mandatory at all sites irrespective of whether the COMAH Regs apply. Two additional HSE publications provide guidance on electrical safety:

- > **HSG85** Safe working practices
- > **HSG230** Keeping electrical switchgear safe

What are the benefits of Power System Analysis?

For large power networks computer based modelling and analysis can offer many advantages:

- > Verification of cable and equipment ratings
- > Load flow and motor starting studies
- > Voltage Dip Protection & re-acceleration scheme limitations can be verified
- > Optimised and fully graded protection with professional documentation
- > HV motor protection is often improved for normal overload and stall conditions
- > Earth fault settings could also be reduced and graded with upstream earth fault settings

The Electricity at Work Regulations requires you to have up to date documentation to include fault levels and protection settings in addition to any up to date electrical network single line diagrams. It is important to have up to date records and protection curves for a network and as many older sites have often undergone many changes, site/facility owners have a responsibility under the regulations to ensure key system records are kept up to date.



What should I be doing?

Initially, establishing a software model that reflects the normal configuration and average loadings of the distribution systems should be carried out. Once done, the model should then show typical maintenance configurations with open points changed or couplers closed. Check switchgear ratings for the worst case values of peak make & break kA and include HV and larger LV motor details for their contribution to fault levels.

Overall, there should be a clear plan for assessing the distribution network as a whole with an initial aim of reviewing any known weaknesses.





Can I do this myself?

Yes. The majority of Electrical Engineers will understand their networks and what issues are present but, may not have the means to model the systems.

Changes to distribution systems will happen over time ranging from large scale equipment additions and removals through to small scale improvements and modifications. The cost of the software tends to be very prohibitive and trying to justify this level of cost may prove difficult. Additionally, training in the software will take time and so an instant payback would be very unlikely.

Where Covol can help

Having worked in similar industries ourselves, we're aware of the increasing number of challenges faced by Site Engineers. Experience and knowledge is lost as a result of staff turnover due to retirement and competition.

Through the adoption of a structured process we can provide the necessary support with the management of your Power Systems. We have extensive experience in the provision of Power Systems analysis along with the implementation of mitigation measures in various environments around the world including petrochemical sites, oil platforms, manufacturing facilities and wind energy installations. This includes;

- > Construction and verification of Electrical distribution system models that include protection characteristics and Arc Flash calculations with incident energies and boundaries
- > Implementation of remediation projects including design and installation.
- > Site surveys, protective device determination and audits of electrical management systems
- > Risk assessment of switchgear
- > Creation and adaptation of maintenance and operating procedures
- > 5 yearly revalidation of electrical systems

If our help in supporting you with Power Systems Analysis is something that you would like to know a bit more about then please contact us.



Ready to engineer change and progress in your business?

Get in touch to speak to our experts

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