The Process
The SAFOP process is a systematic approach to review the safety and operability of the design of an electrical installation from a technical, maintenance and operational viewpoint.

A SAFOP involves the implementation of three studies by a multi-disciplined team of engineers, operations and safety personnel. The three studies include:

- **Safety Analysis - SAFAN**
  A SAFAN examines the physical layout and accessibility of electrical equipment and related facilities and assesses the potential for hazards to personnel who are to operate, work on, or be in the vicinity of the facilities.

- **System Security and Operability Analysis - SYSOP**
  A SYSOP examines the functioning and operation of the electrical system, its components and auxiliaries and considers these in terms of fulfilling the intended security of supply and operating requirements whilst preventing or minimizing hazards and production losses. It assesses the adequacy of the protection and control schemes provided; the potential for, and consequences of, failure, malfunction or mal-operation of the equipment and identification of deficiencies in the design of the electrical installation that affect both the operability and maintainability of the system.

- **Operator Task Analysis - OPTAN**
  An OPTAN examines the tasks of the operators (electrical and others) of the electrical system in control and maintenance situations, in both normal and abnormal conditions. It assesses whether adequate facilities are provided and addresses the adequacy of operator interface and operator’s ability to carry out the required tasks and to do so in a safe manner without error.

The Benefits
A SAFOP review is recorded in a SAFOP report which contains detailed significant findings and conclusions in the form of worksheets and includes the main recommendations to avoid or minimize problems identified by the SAFOP team. Results of a SAFOP include:

- a fitness for purpose assessment of the facilities;
- a better understanding of how the integrated power system will work and its operational limitations;
- a list of proposed tasks to improve the safety and operability of the asset;
- verification of the robustness of the system with suggestions for reducing system susceptibility to upsets;
- a system suited to local circumstances and compatible with local working practices and procedures;
- avoiding nuisance trips and thus downtime of existing plant during tie-in and commissioning;
- improving safe working practices highlighting safety hazards during installation, commissioning and operation;
- identify the required information to carry out operational tasks in a safe manner under normal and emergency conditions.

The correct timing of a SAFOP is essential to minimize the costs of modifications as a result of the review.

The Team
The participants usually required at the review include the team chairman/facilitator, secretary, project engineer, electrical design engineer, process plant operator; electrical maintenance engineer, safety engineer, design consultants and contractor / manufacturer if applicable. The choice of team chairman/facilitator is crucial. The team chairman/facilitator must be an experienced engineer with a sound theoretical and practical knowledge of the design and operation of electrical systems in oil and gas production or processing facilities. To ensure the effectiveness of the SAFOP, the team chairman/facilitator must be trained and practiced in applying SAFOP techniques. Further to ensure impartiality, the team chairman/facilitator should be an independent party, not involved with the project.

The Timing
A SAFOP review of an electrical system is normally implemented at the specification and/or the engineering stage of a project, but can be equally applied to existing installations. For a project, the timing of the individual SAFOP studies is dependent on design having progressed to a level of detail that will enable the objectives of each SAFOP study to be realised. However the project should still be at a stage that will allow implementation of the recommendations to occur without incurring significant costs.

An initial SAFOP study incorporating a SAFAN & SYSOP, should be ideally carried out on completion of the conceptual design of the installation, i.e. after completing the Basis of Design documents and prior to tendering for preparation of the project specification by a contractor. Documentation which should be made available for the initial study includes conceptual initial layouts, single line diagrams, protection philosophies and central ideas.

A final SAFOP study incorporating the SAFAN, SYSOP & OPTAN studies should be implemented during the execution phase of a project, when the plant layout drawings and the electrical protection and control facilities are defined in sufficient detail, with main equipment details known.