



## Typical Power System Study Components

System Fault Study Perform a three-phase and line-to-ground fault analysis of the electrical distribution system from the utility ties to the lowest level to be documented. The case study calculations illustrate the worst case short circuit currents for the switching configuration, including interrupting equipment duty evaluation. A one-line diagram is generated to illustrate the system components, configuration, and impedance data. The device and bus nomenclature used in the model, fault calculation prints and coordination curves are included.

Protective Device Coordination Study This is performed for the electrical system for both phase and ground protection devices. The relay coordination study extends from the utility inter-tie downstream, to the 480V switchgear feeder breakers serving motor control centers and continues to the lowest level to be documented. Recommended low voltage settings are provided for 480V switchgear main and feeder breakers, and fuses to allow proper coordination. The study includes recommendations for protective device settings which allow the optimum coordination.

Arc Flash Hazard Study A flash hazard analysis includes the calculation of the flash protection boundary limits and the incident energy exposure for the maximum arc producing flash expected from a piece of electrical equipment. The study determines incident energy exposure level and arc-flash protection boundaries for electrical equipment in accordance with IEEE-1584 and NFPA-70E. The study is based on the protective device settings and the interrupting device clearing times. The study makes recommendations for improvements to lower the incident energy levels.

Load Flow Study The results predict power flow magnitudes, voltage levels and losses in branches of the system based on the operating conditions. The results are useful for planning future expansions.

Harmonic Measurement Service This evaluation is to identify harmonic content of electrical parameters at the facility load centers. Recommendations will be made for mitigation, if required.

Power Factor Study. The study is based on actual load measurements. The results are evaluated and specific recommendations made for power factor improvement. This often lowers the plant power bill.

## Why Hargrove and Associates?

Our engineers have been performing plant electrical system analysis to determine available short circuit current, safe circuit interrupting capacity and proper coordination of protective devices for a combined total of over 100 years. We are currently assisting customers in meeting the requirements of NFPA 70E.

Founded in 1995, Hargrove and Associates provides comprehensive engineering, technical support and project management services to industrial and commercial customers throughout the Southeast. We function as an extension of our customers' plant engineering or facility management team. Our experienced engineering and project management staff can assist with:

- Developing innovative process solutions or facility plans
- Design and construction management services to deliver the facility solution
- Engineering support for continuous facility improvements
- Technical support for maintenance, planning and inspection
- Consulting and site management for plant relocations, asset sales or facility demolitions.

*For further information, please contact:  
Phil Hamilton, P.E.  
Manager – Electrical and Instrumentation  
Hargrove and Associates, Inc.  
P. O. Box 6821      Mobile, AL 36660  
Phone: (251)476-0605      Fax: (251)476-4895*