Wide-Area Protection System Studies

As part of their day-to-day activities, protection engineers use short-circuit programs and associated relay setting tools to calculate settings for relays that are applied on primary equipment like transmission lines, transformers, distribution feeders and generators. Once these settings are calculated, the engineer has to test whether the settings applied to the relays operate reliably when required, and ensure coordination with settings on other relays in the vicinity. The terms "sensitivity" and "selectivity" are often used to describe these functional requirements.

Sensitivity is the ability of the relay to operate reliably under conditions that produce the least tendency to operate.

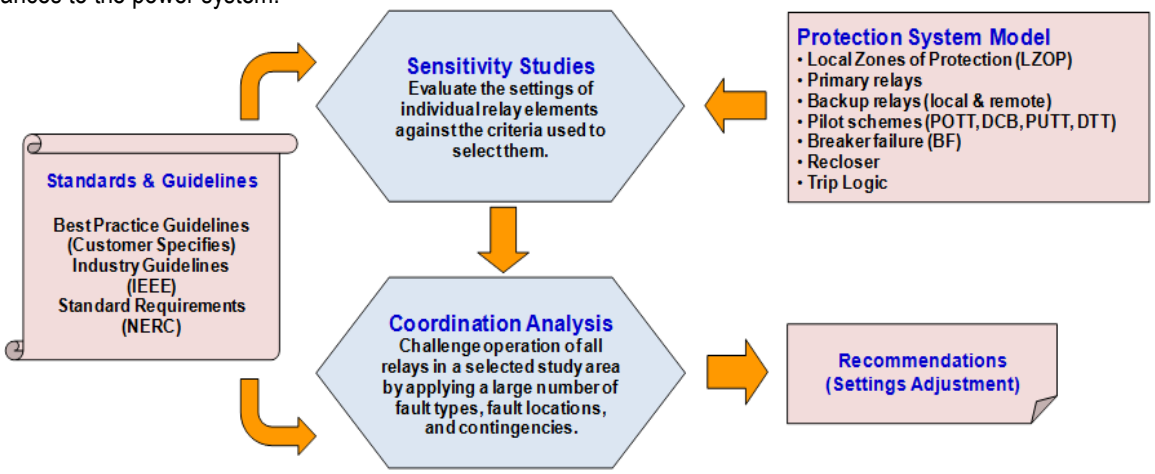
Selectivity is the ability of the relay to discriminate between conditions that require prompt operation and those that require no or time-delayed operation.

Testing sensitivity and selectivity has always been a challenge, and most utilities employ manual procedures to verify that relays are able to satisfy the necessary criteria. When performed manually, such verification tends to be limited in scope.

Even more challenging is the task of verifying protection performance over a wide area. In other words, how can we efficiently test sensitivity and selectivity of protective relays over the entire service area of the utility? Over the past several years, Quanta Technology has helped utilities perform wide-area protection system reviews, using the well-known Computer Aided Protection Engineering (CAPE) software and its advanced built-in tools for relay modeling, analysis and automation.

Quanta Technology would be pleased to demonstrate their extensive experience in applying the following methods to perform these wide-area studies:

- Advanced features of CAPE that make it suitable for wide-area sensitivity and coordination studies.
- Automated sensitivity analysis methods application – what it means and what it can do for the protection engineer.
- Automated selectivity (coordination) studies – what it means and how it can be used to reduce the risk of protection related disturbances to the power system.



Automating Sensitivity & Selectivity Studies

When wide-area studies are performed, large volumes of raw data are produced. It is impossible for a human being to review and analyze the data. To help with this task, Quanta Technology has developed post-processing tools that read the raw data and create easy-to-understand spreadsheets and documents. The spreadsheets rank the problems found according to severity and focus the engineer's attention to the most pressing issues.

While automating the studies helps large-scale reviews to be conducted, it is important to note that the solution to problems identified is still the responsibility of the protection engineer. That is, the tools help run the studies and gather the data very efficiently, but do not replace the protection engineer's knowledge and judgment in resolving the issues identified.

For more information regarding Quanta Technology's Wide-Area Protection System Studies, please contact Bryan Gwyn, *Senior Director, Protection & Control*, at (508) 787-5013 or bgwyn@quanta-technology.com.