Wide Area Coordination Review

This brief document provides an overview of the conceptual steps needed to set up a small area for a pilot project to help you understand how a wide-area coordination review would be done. These steps are based on our experience with several utilities who have executed this type of project.

1. Review Network Model

The network model should be reviewed to make sure it includes all the lines, transformers, and generators that can have an impact on the fault currents on the transmission system you want to study. Are their impedances correct? An up-to-date model of your connections to neighboring utilities and models or equivalents of enough of their systems to give you accurate currents when faults are applied near your boundaries are both needed. Finally, each bus in your model must be looked at to make sure it has been given a real or fictitious type, as appropriate.

2. Create LZOPs

Depending on the protection you are planning to study, you will need LINE and probably some MISC LZOPs to hold those relays. Some companies ignore teleprotection, breaker failure relaying, and differential protection. Some need to include one or more of these. For example, it may be desirable to model line differential protection in some cases.

3. Add CTs and VTs

Add all the operating and polarizing CTs and VTs needed to provide proper current and voltage input to the relays you are planning to evaluate.

4. Add Relays

Add all the relays that are involved in coordinated breaker tripping. Enter their settings (at least the ones CAPE needs). Most companies model both the primary and local backup relays, e.g. schema A and scheme B. Remember, too, that you will need to model enough backup around any line that you are going to study. That issue is important if you plan to study only a portion of your HV network rather than all of it, for example.

5. Add Contact Logic

Add contact logic codes to the elements that are directly involved in the tripping process. Contact logic codes are not needed on elements that supervise other elements because the supervised elements that have contact logic codes cannot operate until their supervising elements have operated.

After you have decided which elements need logic codes, you will need to formulate the contact logic expression for each LZOP and make this assignment. Logic expressions need only be defined once but can be used and reused as often as you have an LZOP that uses the same logic.

The mechanics of doing items 2, 3, 4, and 5 above are covered in the CAPE One-Line Diagram User Guide. This document is included on your CAPE CD in the directory \Printed Documentation\OLUserGuide.

6. Conduct Testing

Run the Data Checking option of the Relay Checking module on each line, one at a time, to help find errors in the data you have entered. This can be an iterative process as errors are found and corrected.

Run System Simulator on each line to make sure that simple faults can be cleared.

Now your system model is ready for the full coordination review.

7. Conduct the Study

Wide-area coordination reviews may be conducted with the standard capabilities already built in to the Relay Checking module.

If the standard studies in RC don't fit the conditions you want to study or if special reporting is needed, then a special macro may have to be written. We have a document available that describes one of these macros. Keep in mind that development of custom macros requires separate funding.

While it is conceivable to run a massive study all at one time, the practical approach is to evaluate one line at a time.

8. Make Settings Corrections

It is not unusual to find that 25% of the lines studied require corrective action. You will need to run the coordination review of a line again after you have changed any nearby settings.

More information about Wide Area Coordination Reviews?

Electrocon has been directly involved in a number of these projects. If you would like to know more about the process and the results, please let us know.

Electrocon: expertise, stability, and responsiveness...when you need us

Electrocon is a full-service software firm founded in 1981. We are dedicated to serving the utility industry and protection engineering. When you use CAPE, we become an active partner in your success. For example, conversion of your existing electronic data from most popular formats is included with CAPE. Our custom training gets your team started quickly and confidently. We're known for our ongoing technical

CAPE models can provide the level of detail and the process automation needed to make Wide Area Coordination Review studies a practical undertaking.

support: expert, thoughtful, and very responsive. And our consultants are ready to serve as additional skilled hands to take on special projects your staff can't address.

CAPE users are part of an active network of protection engineering expertise, worldwide. Annual Users Group Meetings in North America and periodically in Europe provide content-rich opportunities to make connections in person. Our electronic bulletin board makes even broader connections possible year-round.

How can CAPE's power help you?

We would love to hear from you. Our staff is happy to answer your questions about putting CAPE to work to improve the effectiveness of your protection engineering function. Contact us at eii@electrocon.com or 1-734-761-8612 (1-888-240-4044 toll-free in the US), 8 am-5:00 pm Eastern US time, Monday-Friday.