



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.

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.

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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.

Fault Type	Fault Location	Clear Time(s)	Operation
SLG	Close-in L_936_10 159 CYPRESS 0159 to 160 CEDAR ckt 1 (160 CEDAR)	0.082	OK
TPH	Close-in L_936_10 159 CYPRESS 0159 to 160 CEDAR ckt 1 (160 CEDAR)	0.082	OK
SLG	Rem C1s-in L_936_10 160 CEDAR to 159 CYPRESS 0159 ckt 1 (159 CYPRESS 0159)	0.092	MISCOORDINATION(3)
TPH	Rem C1s-in L_936_10 160 CEDAR to 159 CYPRESS 0159 ckt 1 (159 CYPRESS 0159)	0.082	OK
SLG	50% L_936_10 159 CYPRESS 0159 to 160 CEDAR ckt 1 (160 CEDAR)	0.065	OK
		0.065	OK
		0.082	CTI VIOLATION(1)
		0.082	OK
		0.082	OK
		0.092	MISCOORDINATION(3)
		0.082	OK
		0.065	OK
		0.065	OK
		0.082	CTI VIOLATION(1)
		0.082	OK

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

