



## *Single-Phase Reclosing Maximizes Feeder Performance*

Eli Nelson

### **INTRODUCTION**

Traditional distribution feeders have been equipped with three-phase fault interrupters. This is particularly true on heavily loaded feeders where unbalance may be a problem. Utilities have had to accept the fact that as many as two-thirds of customers could be affected unnecessarily by a single-phase fault. Many utilities have been reluctant to consider single-phase tripping on the main three-phase line for a number of reasons, including a desire to protect three-phase loads, difficulty coordinating devices along the feeder, and a loss of sensitivity of the protective device for low-magnitude faults. By taking advantage of today's microprocessor-based recloser controls and the versatile reclosers available, solutions to these problems can be found. As utilities search for ways to improve the performance and reliability of their distribution systems, many are finding that reclosers with single-phase reclosing capability are an economical and powerful solution.

### **PROBLEM**

It is estimated that between 50 and 75 percent of feeder faults involve only a single phase, while only 10 to 15 percent are three-phase faults. There are obvious benefits to opening only the affected phase(s) when clearing a fault. Unnecessary interruptions affect reliability indices, including SAIDI (System Average Interruption Duration Index), SAIFI (System Average Interruption Frequency Index), and MAIFI (Momentary Average Interruption Frequency Index), so every improvement is beneficial to the utility.

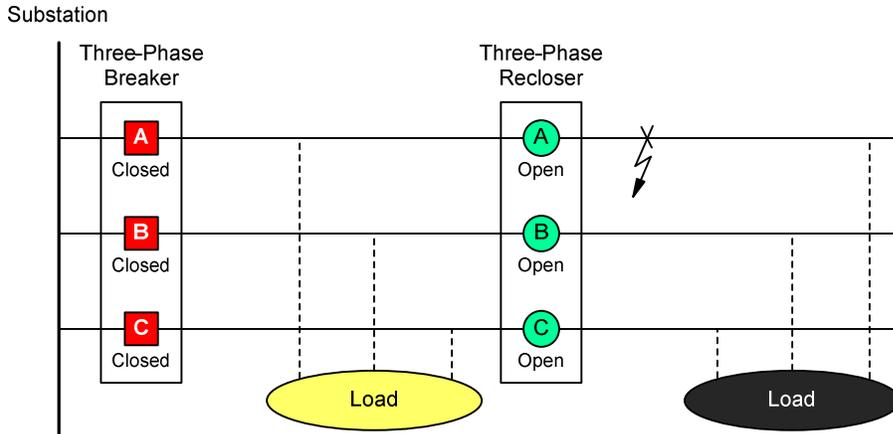
Although the benefits are clear, there is still concern about single-phase tripping and how it should be implemented. Trip and reclose modes need to be defined; ground fault sensitivity should be considered as well as load unbalance for single- and two-phase trips.

### **SEL SOLUTION**

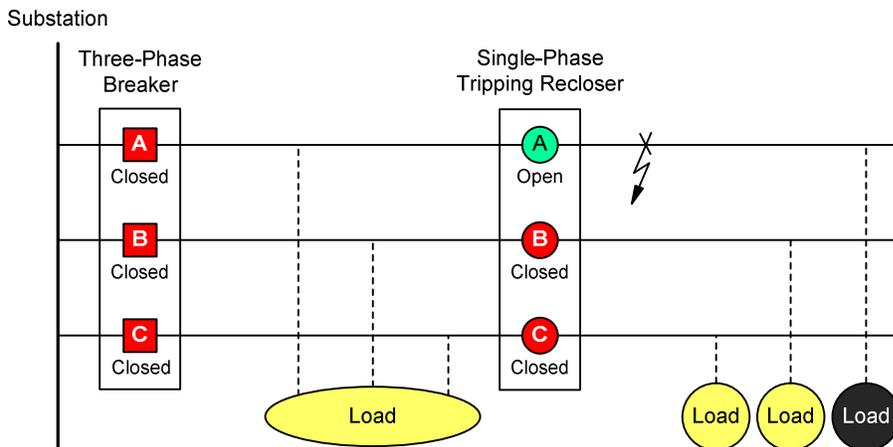
Microprocessor-based recloser controls not only provide the ability to implement single-phase reclosing but also ways to address operational and protection concerns. The reclosing mode in each recloser can be set based on the location, peak loading, or other considerations. For example, at times when a feeder is heavily loaded and a single-phase trip will create too much ground current, three-phase tripping can be used. Recloser control settings can be changed automatically based on time or feeder conditions. This allows for more flexible solutions and better feeder performance.

Single-phase tripping is used by many utilities. There are several proven benefits, including the following:

- Single-phase tripping and reclosing offers an excellent method for reducing unnecessary customer interruptions.
- Single-phase fault interruption is no longer restricted to just lightly loaded feeders.
- Settings and reclosing mode can be changed dynamically based on feeder conditions.
- Customizable logic allows for application on a wide range of feeder configurations.



**Figure 1 Three-phase reclosing affects all the customers beyond the recloser**



**Figure 2 Single-phase reclosing only affects about one-third of the customers**