Case Study

Industrial Feeder Restoration

Challenge

A major Midwest manufacturer of raw material used in making LCD chips needed to expand their manufacturing operation to accommodate a substantial increase in business. They already had two plants that were filled to capacity so they decided to build a new facility that would more than double the output of their existing operations. Besides the need for a new facility, the industrial customer had several critical power requirements. One requirement was for maximum service reliability because of the estimated millions of dollars of lost revenue if any significant downtime were to occur. The other requirement was an unusually short lead time to research, design, procure, test and commission the best power distribution system for the application. After a thorough investigation, the industrial customer found a location near their existing sites and a municipal utility willing to take on the short lead time challenge.

Figure 1: Viper-ST recloser with SEL-651R controls were installed on the two overhead lines.

Solution

The municipal utility soon determined they needed a feeder restoration system which could automatically sense and isolate an electrical problem without the need for dispatching a crew. The utility researched some of the industry's better known suppliers of distribution automation equipment. After numerous proposals, G&W Electric was chosen because they offered a field proven solution and were willing to work closely with the utility's engineers to accommodate their specific requirements. G&W Electric's Lazer® Distribution Automation system offered a pre-engineered package of both the field switching devices and the complete control package, providing a single source solution. The solution consisted of Lazer automation solution comprised of two overhead reclosers and four padmount switches, all with SEL controls.

Figure 2: G&W padmount switches and transformers were installed on opposite sides of the building.

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System configuration

The new industrial site already had two 35kV overhead distribution lines nearby. The municipal decided to tap off these lines and feed the new industrial plant underground through four padmount switches. The new plant was divided into 12 separate loads, with three loads being fed through each switch. Reclosers (G&W Viper-ST style with SEL-651R controls) were installed on the two overhead lines, one feeding two switches and the other feeding the remaining two switches *(Figure 1)*. One of the switches had a normally open point which would automatically switch from one source to another if a problem occurred.

The switches (G&W PNI style) incorporated two automated source (line) ways and three, 3-phase load ways *(Figure 3)*. Each source way switch was controlled with an SEL-451 relay and incorporated a stored energy mechanism for high speed switching, An SEL RTAC, located in one of the padmount switch control enclosures, served as the master control for reconfiguration after a fault occurrence *(Figure 4)*. Each switch had an additional way to protect the potential transformers which were located in a side enclosure. These PTs provided real-time voltage values and power for the controls. A battery backup system was provided in the event of a widespread, extended power outage.

Figure 3: G&W PNI style switch with two automated source ways, three load ways and an additional way for PT protection only.

Figure 4: SEL RTAC master was mounted in the same enclosure as the SEL-451 control.

Operation

The automated system operated as an open loop with fault interruption occurring at the feeder reclosers. When a fault or voltage loss was detected, the line recloser would open to clear it. Fault indicators on the line ways of the switches were tied through the relays and back to the RTAC controller. The controller would then determine the location of the fault by which fault sensors had been activated. Once the fault was located, the controller would open the closest switches very quickly to isolate the faulted section and close the midpoint switch, if ecessary, to allow power flow to all of the loads. Finally the recloser would close back into the re-configured circuit to restore power. This allowed all of the loads to be re-energized while the faulted line section was isolated. See the diagram below for a system layout.

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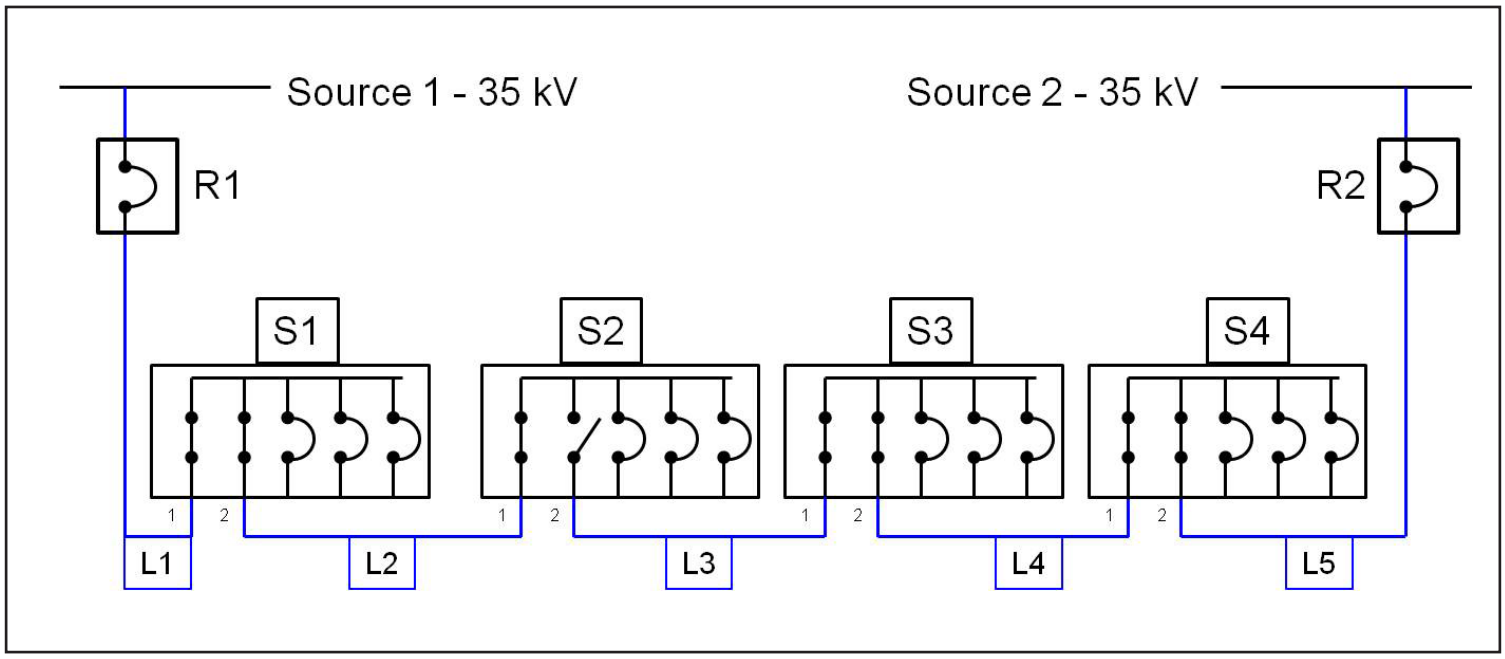
Solution Results

The system was programmed and fully tested at G&W prior to shipment. All re-configuration scenarios were confirmed and the reconfiguration time was verified as less than one second. The switches and reclosers were installed on site and are fully operational.

System Diagram



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