CASE STUDY
SYSTEM RELIABILITY

S&C ELECTRIC COMPANY
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Single-Phase Reclosers on Rural Distribution Lines Help Utility Improve Reliability

S&C Featured Solution: Advanced single-phase cutout-mounted recloser

Location: Minas Gerais, Brazil

Customer Challenge

Energisa Minas Gerais Distribuidora de Energía, one of 13 utilities in the Energisa Group, serves a 17,200-square-kilometer area in the southeastern part of the Brazilian state of Minas Gerais. It provides electricity to 438,600 customers through 21,000 kilometers of 11.4-kV and 2,000 kilometers of 22-kV distribution lines.

Approximately 90% of the utility's medium-voltage distribution lines serve the rural areas of the service territory. In a study, the utility found that, on average, 76% of the faults that occurred in 2012 were temporary in nature. These temporary faults caused fuse cutouts to operate, resulting in a permanent outage for customers on the affected section of line. The temporary faults also resulted in a 17% increase in the System Average Interruption Duration Index (SAIDI) rating and a 7% increase in the System Average Interruption Frequency Index (SAIFI) rating.

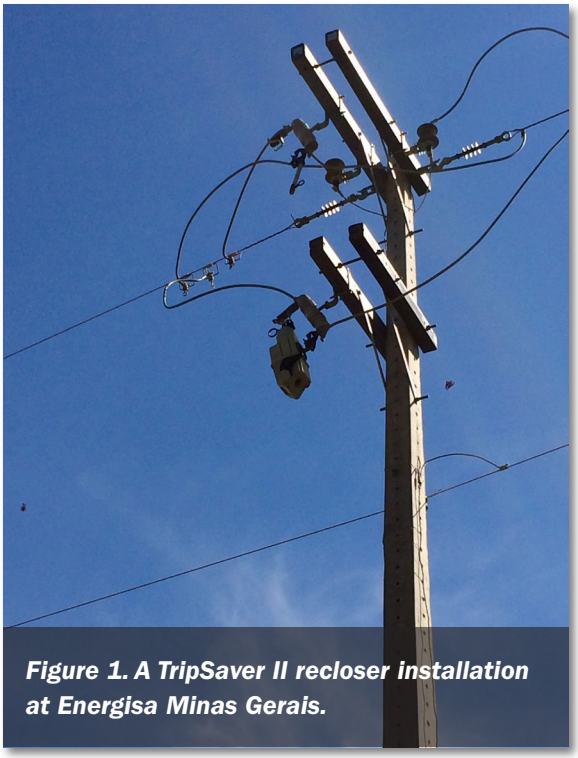


Figure 1. A TripSaver II recloser installation at Energisa Minas Gerais.

The study also determined that 55% of all truck rolls were dispatched to fix permanent outages caused by fuse-cutout operations that resulted from temporary faults. In addition, 30% of all crew work hours were spent restoring service when temporary faults caused outages in rural areas.

Based on the findings, the utility decided something had to be done because it was facing growing pressure to significantly reduce its SAIDI and SAIFI ratings to meet government regulations and to avoid financial penalties.

Energisa Minas Gerais studied various solutions to improve its reliability indices and developed plans to implement various solutions focused on protection schemes, three-phase reclosers, and fault indicators. The utility also determined that another solution to the outage problem was to install single-phase reclosers on its single-phase rural laterals as an alternative to traditional fuse cutouts. The utility set out to research

"The S&C TripSaver® II Cutout-Mounted Recloser was easy to install and provided Energisa with improved reliability numbers. We will be looking to expand the use of this recloser throughout the service territory."

—Paulo Roberto F. Valadão – Distribution Engineering, Construction and Maintenance Supervisor, Energisa Minas Gerais

S&C's TripSaver II Cutout-Mounted Recloser eliminated permanent outages caused by temporary faults.

potential market solutions. The criteria for determining which single-phase recloser to use included total cost, ease of installation, and features. In addition, the recloser for this application was not required to have communication or SCADA capabilities.

S&C Solution

After analyzing various single-phase reclosers, Energisa Minas Gerais decided on the S&C TripSaver®II Cutout-Mounted Recloser. It liked that its unique design enabled mounting in a standard S&C Type XS fuse cutout, conducted four operations before dropping open, and that it had a high interrupting rating, which allows TripSaver II units to be applied in more locations. Moreover, with more than 200 different Time-Current Characteristic curves to choose from, it provided greater coordination flexibility.

Energisa Minas Gerais launched a pilot project that involved acquiring 10 TripSaver II units and installing them on laterals having poor service reliability. To determine the best locations, the utility reviewed several criteria based on a weighted average, including truck-roll cost, the number of customers on the lateral, and the length of the overhead line being protected.



Figure 2. An Energisa Minas Gerais engineer reviews TripSaver II recloser logs.

Valued Outcome

Energisa Minas Gerais had detailed historical feeder-performance information for all 10 installation locations. After one full year in service, the utility found when comparing the historic data with the data logs from the TripSaver II units, the overall improvement in all measured performance metrics was over 91%. See Table 1. The significant reduction in truck rolls to replace fuse links when temporary faults occurred and the associated savings resulted in a viable short-term payback.

Table 1. How the TripSaver II Units Performed Against Pre-Installation Results

Performance Indicator	One Year Before	One Year After	Relative Change	Percent Improvement
Truck rolls	111	9	-102	92%
Distance truck travelled (km)	1983	95	-1888	95%
Man-hours worked	108.8	5.6	-103.2	95%
SAIDI (hours)	0.0927	0.0067	-0.0860	91%
SAIFI	0.0322	0.0030	-0.0292	91%

In the year before the installation of the 10 TripSaver II reclosers, Energisa Minas Gerais paid out $1300 in penalties to customers on those laterals because of poor reliability indices performance. In the year after the installation of the reclosers, the payout totaled only $24, resulting in a penalty-cost reduction exceeding 98%.

Based on these results, Energisa Minas Gerais has already purchased additional TripSaver II reclosers, and two other utilities in the group have also purchased units for pilot projects as well.

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