



Trans-Rupter II® Transformer Protectors Fill a ‘Tall Order’ for Improved Protection

S&C Featured Solution: Trans-Rupter II Transformer Protector

Location: Southwest United States

Customer Challenge

A large utility in the U.S. Southwest contracted with S&C’s Power Systems Solutions division to study ways to improve its system reliability. One concern was a substation with four 138-kV transformers.

The existing transformer protection scheme used the line-terminal circuit breakers and bus breakers to trip the entire high-voltage bus after a fault. The motor-operated air-break disconnect switch on the primary side of each transformer would then open, isolating its associated transformer. Only after the system operator located the faulted transformer could the disconnect switches on the unfaulted transformers be reclosed, followed by the line-terminal and bus breakers.

By installing individual transformer protective devices, a secondary fault or a faulted transformer could be quickly isolated without affecting the rest of the transmission line or neighboring transformers, dramatically decreasing outage time and increasing power reliability by reducing the number of customers out of service.

The utility had previous experience with S&C’s Series 2000 Circuit-Switchers and was interested in using them in this application. But space constraints made this impractical. The disconnect switches, sensors, buswork, and dead-ending insulators were installed on an elaborate overhead structure. There was no room between the transformers and the structure for Circuit-Switchers with vertical interrupters. And there was no clearance underneath the structure for Circuit-Switchers with horizontal interrupters.

S&C Solution

S&C proposed using Trans-Rupter II Transformer Protectors, mounted 30 feet (914 cm) up on the existing structure! Trans-Rupter II Transformer Protectors offer extraordinary application flexibility. There’s no mechanical linkage. The pole-units are electrically linked . . . thus allowing mounting at almost any height. The lightweight pole-units could be easily accommodated by the existing structure.

Because the 30-foot mounting height would make use of the manual charging tool impractical, optional motor operators were specified that allow the pole-units to be closed and charged from ground level. The existing disconnect switches were retained to provide visible air-gap isolation when the Trans-Rupter II Transformer Protector pole-units are open and also pick up transformer magnetizing inrush current after the pole-units have been closed and charged. A specially modified S&C LS-1 Switch Operator was furnished for each disconnect switch, wired to provide sequenced operation of the Trans-Rupter II Transformer Protector motor operators and the disconnect switch.

Channels were installed on the overhead structure to support the Trans-Rupter II Transformer Protector pole-units and the insulators for the conductors connecting the transformers to the pole-units. The installation crew used slings attached to the overhead structure to hoist the pole-units into place . . . no crane was required. The existing vertical operating pipe for the disconnect switches was retained, making installation

Two of the four new 138-kV Trans-Rupter II Transformer Protectors are visible, installed on the structure above the transformers they protect. The disconnect switches—now motor-operated by S&C LS-1 Switch Operators—are installed above the Trans-Rupter II Transformer Protector pole-units.





of the LS-1 Switch Operators simple. All four Trans-Rupter II Transformer Protectors were installed in the allotted two-day outage ...with time to spare!

Results

The utility is more than satisfied with its Trans-Rupter II Transformer Protectors. The upgrade project cost was well within the utility's original budget, and the work was completed ahead of schedule.

Single-line diagram of the four-transformer substation.

