Actual Loss-of-Voltage Event Trumps Planned Site Automation Testing, Demonstrating Automatic Restoration by IntelliTeam® SG

**S&C Featured Solution:** IntelliTeam SG  
**Location:** Wuzhong, Ningxia China

### CUSTOMER CHALLENGE

State Grid Corporation of China—the central government-owned utility—serves 128 million customers...double the number of customers five years ago. Service reliability has been a key issue for the utility. A trial installation of S&C IntelliRupter® PulseClosers utilizing the S&C IntelliTeam® SG Automatic Restoration System was authorized, to investigate their potential to improve reliability.

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### S&C SOLUTION

Seven IntelliRupter PulseClosers furnished with IntelliTeam SG Automatic Restoration System software were installed on two 10-kV feeders in the Wuzhong, Ningxia area, as shown on page 2. The IntelliRupters communicate with each other and the utility’s SCADA system using RuggedCom RS900 Fiber-Optic Transceivers. S&C IntelliTeam® Designer software is used to configure the teams and retrieve operational data.

### VALUED OUTCOME

After the IntelliRupters were installed and commissioned...but before site automation testing was completed by S&C’s...

*The IntelliRupter teams on both feeders immediately responded to the loss-of-voltage event and restored service to the loads normally served by Substation 2.*
Field Service Technologists . . . transmission power was lost at Substation 2. The IntelliRupter teams on both feeders immediately responded to the loss-of-voltage event and restored service to the loads normally served by Substation 2.

IntelliRupters IR 3 and IR 7 experienced an extended loss of voltage and tripped open. Then IntelliRupters IR 2 and IR 6 closed, restoring service to their associated line sections, using power from Substation 1.

State Grid engineers were anxious to retrieve data associated with the event. But the SCADA connection to the IntelliRupters was not functional. Using a computer with access to the fiber-optic network, they ran IntelliTeam Designer, to poll the affected devices and compile an event summary. The event summary was then replayed on the single-line diagram used to configure IntelliTeam SG. The engineers were impressed that it took only minutes to gather data from the IntelliRupters and demonstrate the event.

The actual loss-of-voltage event thus trumped the planned site automation testing, as it demonstrated half the scenarios to be effected.

To verify that no automation operations would occur when a hot line tag is set on an IntelliRupter, the State Grid engineers applied a hot line tag to IntelliRupter IR 2. As expected, IntelliRupter IR1 and IntelliRupter IR3 went out of “Ready.” A loss-of-voltage event was then simulated; no automatic operation subsequently occurred.

A script was used to simulate a fault between IntelliRupter IR 4 and IntelliRupter IR5. To verify proper performance, State Grid engineers waited near the IntelliRupters which were expected to operate. Indeed, IntelliRupter IR 4 tripped open and locked out. Then IntelliRupter IR 5 opened to isolate the fault. And IntelliRupter IR 6 closed to restore power.

The engineers initiated the return-to-normal process by closing IntelliRupter IR 4. IntelliTeam SG responded, and returned all the IntelliRupters to their normal positions.

On the second day of the planned site automation testing, another actual event took attention away from the planned tests. This time, a fault occurred downstream of IntelliRupter IR 1.

IntelliRupter IR 1 tripped on overcurrent protection. But the circuit breaker at Substation 1 opened as well. Since the circuit breaker did not reclose, IntelliRupter IR 1 had no source voltage, and could not continue its test sequence. IntelliRupter IR 1 locked out to isolate the fault. IntelliTeam SG identified that line section as faulted and did not allow automatic restoration.