1.0   GENERAL

1.01   The automatic restoration system must be comprised of user configurable automatic switch groups. System expansion shall require nothing more extensive than connecting the configuration program to a single switch control for changing the system configuration to accept the expansion. Adding new devices to the system configuration shall require nothing more extensive than graphically entering the new devices on a one-line diagram in the configuration program. Script, logic, or code changes to the control program are not allowed.

1.02   The automatic restoration system shall be scalable, to operate any system size with the same software. Script, logic, or code changes to the control program are not allowed.

1.03   The automatic restoration system shall provide an interface module to enable existing devices that communicate with DNP3 Protocol to participate in the system.

1.04   The system shall be configurable to use one source and up to seven alternate sources for a given line segment. Script, logic, or code changes to the control program are not allowed.

1.05   The system shall provide optional user configuration of alternate source priority, when more than one source is available for a given line segment.

1.06   The automatic restoration system provider shall have a minimum of 12 years experience providing automatic restoration systems.

1.07   The automatic restoration system shall monitor line segment load conditions and user configured capacity limits to prevent overloading a switching device controlled by the automatic restoration system.

1.08   The automatic restoration system shall be configurable to check for sufficient alternate source capacity before using that source to restore load.

1.09   The automatic restoration system shall be configurable to allow for load transfer and load shedding to relieve overload conditions that develop after a restoration has occurred.

1.10   The automatic restoration system shall provide a means to test the automatic restoration logic in the automatic switching devices in the field through event simulations that are responded to by the automatic restoration logic residing in the automatic switching devices.

1.11   The automatic restoration system shall use multiple Autonomous Mobile Software Agents that work together over a geographically distributed network of intelligent devices. The coordinated interactions of these autonomous Software Agents shall form the intelligence needed to apply the rules of the automatic restoration system over an evolving system in order to adapt and restore power in response to multiple events on the system.

1.12   The automatic restoration system shall have an event playback system that collects and compiles logs from field devices into a single event file that can be played back on a one-line diagram of the automatic restoration system.

2.0   READY CONDITION

2.01   Each device in an automatic switch group must provide an indication of the ability of that group to provide automatic restoration.

2.02   Each automatic switch group shall operate independently, and provide automatic restoration for its line segment even if other switch groups are not ready to provide automatic restoration.

2.03 An automatic switch group that has been reconfigured by a successful automatic restoration must remain ready to select a different alternate source in the event a second or third automatic restoration is required before that switch group is returned to its preconfigured normal state.

2.04 Each automatic switching point shall accept a SCADA command that disables automatic restoration. Only the automatic switch groups, that the commanded automatic switching device belongs to shall be disabled by the SCADA command.

2.05 Each automatic switching point shall accept a local command that disables automatic restoration. Only the automatic switch groups, that the commanded automatic switching device belongs to shall be disabled by the local command.

3.0 LOSS OF PRIMARY SOURCE VOLTAGE

3.01 An automatic switch group must monitor its primary and alternate sources, and initiate automatic restoration when voltage at the source device is lost (or reduced to a predetermined level) for a predetermined period of time sufficient to confirm that the loss is not transient. When voltage is lost the source switch will be opened and then one of the available alternate source switches will be closed to restore power to that line segment.

3.02 Automatic restoration must be initiated when the source switch for a given line segment has been opened for extended loss-of-voltage, phase-loss detection, or voltage-loss counts.

4.0 FAULT DETECTION

4.01 The automatic restoration system must monitor fault current entering and leaving each automatic switch group. The faulted automatic switch group will have sensed fault current entering, and no fault current leaving that group at one or more switches. The automatic restoration system must never attempt to restore a faulted switch group.

4.02 In the presence of a fault, the automatic switch group must not attempt to restore power to its line segment until each of its automatic switches has appropriately performed its protection function and a manual command is given to close its primary source switch.

4.03 Fault isolation must be initiated by an automatic switch group when its source switch has opened on fault-current counts or has locked out, and no-other switch in the group has opened on fault-current counts.

5.0 RETURN TO NORMAL

5.01 The automatic restoration system must have the ability to automatically return to a predetermined normal state. This ability shall be referred to as return to normal.

5.02 Automatic return to normal must be configurable for open transition, closed transition, or none.

5.03 When closed transition return to normal is set and voltage returns to the automatic switch group's normal source switch for a predetermined period of time, the system shall close the normal source switch, and then return the other switches in the group to their configured normal state.

5.04   When open transition return to normal is set and voltage returns to the automatic switch group's normal source switch for a predetermined period of time, the system shall open the alternate source switch, and then close the normal source switch and return the other switches in the group to their configured normal state.

5.05   When return to normal is set to none and normal voltage returns to the automatic switch group's normal source switch, the system must wait for manual intervention to return the switches in the group to their normal state.

6.0   SCADA OPERATION

6.01   The automatic restoration system shall communicate using DNP 3.0 Protocol.

6.02   The DNP points shall include a control point to prohibit automatic restoration.

6.03   The DNP points shall include a status point to indicate the automatic restoration system is enabled or disabled.

6.04   The DNP points shall include a status point to indicate that the automatic restoration system is actively performing a restoration.

7.0   COMMUNICATIONS

7.01   The automatic restoration system shall use distributed intelligence that is not subject to a single point of failure.

7.02   The automatic restoration system shall use a mesh or loop communication system that is not subject to a single point of failure.

7.03   Automatic switching points shall use peer-to-peer communications to allow critical data to be shared directly between devices in an automatic switching group, avoiding the need to go through a centralized communication device.

7.04   The automatic restoration system shall use distributed intelligence and peer-to-peer communications to collect the necessary data to make the determination that results in the decision to close a switch and restore power.

7.05   The automatic restoration system shall use distributed intelligence and peer-to-peer communications to communicate to potential alternate sources without the need to route the messages to centralize logic controller.

7.06   The automatic restoration system shall provide a means to test communications between the automatic switching devices in the field through event simulations that are responded to by the automatic restoration logic residing in the automatic switching devices.

7.07   The automatic restoration system shall be capable of managing communication enhanced coordination of S&C IntelliRupter® PulseClosers with PulseClosing Technology™.