APPLICATION

SICAM PMS LS

Load shedding for industry grids is an integrated solution

Load shedding maintains the stability of electrical grids, especially in critical situations such as a sudden loss of generated power.
The load shedding function establishes and monitors the balance of generated and consumed loads by shedding consumer feeders with low priority. Automatic load shedding is the only way to prevent deep drops of system frequency or frequency collapse following a large disturbance.
Load shedding uses a distributed system architecture based on the IEC 61850 standard. The central load shedding controller at the plant level is based on a single or redundant SICAM RTU. At the bay level, the intelligent electronic devices (IEDs) are based on SIPROTEC devices for protection and control. Operator access is provided by Human Machine Interface (HMI) of the automation system.

Main functions

Fast power based load shedding (FPLS)
During critical events, low-priority consumer power must be shed very fast to restore the balance of generated and consumed power.
To determine how much power must be shed, the balance of the active power is calculated periodically for each contingency. The calculation determines which feeders will be shed, in case of a critical event based on the available power, spinning reserve, and actual topology. If a critical event happens, fast load shedding will react within 30 ms to 70 ms*. FPLS automatically recognizes multiple islands of the grid and operates separately for each island.

Dynamic power based load shedding (DPLS)
When the grid is operated in island mode, the load balance is calculated periodically. If the spinning reserve falls below an operator-defined threshold, consumed power is shed starting with low priority loads until sufficient spinning reserve is regained. DPLS occurs separately for each recognized island grid. DPLS is an optional function, similar to load inhibition that monitors large consumers like MV motors whose equipment is currently not operating. If the typical power consumed by these loads is larger than the current reserve, the loads are prevented from becoming energized.

Frequency-based load shedding (FBLS)
FBLS provides a backup shedding function. It works independently of power-based load shedding and uses a distributed architecture. One frequency relay per busbar section supervises the frequency for up to four thresholds. When a threshold is reached, fast shedding of predefined feeders is initiated automatically. Every stage of the frequency relays includes a time delay to prevent unwanted shedding. In addition, the rate of change (df/dt) can be monitored for faster reaction.

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*under definded conditions

Range for operation

Load shedding is configured using distributed IEDs that communicate via the IEC 61850 protocol. Very fast GOOSE messages ensure a short reaction time. Up to 300 loads can be shed based on the assignment of 50 priority levels. Feeders with the same priority are treated as a group and shed together.

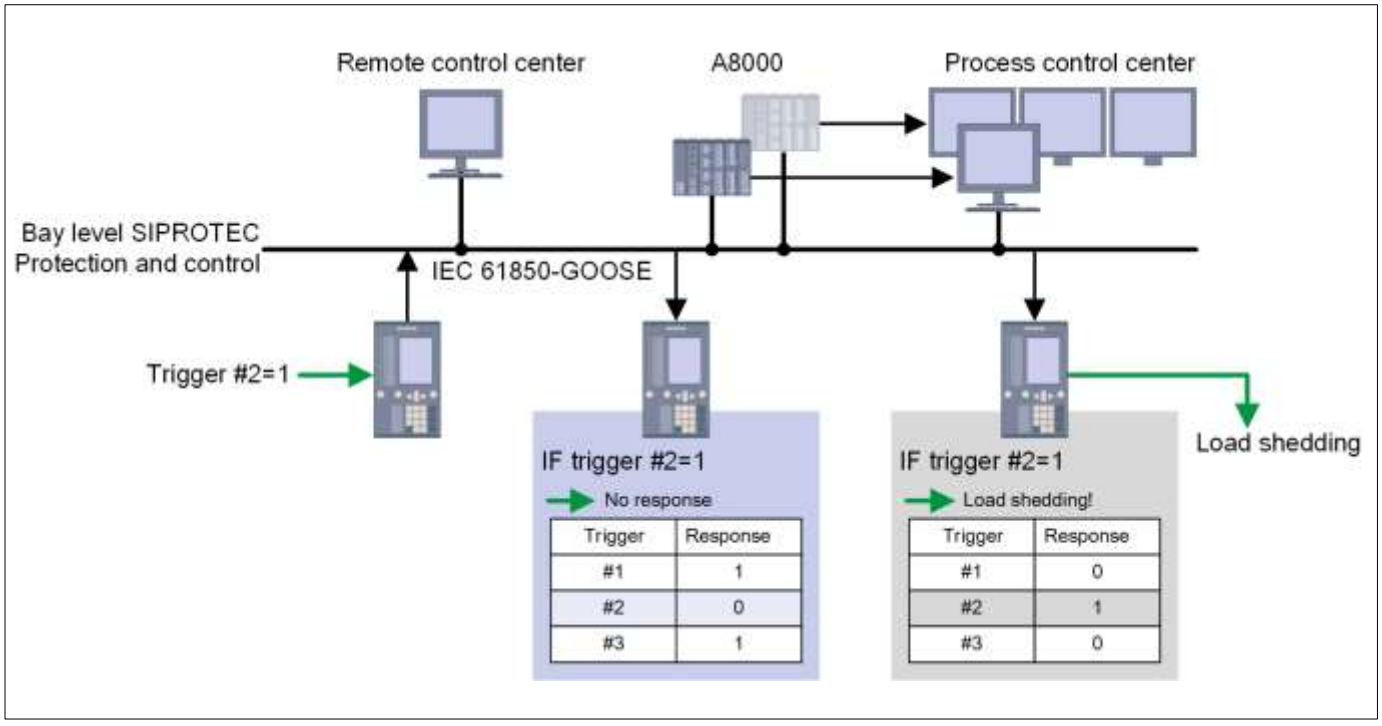
Up to 60 contingencies can be defined as critical events that trigger load shedding. The response time of FPLS is at 30 ms to 70 ms* maximum. This figure measures the time from recognition of a contingency to the activation of the trip signal for the affected loads.

System requirements

- A load shedding controller based on SICAM A8000 (CP-8050 with restrictions) with Ethernet connection to all IEDs via IEC 61850
- IEDs with IEC 61850 interface including GOOSE function and capability of fast functional plan charts
- An operator HMI based on SICAM SCC or Spectrum Power 5 for monitoring and tuning of LS.

Benefits

- Fully integrated into the substation automation system, only central controller is needed
- Power-based load shedding only trips minimum number of feeders
- Grid topology, for example for multiple islands, is calculated automatically
- Based on the IEC 61850 standard to ensure communication between all included automation devices. This significantly reduces parallel wiring, increases system availability and provides a future-proof solution
- Very high availability: redundant controllers (option) and independent FBLS as a backup ensure system availability.



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