



Reliability Scenario

Background Information

"Protection, well integrated with the class of service desired, may reduce capital investment by eliminating the need for equipment reserves in the industrial plant or utility-supply system.

While the protective devices are the watchmen of the power system, the industrial electrical engineer must be the custodian of the protection system. Adequate and regular maintenance and testing should be done, as well as reanalysis of the protection scheme when major system changes occur."

-- IEEE Red Book, ANSI/IEEE Std 141-1986

Reliability costs are typically driven by:

- planned outages, such as regularly scheduled maintenance or upgrades, and
- unplanned outages, usually the result of a lack of reliability and often requiring repair to get a system functioning again

Both are influenced by the system's troubleshooting capabilities and tools.

Planned Outage/Maintenance

Historically, maintenance has been done on a predetermined schedule, with little or no device history to indicate where a problem might be.

Entellisys' reliability is enhanced by the following:

- Continuous self-monitoring and diagnostics
 - Any electronic component malfunction or failure will be flagged and you will be notified.
 - In most cases, component malfunction or failure will not affect protection, metering or any other user function and enables you to plan maintenance when it is convenient.
- The availability of metering information at each circuit (without having to install additional hardware or wiring) allows you to compare values at each circuit point from any Entellisys Human Machine Interface, including from your desktop or laptop. This eliminates maintenance just to see if the trips are working.
- Entellisys tracks circuit breaker usage and load interruption data and informs you when a substantial percentage of perceived life is used up and maintenance should be planned

Extensive Troubleshooting

Entellisys has unique features that can help you fix a problem before it occurs:

- Almost 600 separate alarms, easy to set up and change
- The ability to meter every circuit without additional hardware and wiring
- Synchronized wave form capture at all circuit points

Whether the timing of events is causing voltage and current fluctuations, or you're encountering harmonics problems, Entellisys' waveform capture will inform you.

Unplanned Outages

Entellisys integrates reliability and protection as follows:

- A simplified system design, drastically reducing the number of components and wiring
 - Conservatively figure a 50% to 70% spare parts reduction
- Because Entellisys' components are outside the circuit breaker, they are larger and more robust.
 - The components have been through integrated system testing, such as EMI
 - They deploy faraday and other, tougher cases, enclosures and packages
- System redundancy, so that there is no single point of failure
- Backup protection
 - LSIG settings at the CPU always operate in the background
 - If zone-based functions are 'turned off' because the required criteria aren't met, then the CPU's LSIG functions are the next level of protection.
 - If the CPU isn't working or communicating with a particular messenger, then the backup LSIG at the messenger itself provides a third level of backup.
 - If selected by the user, all these functions operate simultaneously 100% of the time
 - At any one time, the fastest will signal the circuit breaker to open (trip, if protection is required).
 - Typically, the fastest will be the zone-based functions unless the instantaneous setting has been chosen and the fault is high enough to cross that threshold, at which point instantaneous will be faster
- The zone-based algorithms can have designated back-up circuit breakers: they can operate in case the primary controlled circuit breaker does not do its job, regardless of the reason.
- LSIG backs up the zone-based function
- Messengers back up the CPUs
- Zone-based functions have designated backup-trip targets

In addition, Entellisys's extensive safety options and protection features may result in additional savings due to a reduction in PPE levels and related clothing.