Allow No Interruption in Operations – Use Bump-less Transfer between Utility Transformers and On-site Generators

Most loads can tolerate a short break in power. Hospital emergency power systems, for instance, are designed to handle short power breaks as long as power is restored to vital circuits within ten seconds. Emergency loads requiring fast restoration are supplied by engine-generator sets that start upon failure of the normal supply and a transfer switch, which transfers the vital load from utility supply to the alternate source when it becomes available. Typically, there will always be a break in power to the load anytime the load is switched, even if both power sources are available. The key factor in these systems is maximum reliability. A momentary interruption is acceptable; a sustained or prolonged interruption is not!

On the contrary, there are some mission critical applications, where even momentary interruption is not liked and power continuity is considered important for life, safety or economic reasons. These applications require two independent sources of power viz city-power and on-site power generation. In the event of a failure or abnormality of the city-power supply, the vital load is transferred to the on-site power generators.

Ideally, this transfer should cause no interruption to the load and should involve no major transients. It is possible to accomplish such a transfer where the application requires absolute continuous, "no-break" power at all times. To do so, it is essential that both sources of power be continuously available.

Currently, systems consisting of modified transfer switches (closed transition transfer) are proposed as an economical way to accomplish "no-break" switching. The devices achieving these are called bump-less transfer panels.

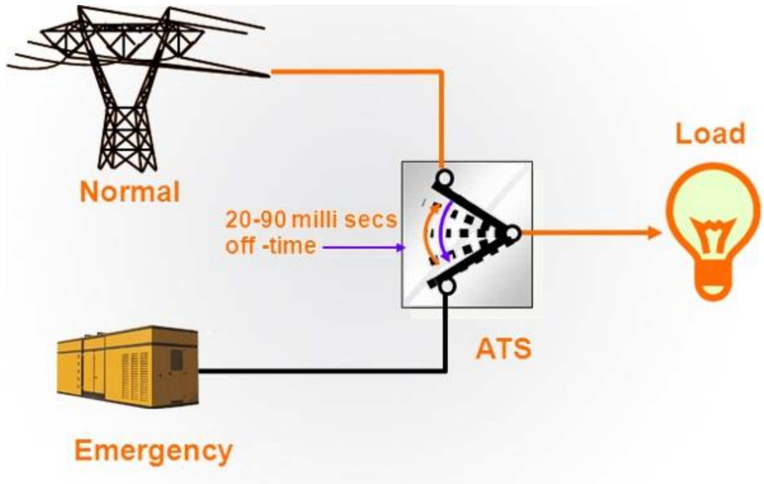
ESL provides these panels based upon Deep Sea Controllers, which can also take advantage of the scheduled power outages in the main cities and thus provide no-break power transfers on either side of the mains failure. The site-generator is started shortly before the scheduled mains outage. As it attains required speed and voltages, the site load is transferred from mains to the generators, without interruption, using passive synchronization. Same cycle is repeated upon restoration of the mains and there is no interruption in the operations, no loss of productivity, whatsoever.

Let us now review the transfer systems very briefly and see how they function:

TRANSFER SYSTEM

1. OPEN TRANSITION

    - The conventional transfer of a critical load between power sources is accomplished with a double-throw (either city-power or site-generator) transfer switch arrangement. Historically, transfer switches have been designed with a positive mechanical interlock that absolutely prevents both sources being closed to the load at the same time.
    - There will always be a break in power until the alternate source is available.



OPEN TRANSITION SWITCH

- In most instances, it is desirable to have a short time delay before retransferring the load automatically in order to assure that the utility supply is going to remain available.
- This is also called break-before-make transfer system.

2. CLOSED TRANSITION TRANSFER SWITCH (CTTS)

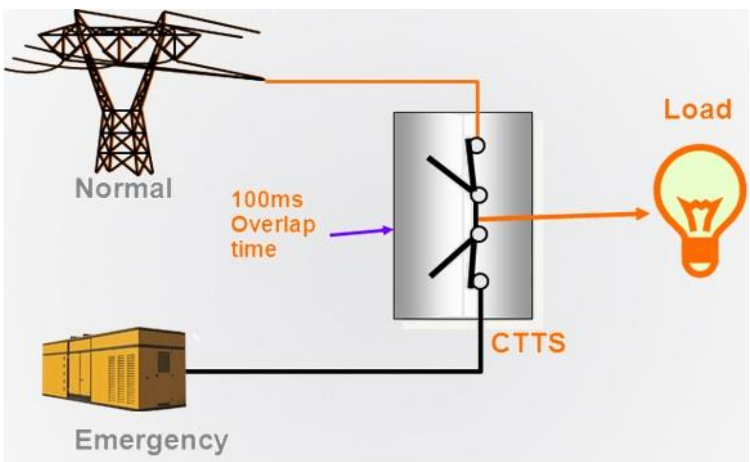
- When testing a system (no actual power loss) and when returning the load to its normal source, both power sources are available, and it is possible to accomplish a "no-break" transfer. All "no-break" transfer schemes involve paralleling of the two sources for some period of time. Since conventional transfer switches have mechanical inter-locks to positively prevent paralleling of the two sources, they cannot be used. It is necessary, therefore, to either:

a. Replace the transfer switch with paralleling circuit breakers and controls.

- This requires replacing the transfer switch with two electrically interlocked circuit breakers, synchronizing controls, some type of power transfer control, and a full set of protective relaying for both sources.
- If only one power source is available, the circuit breakers operate in a "break-before-make" configuration, the same as a conventional transfer switch (but without the positive mechanical interlock).
- If both power sources are available (while testing and retransferring), the synchronizing controls bring the alternate source engine-generator into synchronism with the normal utility source, parallel them, and gradually shift the load from one source to the other.
- This type of system can provide a "no-break" transfer during test and re-transfer to city-power.

b. Provide a modified transfer switch that has overlapping contacts some of the time (closed transition transfer switch - CTTS).

- In the event of an unscheduled power failure, this transfer switch operates in a conventional “break-before-make” mode.
- However, before a scheduled power outage and during retransfer upon restoration of city-power, the sources are paralleled (make-before-break). To accomplish this, the mechanical interlock has been removed.
- Relays are provided to check the relative phase relationships and the relative voltage and frequencies of the two sources. When the voltage and frequency are within approximately 5% and the phase relationship within approximately 15%, a signal is given which causes both sets of contacts of the transfer switch to be closed to the load at the same time, paralleling the two power sources.
- After a brief period, one side of the switch is opened, leaving the load connected to the other source. The transfer thus occurs with no apparent break in power.
- Protective relaying is not necessary (since the sources are only in parallel for a short duration, i.e., 100 milliseconds).



CLOSED TRANSITION SWITCH

- As no active synchronizing controls or protective devices for either source are provided, generally, the cost of such a system is lower in comparison to true paralleling controls.
- As these systems do not employ any active synchronization, there is no way to automatically adjust the voltage or frequency of either source. There can be issues with respect to power transfer control to gradually transfer the load between the two sources.
- The sudden application or removal of large block loads from the engine-generators, as they are paralleled with a utility, can cause system disturbances which can be detrimental to a sensitive load.
- Care should be exercised as in the event of a utility failure, an on-site power source, paralleled with the utility grid, even momentarily, could energize utility lines.
- Incorrect paralleling of an on-site generator with the utility can result in destruction of the engine-generator itself.

SUMMARY

Conventional open transition transfer switches offer a proven reliable method of transferring between two power sources. The power interruption that occurs with conventional transfer switches may not be acceptable in some applications. Two options are available on systems that cannot tolerate any power interruption; one is an active synchronizing method with protective relaying and meets typical utility company approval requirements. Other is a lower cost, passive synchronizing system known as BUMPLESS TRANSFER.

ESL uses marine compliant Deep Sea Controllers for bump-less transfers. These allow:

1. AMF operation,
2. Synchronization between generators and utility transformers (real and reactive power load sharing with up to 32 generators),
3. Breaker monitoring and control,
4. Open- close control of breakers
5. Open / closed transition between generators and utility,
6. Active / passive synchronization,
7. Soft loading / soft unloading through programmable operation sequences using Deep Sea's DSE Controller software, which enables adapting to specific needs.

To install bump- less transfer systems on your existing generators, please consult ESL at customercare@eslpk.com and get a return on investment of less than a year.