Parallel Redundant vs. Isolated Redundant
by John Mock

When selling Powerware Plus 30-300kVA or series 3000M products into a situation that requires, or may grow into a redundant opportunity, the customer may ask for a comparison of parallel redundant and isolated redundant systems. First, the customer should understand that we can provide isolated redundant configurations if that’s what is really desired. It is a simple configuration that anyone can do. No problem (almost). However, we believe parallel redundancy is a better, more reliable, configuration. Redundancy in an isolated (or stand-by) configuration depends completely on the successful transfer of the load by the on-line (primary) UPS to its bypass and the graceful acceptance of that load by the stand-by (secondary) UPS. Theoretically, it could be a 100% load step which is a pretty serious bump.

A successful transfer is a four step affair:

1. Recognition
   The primary unit must recognize that a transfer is required.
2. Qualification
   The primary unit must ensure that the transfer is feasible:
   - Bypass source is available
   - Bypass source is in sync
   * Voltage
   * Frequency
3. Execution
   The actual transfer action has to take place:
   - Static switch must turn on
   - The primary unit’s inverter must disengage
   - If there is a wrap-around breaker, it must close successfully.
4. Acceptance
   The secondary UPS must accept the load step and maintain a voltage variation within limits that are acceptable to the critical load. Actually, since the secondary unit is not supporting any load, one cannot be certain it is operational and will accept the transfer at all until it is attempted. What a time to find out there is a problem!
These four steps are in series. If any one of the four steps fail, the transfer fails and the load will be dumped. Remember, this is an emergency situation. There is no room for a slip. If the reason for transfer is a faulted bus, the transfer must take place TWICE before the load bus is attached to a power source capable of clearing the fault (through the bypass of the secondary UPS). If the reason for transfer is a failed primary UPS, the module cannot be isolated for repair because the secondary UPS is feeding the load through the bypass of the primary UPS. If there is a maintenance bypass, the load can, of course, be transferred to it but if UNPROTECTED power is acceptable, why spend the money for redundancy?

A PARALLEL redundant system has a number of advantages that increase the availability of protected power to the load and gives the customer fewer things to worry about where support of the critical load is concerned.

1. The two most critical elements in the isolated redundant scheme are eliminated. Execution and Acceptance,
2. The Qualification stage is minimized because the normal operation of a parallel redundant configuration is for the modules to share the load which means they must be in sync for both voltage and frequency.
3. If a module is taken off line for maintenance, the remaining module AT WORST will suffer a 50% load step which substantially reduces the risk of voltage variations outside the limits of the critical load (its safe to say the risk is eliminated). You can be sure the on-line module is operational and will accept the transfer because it is already sharing the load.
4. The unit that is off-line is isolated so maintenance can be performed.
5. Protected power to the load is maintained by the on-line unit and automatic transfer to bypass is still an option if necessary.
6. If a faulted bus occurs, only one transfer is required to reach a power source (the feeder bus) capable of clearing the fault.

If the prospective customer understands these important points, the competitive influence on a bid can be reduced or eliminated:
- The Liebert S300(50-125kVA) is not designed for parallel operation.
- The MGE S2000(50-125kVA) is not designed for parallel operation.
- The MGE COMET (50/65/80kVA) is not designed for parallel operation.
- The MGE EPS 6000(150-4500kVA) is designed for parallel but not with a common battery,
- The Liebert 600T(150-3000kVA) is designed to parallel.

The Exide Electronics Powerware &REG; Plus UPS offers parallel redundant capability from 30-300kVA and unprecedented reliability with its Hot Sync Tie&REG; capability, only four PCBs per module, and automatic battery testing capability. The Exide Electronics S3000M has set the standard in the industry for twenty-five years where the subject is paralleling, load sharing, and selective shutdown.
These are strong features! Don’t let your customer be mislead by a technology that does not provide the finest power protection available.

An isolated redundant configuration can be an economic way to add a measure of redundancy at a site where UPS modules exist but they are by different vendors or where a number of single modules exist and the customer wishes to move up to a higher level of availability using the existing equipment. As long as the primary module has a dual input and the secondary module is as large or larger than the primary module, they can probably be connected in an isolated redundant configuration. Although it does not offer the same level of availability as a parallel redundant system, it’s better than a single module.

There is a white paper on the street (by EPE/MGE, of course) that purports to show that an isolated redundant configuration has a higher MTBF than a parallel redundant configuration. As in most statistical analysis, knowing what is in(or not in) the numbers is important. In this case the assumption is made that the theoretical UPS works as designed... A transfer to bypass will always happen successfully and the secondary module will always accept the load gracefully. But if they don’t? That is the question that is ignored in the analysis. A parallel redundant system eliminates the question.