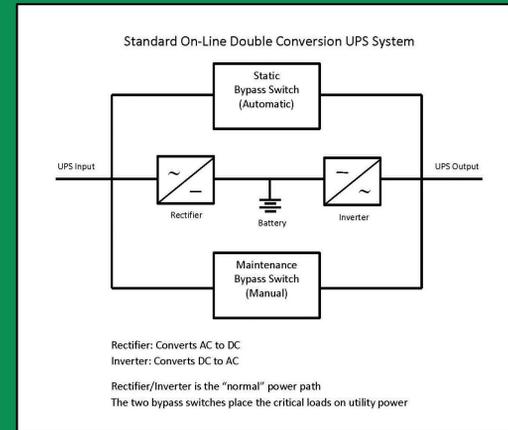


# Fermilab's Grid Computing Center Power Systems

## Series 610 Uninterruptable Power Supply



- ✓ Operating efficiency of up to 94%
- ✓ MTBF in excess of two million hours
- ✓ UPS rating: 1000kVA, 900kW, 0.9 PF
- ✓ AC Input / Output Voltage: 480VAC
- ✓ Battery Holdup Time: ~8 minutes
- ✓ LS2-600 2V 600Ah Sealed Lead Acid batteries
- ✓ 240 batteries per UPS;  $2V * 240 = 480V$
- ✓ Battery Weight: 95lbs



The online UPS isolates the input from the output, the batteries will drive the inverter even when the AC input is lost, and there are no power transfer switches required

As the name implies, the UPS converts power twice. First the rectifier converts AC to DC. Next the inverter reverses the process and converts DC back to AC

- The role of the UPS system is to supply uninterruptible, clean power to the critical load. The UPS maintains a full-voltage, low-distortion output, even if the utility source power sags, becomes distorted or fails.

## Power Outages

- Utility power outages can be un-scheduled or planned. The Laboratory and ComEd ensure the utility power is highly reliable. Unscheduled outages fall into two categories – brief and extended
  - A brief outage is usually a fraction of one second resulting from a voltage sag or power interruption. The cause can be a feeder fault or a lightning strike from a thunder storm. By conditioning the electricity, the UPS system protects this facility from these power glitches
  - An extended outage may have a duration of greater than one hour and be the result of a major failure. This occurs very infrequently and can completely shutdown this facility

## Renting Portable Generators

The rental generators provide power during scheduled power outages which occur about twice per year, typically between June and October, related to maintenance of the Laboratory electrical power grid

- Providing power to three computer rooms can require up to 6 generators
- Size of generators can range from 500kW to 1000kW
- It requires about a day to deliver, setup, test and have the generators ready
- A single 4/0 AWG 100 foot cable can weigh over 80lbs, capable of 400 Amps
- The nominal full load for the computing center is roughly 4.5MW (mega-watts)
- The first year generators were rented for GCC was 2007
- The setup and operation requires several different vendors and procedures
- Each computer room can use nearly 1MW (mega-watt) for computing equipment
- The cables required to connect the generators is over 1 mile in length if laid end to end

