

Backup power supplies

Electric devices are inherently dependent on electric energy. Without it they would not function. Most of the time we power these devices from the public power grid. However during power outages the flow of electric energy is disturbed and electric devices cease to operate. There are situations where such outages could have catastrophic consequences and thus we have to have backup options. Hospital systems that support life of many people are an example of such mission critical systems that have to withstand power outages. Computer networks, telecommunication systems and industrial production facilities also cannot cease to operate and thus rely on backup systems when power outages occur.

The simplest backup power supplies are secondary power sources – rechargeable batteries.



Battery cell utilizes an electrochemical reaction to create electricity. During charging a direct current is applied to the cell's terminals and chemical reaction is invoked. When the cell is connected to a device a chemical reaction creates a flow of electrons which in turn creates electric current and thus the cell is being discharged.



Because the voltage that electrochemical cells are capable of producing is small (around 1,4 - 3,6 V), they are usually grouped into batteries with higher voltages such as 12 V or 24 V. When combined correctly, such batteries can supply electric energy immediately and without interruption.

When the system's load exceeds the capabilities of traditional batteries we can utilize power generators to supply electric energy.



Power generator or diesel generator is an electric device that generates electricity from mechanical work. The generator consists of three basic parts – motor, alternator and splitter. The motor spins the alternator which in turn generates electricity that is stabilized and made available for consumption. The motors can be powered by diesel, gas or any combustible material.



Since the generators are kept offline to not waste fuel, there is about a minute startup time before they start producing power.

UPS is Uninterruptible Power Supply (Source). It is a single device or a system of devices that supply continuous power to other electric devices that cannot be unexpectedly powered down. In real world we sometimes refer to these devices as backup sources or uninterruptible

sources of power. UPS is usually connected between the primary supply of voltage (electric current) and the device or system that needs to have access to backed up power source.



UPS is basically a large collection of batteries. While the power from the primary source is on-line, the batteries in the UPS are kept charged at a constant level. This also enables the device to filter out power spikes as the batteries and internal electronic components either fill in or cut off the surplus or deficit of electric voltage. Immediately when the primary source of power goes down, the UPS starts converting the power stored in its batteries and without a interruption it supplies voltage until either the batteries run out or the primary source of power is switched back on.



The duration that the UPS can supply power to devices is variable and is depended on the capacity of the batteries that are connected to the system. The small UPS systems can supply voltage for several minutes while the big ones can last for hours and with the aid of diesel generators even for days.

The Uninterruptible Power Supply consists of these basic parts:

- Rechargeable batteries that store the energy needed when power outage occurs,
- Charging circuit,
- Inverter that takes in direct current from the rechargeable batteries and converts it into alternate current of much higher voltage that is needed by the endpoint electric device (such as a computer)

However modern UPS systems contain many other advanced components. The systems are capable of network communication, they can be connected directly to a computer or using special network protocols such as SNMP they can be controlled and monitored from remote locations. They can also contain special filters and surge protectors to protect electric devices from excessive voltages.

OffLine UPS systems are one of the cheapest backup solutions. The electronic device is powered directly from the power grid while at the same time a battery is connected to the device through a charging station. When the power grid goes down, respectively when there is a voltage fluctuation, a special electronic circuit switches to the battery powered inverter within 2 to 10 milliseconds.

OnLine UPS systems are used for mission critical applications such as powering datacenters or hospitals. The whole electric load is connected to an inverter which in turn generates required power from batteries or diesel powered alternators. In case the public power grid goes down, the UPS system steps in and continues to supply the power without interruption. Some UPS systems are capable of signaling devices when outage has occurred. In turn these devices can either log the event or prepare for shutdown.

VOCABULARY

cell – článok, bunka

source – zdroj

generator – generátor, zdroj, budič

outage – výpadok, porucha, strata

cease to operate – prestane fungovať

rechargeable – dobíjací, dobíjateľný

discharged – vybitý

splitter –

spin – točiť, krútiť

uninterruptible – neprerušiteľný

excessive – nadmerný

shutdown – vypnutie

backup – záloha, rezerva

supplies – dodávky, zásobovanie

inherently – neodmysliteľne

dependent – závislý

consequences – dôsledky

support – podpora, pomoc

immediately – ihneď, okamžite

exceed – prekročiť

consumption – spotreba, odbyt

combustible – horľavý, spáliteľný

fluctuation – kolísanie

waste fuel – vyhorené palivo