

Article

Power conditioning - Big data equals big power – why medium voltage UPS?

The tendency towards mega datacenters in the internet and IT sectors requires an increasing demand for stable power at single locations. With more demand for data storage (largely due to frequent uploads of photos to Facebook or other social media accounts), datacenters are becoming bigger and consuming larger amounts of power. They are beginning to take on a more industrial approach to power consumption. That said, more and more large critical industrial processes rely on a power quality level that cannot be provided by the public grid. The distribution of the electrical power within many of these large facilities is realized at medium voltage (MV) level.

Medium voltage distribution reduces losses and space by a simple reduction in current. As voltages increase, the current required reduces for the same power level. The modular design of a Static UPS simply allows a replacement of the grid-to-load interface from low voltage to medium voltage components, keeping the basic parts of the UPS and storage the same as for LV applications. In this way, the proven and familiar experience of working with the functionality and maintainability of a reliable LV UPS is maintained but the advantages of medium voltage are realized.

Mission critical applications that require safe and reliable power

Fast-growing online activity over the last decade has forced a rapid rise in both the space and electrical power required to operate datacenters. Accordingly, power density becomes higher, and cooling of these datacenters becomes critical. Industrial enterprises, such as semiconductor fabrication, and chemical and food industries, more often require a safe power supply, because major production losses caused by mains interruptions cannot be tolerated. Economies of scale mean single locations have grown larger, with the demand for a safe power supply reaching well into the tens of mega watts for many facilities. In addition, the production area is often widespread and distribution of a high level of electrical power throughout the location is necessary. Long distances in power distribution also have to be overcome in applications such as large airports or in electronics manufacturing facilities where the scale of the operation is vast.

Advantages of MV UPS technology

Integrating a medium voltage UPS system to protect these critical applications will reduce feeder ampacity. For example, 1 MW in 400/230 VAC system means 1443 A current per phase. If the voltage is 15 kV, the current for 1 MW power is only 115 A. Another feature of the MV UPS is that the system can be centralized, which helps manage floor loading and gives freedom in the floor plan. One of the major cost issues



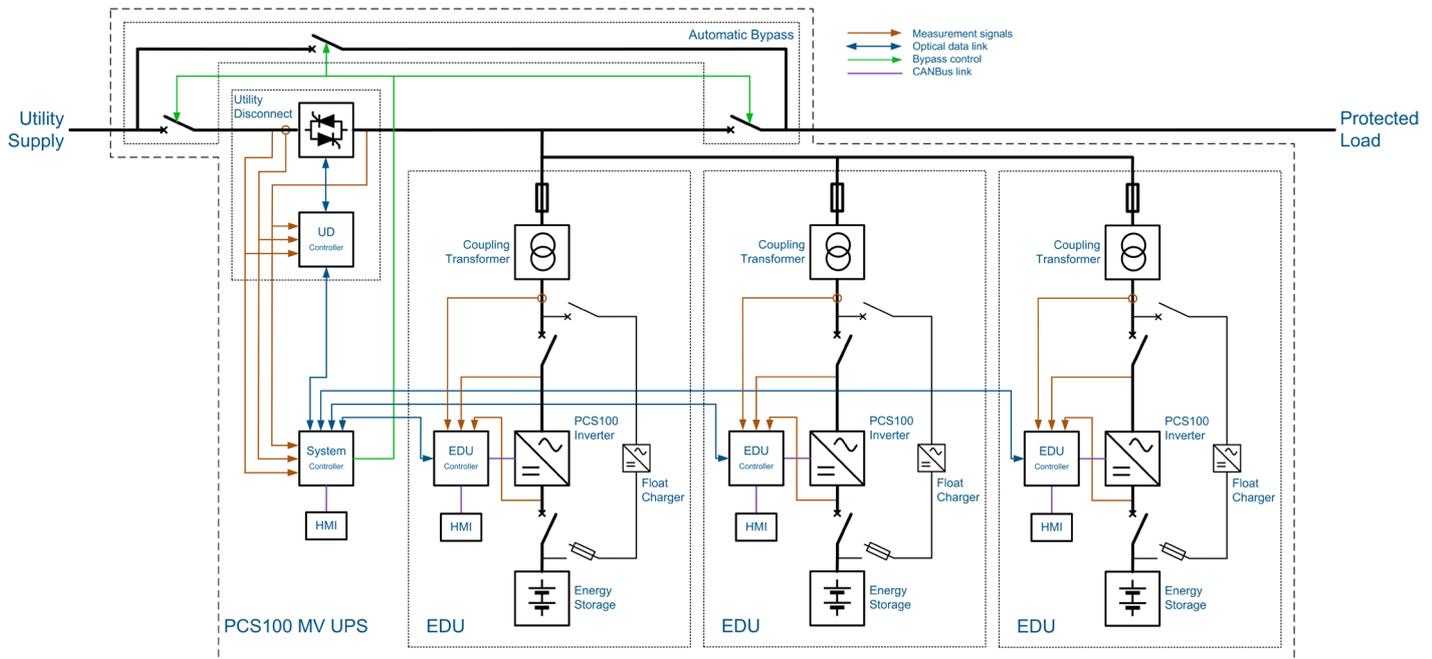
in a datacenter or a production facility is efficient use of floor space. Reducing the space for infrastructure equipment results in additional space for IT or manufacturing equipment.

Often the available area for the UPS system is limited, particularly in existing buildings, but the required power is increasing. High power, compact MV static UPS products are well suited to overcoming this challenge. Modern static MV UPS systems also make extensive use of low voltage components, including the entire power electronics, energy storage and control systems, taken from standard and proven low voltage units.

Besides the footprint, electrical losses are an important point to consider. Particularly at long distribution distances, in large industry facilities or wide spread areas such as airports, distribution losses can become significant. For longer distribution lengths, the influence of the cable will rise, which will give a better result at medium voltage.

Typical MV applications now seen in today's economy

In large high technology manufacturing facilities, such as those used for semiconductor fabrication, the role of MV UPS systems is well established. The MV UPS provides plant-wide secure power, protecting from all grid disturbances and providing a buffer period before switching to local generation (in the case of a major outage). More frequently, the UPS is required to condition the incoming power, removing the sags and short duration micro-cuts caused by faults in the external power network.



The PCS100 MV UPS can start at 2 MVA and grow in size as the factory or datacenter develops

In mega datacenters, the philosophy is quite similar. Many design options are possible, including performing the UPS function at medium voltage and having MV distributed to the individual floors of the datacenter. Transformers, complemented by static transfer switches close to the IT equipment, can be used to create an isolated redundant back-up line with two alternative power supply paths to the loads [1].

MV UPS may well be behind every large scale critical application in the future

Increasing power density and total power demand at single sites, combined with rising requirements for high reliability power in IT, business and production facilities, are today's trends. The power supply system has to respond with suitable UPS and distribution designs. High power low voltage systems lead to current limitation in the distribution and, often, long distances need to be bridged, but the step to medium voltage level is a suitable technical solution. MV systems reduce cable size and losses, which increases the efficiency of the distribution network. Additionally, the utilization of integrated high power MV UPS systems can reduce the number of components, such as switchgear and cabling. The basic parts of modern static MV UPSs, including the power electronics and energy storage, are taken from standard and proven low voltage equipment.

ABB's PCS100 MV UPS is available in multi megawatt ratings and enables tailored solutions to large IT, business and production facilities. The PCS100 MV UPS has been designed to provide clean, reliable and efficient power at a lower total cost for customers consuming high levels of power. Perry Field, ABB's General Manager for Power Conditioning, outlines one of the main features of the MV UPS. "The PCS100 MV UPS can start at 2 MVA and grow in size as the factory or datacenter develops. As well as EDU modularity, the PCS100 MV UPS has inverter modularity, giving extremely high levels of availability through inverter redundancy. The

advantage is that the customer does not need to invest as much money at the start and they can be flexible – growing their infrastructure as their business grows."

The single-conversion topology used is a natural choice for medium voltage as losses are extremely small, meaning efficiencies well in excess of 99 percent can be achieved. The PCS100 MV UPS can be installed to protect a complete supply or just selected sensitive loads.

References

[1] Frank Herbener, Iso-Parallel UPS Configuration

To find out more about ABB's power protection solutions:

Web: www.abb.com/ups

Email: powerconditioning@abb.com

PCS100 MV UPS Video: https://www.youtube.com/watch?v=g6oUfmZh3ml&index=1&list=PL-Q2v2azALUPKFQqlbhFgabb_6df26fqU

