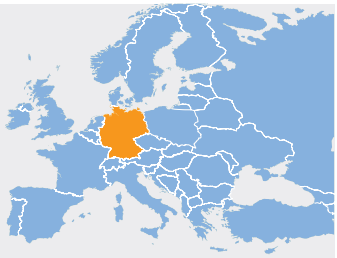
EMERGENCY POWER FOR THE CHARITÉ – EUROPE'S LARGEST UNIVERSITY HOSPITAL

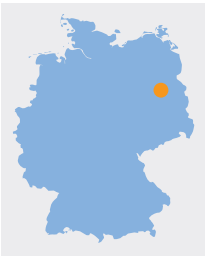
TURNKEY SYSTEM ENSURES HOSPITAL SERVICES IN CASE OF MAIN POWER GRID FAIL

// **Who:** Charité University Hospital Berlin

// **What:** Emergency power supply for the north section of the hospital site Campus Charité Mitte provided by two diesel gensets based on 12-cylinder Series 4000 engines including peripherals

// **Where:** Berlin, Deutschland, Europa





Since July 2010, two emergency backup gensets supplied by MTU Onsite Energy have been standing by to ensure that the Campus Charité Mitte north section of the Charité University Hospital in Berlin can continue functioning normally even if there is a mains power outage. The generator units are based on MTU type 12V 4000 G23 diesel engines with a combined electrical output of roughly 1,700 kVA and can be up and running inside ten seconds. MTU supplied a turnkey system – as well as the diesel gensets it includes cooling, fuel and exhaust systems, air supply and extraction system and control system.

Roughly half a million patients a year, 7,000 operations a month and 20 births a day: those are the figures that define the Charité University Hospital Berlin as the largest of its kind in Europe and among the most highly regarded worldwide. Spread across four sites, its 103 clinics and institutes employing around 4,000 doctors and scientists cover the entire spectrum of medical science. In 2010, Berlin's fifth largest employer and third largest electricity consumer celebrated its 300th anniversary. In order to be able to maintain uninterrupted hospital services even if the mains power grid fails, the Charité has an extensive emergency power supply system. To provide backup power for the north section of the hospital site Campus Charité Mitte, the hospital recently chose an MTU Onsite Energy system to replace the old emergency generators. "The power supply is the backbone of hospital operation – without it, nothing works," explains Thomas Flügel, technical manager at the Charité. "In a hospital, you can't afford to experiment – you have to be able to rely on the plant one hundred percent."

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/ // / Thomas Flügel, technical manager, Charité

Components of the turnkey installation

MTU Onsite Energy supplied the hospital with a turnkey system. Based on two diesel gensets driven by MTU type 12V 4000 G23 engines, it also includes cooling, fuel and exhaust systems, air supply and extraction system and control system. The fuel supply is provided by a 2,000-liter service tank for each genset and a 20,000-liter storage reservoir. That means that the emergency

Campus Charité Mitte site

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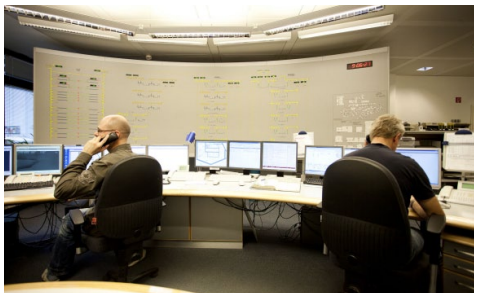

From there the staff has everything in view: A look inside the technical control room of the Charité at the Campus Charité Mitte site, in the background the overview switch panel for the electrical supply of the Campus.

power supply can operate for around 50 hours. Each of the gensets has an electrical output rating of 850 kVA. The engines themselves have a higher power rating so that they have sufficient reserves for future expansion of the site.

The plant is housed in a purpose-built brick building on the hospital grounds which accommodates the gensets on the ground floor and the cooling system on the first floor. This configuration is of benefit due to the volume of air required to cool the systems. A large display window gives everybody — be they patient, visitor or hospital employee — a clear picture of the backup power plant.

Project planning services

Commissioned as general contractor by the Berlin urban development authority, MTU was responsible for overall planning of the project including construction project management and thus also for the installation of building fixtures and fittings such as chimneys, underground tank and firewalls. In addition, MTU itself installed and set up the genset control systems and implemented coordination with external interfaces such as the central emergency power supply control system.

MTU also planned for parameters not specifically demanded but necessary for a smooth-running process such as fuel consumption during trial runs. "We were glad to have a large, experienced company such as MTU Friedrichshafen onboard in this project," relates Thomas Siebeck, managing director of the engineering office IBB Ingenieurbüro Siebeck, the consultants responsible for overseeing the building work on behalf of the Charité. "It was important for us to be able to utilize the wealth of knowledge that the company had to offer."

The planning of the installation involved two central tasks — firstly, the strict noise abatement regulations due to the fact that the generator building is located in the immediate vicinity of patient accommodation. "The noise insulation was designed by MTU so that the 120 decibels — equivalent to a pneumatic drill — produced by the gensets when running is hardly perceptible outside the building," explains Jochen Thurner, MTU project manager. Secondly, the German clean air regulations prescribe stringent exhaust emission limits due to the inner-city location of the Campus Charité Mitte site. The energy plant specialist was able to meet those requirements by using emission-optimized engines with diesel particulate filters fitted to the exhausts.

The backup power supply systems provide the electricity for important installations such as the main diagnostic suite and the nuclear medicine, dermatology, psychiatry, neurology and pathological diagnostics departments. The main heating system and the kitchen are also dependent on the emergency gensets in the event of a mains power cut.

Up and running in ten seconds

If the mains power grid goes down, the two emergency gensets start up entirely automatically with the aid of starter batteries — of which there are two for each genset. Starting only requires one starter system, the other acts as redundant backup for additional safety. The start-up command comes from the overall emergency power supply control system which can see all loads to be supplied. When there is a power cut, each generator unit starts within one second and runs up to its rated speed of 1,500 revolutions per minute, at which it produces a frequency of 50 hertz.

So that they can be up and running as quickly as possible, the engines are kept continually preheated. Due to their high torque, they have rapid and high load uptake capabilities. The gensets achieve fully operational status with stable voltage and frequency levels within ten seconds. From that moment on the electrical load can be connected. In the case of the Charité hospital gensets, the high load uptake capabilities mean that all electrical equipment allocated to the emergency power supply can be connected at once. Other power-consuming equipment will follow as planned and required.

The emergency power supply comes from the generators at a voltage of 10,000 V and so has to be converted down to a usable low voltage by a transformer. Backup power supply systems usually operate at low voltage so that the electricity is directly usable. 10,000 V is the high voltage usually used by public power grids to distribute electricity across a city. "We also use a high voltage of 10,000 V for our internal power grid because we have to work with high power

levels," explains Flügel. The Campus Charité Mitte site, for example, has a power requirement of around 12.5 MVA, which roughly equates to the output of one power plant unit. "The advantage is that we can synchronize directly with the mains power grid. In addition, the electricity can be distributed over long distances with lower losses and the emergency supply to all buildings can be managed by control centers."

Thoroughly tested under real conditions

Before the emergency power systems were delivered to Berlin and went into operation in July 2010, MTU comprehensively tested them using a simulated load connection sequence on its own ultramodern genset test bench in Friedrichshafen.

What is more, Flügel regularly runs emergency drills — not only with the hospital staff but also on the backup power supply systems. Once a month there is a test run to make sure that the emergency power supply systems function perfectly. The electricity produced in the process is fed into the hospital grid.

MTU Onsite Energy — not an isolated case

The Charité hospital doesn't just use backup power gensets supplied by MTU Onsite Energy for the north section of its Campus Charité Mitte site. The south section also has two gensets driven by Series 4000 engines. And since October 2010 on the Campus Virchow Klinikum site in the North-Berlin district of Wedding, emergency gensets driven by the first two of the new MTU Series 1600 engines to be supplied in Germany have been in use. Their type 12V 1600 G20F engines have an electrical output of 700 kVA each and supply the research building on the site incorporating the data center and central and satellite laboratories with electricity if there is a mains power failure.

MTU Friedrichshafen GmbH
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Photo credits: Page 1, Charité – Universitätsmedizin Berlin. Page 2, Charité – Universitätsmedizin Berlin (top), MTU (middle and bottom)

MTU Onsite Energy is a brand of Rolls-Royce Power Systems AG. It provides diesel and gas-based power system solutions: from mission-critical to standby power to continuous power, heating and cooling. MTU Onsite Energy power systems are based on diesel engines with up to 3,400 kilowatts (kW) power output, gas engines up to 2,150 kW and gas turbines up to 50,000 kW