Customer Success Story:  
North Estonia Medical Centre

Eaton’s electrical distribution solutions meet medical center’s demanding expectations

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Sergei Kedrov, North Estonia Medical Centre

**Location:**  
Tallinn, Estonia

**Segment:**  
Commercial Building

**Challenge:**  
To build a highly reliable, safe and economical electrical distribution system for a new hospital block housing critical applications

**Solution:**  
Power Xpert FMX medium voltage switchgear, Power Xpert 9395 UPS systems, Arcon arc fault protection, various low-voltage switchgear including xEffect digital miniature circuit breakers and NZM circuit breakers, SmartWire-DT intelligent wiring

**Results:**  
Eaton’s solutions resulted in extreme reliability, protection and safety where absolutely essential, while achieving low maintenance capital and operating costs.

**Background:**  
The North Estonia Medical Centre is one of the top health care providers in the country. A patient-centered institution committed to professionalism, innovation and teamwork, the Medical Centre has more than 3,500 employees consisting of doctors, nurses, caregivers and specialists, all working for the good of patients. Over 500 of them are doctors and at any given time, 100 medical residents are also based at the hospital. The hospital consists of seven clinics and 31 specialist centers. Similarly to European university hospitals, the North Estonia Medical Centre offers medical care in all specialist fields apart from ophthalmology and obstetrics. Over recent years the Centre has been going through massive reconstruction and expansion to become the most modern hospital in the Baltic region; the project is now two-thirds completed. One phase involved rebuilding a substation which accepts a medium voltage power input and provides a low voltage supply to other parts of the site. Another was a new ER (Emergency Room) block called X-Block; an innovative diagnostics and active treatment complex, where the hospital’s most technology dependent treatments are administered. The most recent and largest phase concerns the renovation of the Center’s C-Block premises that house clinical units, logistics and a waste center as well as other staff and technical facilities.

**Challenge**  
While most enterprises today depend heavily on a reliable electricity supply to ensure their success and ultimately their survival this dependency takes on an extra dimension for the Centre. Its 100% digital environment contains many types of sensitive medical equipment, X-ray machines, large numbers of laboratories with specialist equipment, and refrigerators holding medicines. Clearly, loss of power to such devices simply cannot be tolerated. Sergei Kedrov, Electrical Development Engineer for the Centre, was well aware of these considerations as he planned the electrical distribution system for the C-Block. He felt that confidence in the supplier was absolutely essential. Agreeing on an electrical distribution system that met their expectations on paper was of course essential, but a vital question was whether the solution actually delivered would live up to its reliability and performance as promised. Meanwhile, the Centre had further clear requirements for the C-Block; while being reliable and safe for everyday hospital work, the system had to be highly cost-effective to operate. This meant low...
maintenance costs and high energy efficiency. Maintenance should be easy to manage, so Eaton’s intelligence and communications capabilities should allow ready access to system status, and rapid diagnosis of actual and potential fault conditions.

Solution
The Center’s Electrical Development department turned to Eaton for a solution, partly because of the protection, efficiency and intelligence capabilities of their distribution, backup and switchgear components, but also through the essentially consulting role that Eaton had fulfilled over several years during the earlier projects. Eaton offered candid advice on technical approaches to take as well as which installers to use, which the Centre valued for its element of impartiality. “Eaton’s proposals have always been the best fit for the requirement, rather than the cheapest or easiest for them to sell,” commented Kedrov, “while their knowledge of installers and their track records have been equally useful.” The electrical distribution system is a complete multi-level hierarchy extending from Power Xpert FMX medium voltage switchgear systems, which are based on environmentally-friendly SF6 free technology, through various levels of low voltage panels for floors and departments, down to consumer units located close to points of use around the Block. Backup for the medical and IT equipment is provided by a pair of Power Xpert 9395 uninterruptible power supply (UPS) systems, while emergency lighting is supported by an Eaton system based on CEAG technology including a centralized battery and comprehensive monitoring functionality. Ultimate backup is available from a pair of large-scale generators. The main 9395 UPS system, which provides the medical equipment, has six units, with enough spare capacity to provide at least n+1 redundancy. Another 9395 UPS unit protects the server used for the Block’s IT system. UPS battery service life, at the Center’s request, is warranted for an extended period of at least 12 years. In the event of a power failure, battery autonomy is for 30 minutes, compared with a more usual 10 to 15 minutes of protection. In addition to the backup systems, reliability is enhanced by redundancy throughout the system. The main FMX medium voltage system configuration comprises 6 + 6 panels, while a second FMX installation with 3 + 3 panels in a separate room supports the generators. The low voltage distribution units also have electrical redundancy, with physical separation and firewalls using key safety areas. Safety and protection, as well as reliability, are viewed by the Centre as critical issues. Accordingly, Eaton’s advanced safety technology is employed throughout the system. The low voltage distribution units are built by Elrato, a leading Estonian panel builder that has worked with Eaton since 2005. These panels contain Eaton’s switchgear and Arcron arc fault detection and quenching systems. The fully-assembled panels are tested by Eaton in their laboratories and verified to meet their standards.

The Arcron system detects the light and increased current from an arc flash, and reacts by initiating a three-phase short circuit diverting the energy that would have otherwise fed the arc. The incoming circuit-breaker immediately disconnects the affected busbar section from the mains supply. Thus, the arc can be stopped before it has a chance to develop and cause injury or damage switchgear equipment. The entire process from detection to quenching is completed in less than 2 ms. Troubleshooting and maintenance is made easier and lower-cost for the Centre through Eaton’s intelligence and communications capabilities at both low voltage distribution and consumer unit levels. The NZM series circuit breakers used in the low voltage distribution panels all have SWV NZM communications modules; these connect the breakers to the SmartWire-DT intelligent wiring system. This allows the Center’s staff to monitor the breakers’ status in terms of alarm, errors, load currents, overload warning, trip signals and causes in real time. A second SmartWire-DT system has been installed into all ventilation and climate control boards, so any motor protective device trip or switching device malfunction is identified immediately. For both systems, all events are stored in log files, so problems can be immediately flagged and their causes and locations rapidly identified. The SmartWire-DT system was chosen as it significantly reduces the wiring complexity within control panels. This simplifies design, installation and commissioning saving time and money – while giving a better overview of system status. Communication with critical consumer units is similarly facilitated. These are fitted with xEffect digital miniature circuit breakers. By constantly monitoring their throughput current, xEffect devices can proactively report on abnormal levels. System status is also instantly visible through tri-coloured LEDs. Problem areas can be identified, and troubleshooting performed, before a failure occurs. This eases system maintenance and significantly increases power availability for the system’s critical load.

Results
In designing their electrical distribution system, the Center’s team faced a demanding set of challenges; extreme reliability, protection and safety were absolutely essential, together with easy maintenance and low capital and operating costs. Eaton’s technology and support ensured that they achieved this. Carefully balanced advice led to appropriate equipment specification and the right installers for a cost-effective installation, designed to maximize uptime and reliability. Safety, protection, and easy, reduced-cost maintenance are enabled by Eaton’s advanced technologies, such as Arcron, SmartWire-DT, xEffect as well as its maintenance-free and thanks to no use of SF6 gas environmentally-friendly range of medium voltage switchgear.

“Our relationship with Eaton has been built up over the history of the three major projects we have worked on together – the X-Block, the Substation and now the C-Block,” commented Sergei Kedrov, “and we know that we can trust them in terms of both what they recommend and what they deliver. Their systems have proven to be reliable, cost-effective and in compliance with our expectations. We are now looking at possibilities for clinics in other North Estonian locations, and will be inviting Eaton to offer their proposals for these as well.”