



Total power protection for the world's largest cruise ship

Oasis of the Seas sets sail with Eaton UPSs on board

Eaton supplied more than 20 double-conversion online UPSs for this giant of the seas. The Oasis's sister ship, Allure of the Seas, due to be delivered by the end of 2010, will also rely on Eaton's expertise to secure power distribution network on board

What's 361 metres long, 66 metres wide and attracts thousands of visitors every year? No, it's not the Eiffel Tower with a 40-metre extension placed horizontally – it's the world's largest cruise vessel, Oasis of the Seas. This giant cruise ship features 16 passenger decks, encompasses 225,000 gross registered tons, accommodates 6,360 passengers and 2,100 crew members, and towers 72 metres above sea level at its highest point. Oasis of the Seas set sail on its maiden voyage on 5 December 2009, and as well as its massive physical size, the vessel has giant-sized demands in terms of power consumption: its total requirement for uninterruptible power can be as high as 2,000 kVA. The need for power protection devices is equally massive.

"We supplied the cruise ship with more than 20 double-conversion online UPSs, ranging from 1 kVA to 350 kVA. The UPS delivery is without doubt the largest in our 40-year history of providing the marine industry with uninterruptible power systems," says Rauli Lehtonen, Sales Manager at Eaton Power Quality.

"The unparalleled size of the vessel and the variety of high-tech applications on board posed remarkable challenges in terms of power supply. One-hundred-percent reliable, continuous and clean power has to be guaranteed for the ship's safety and cruising-related applications as well as commercial applications that affect customer satisfaction the most. Our customer cannot risk losing power in applications such as navigation equipment and emergency power and lighting. A loss of load would result in highly dangerous situations at sea," explains Lehtonen.

Reliable power leads to an enjoyable experience

Conditions on board a ship differ significantly from those on

shore: the power distribution network is ungrounded, and the electricity generated by the ship's engines is not of uniform quality. That is why power needs to be double-converted for all critical applications. Ship vibration, shocks, inclination, temperature variation and very limited space present further challenges for the setup. In addition, every device securing safety and cruise-related systems needs to meet the stringent requirements set by various classification organisations.

"Eaton's answer is double-conversion online topology. All our marine UPSs incorporate this; it can protect critical marine equipment from all types of power interruptions that may occur in the ship's supply network. To guarantee continuous, high quality power to the most critical loads, the UPSs can be configured to provide parallel redundancy," Lehtonen says.

"Every Eaton marine UPS also has a hardened mechanical design, shock absorbers and a drip-proof cover. What's more, they also employ the same global technical platform and

To learn more about Eaton marine UPSs, visit www.eaton.com/powerquality/marine

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Eaton Corporation is a diversified power management company with 2008 sales of \$15.4 billion. Eaton is a global technology leader in electrical components and systems for power quality, distribution and control; hydraulics components, systems and services for industrial and mobile equipment; aerospace fuel, hydraulics and pneumatic systems for commercial and military use, and truck and automotive drivetrain and powertrain systems for performance, fuel economy and safety. Eaton has approximately 70,000 employees and sells products to customers in more than 150 countries. For more information, visit www.eaton.com, www.eaton.com/powerquality

the same core components as our standard UPSs. This enables the use of common spare parts and accessories and leads to effortless system upgrading, maintenance and service."

On board Oasis of the Seas, Eaton's UPS systems protect critical applications including emergency lighting, navigation equipment, ship automation and HVAC applications as well as casinos, theatres and other entertainment venues against disruptive power interruptions. The delivery consisted of a set of Eaton 9395, 9390, 9355 and 9155 marine UPSs.

"The project was a new milestone for us, as it saw the installation of the largest marine UPS we have ever delivered – the 350 kVA Eaton 9395 Marine UPS. The two 9395s on board Oasis of the Seas protect the most business-critical applications, including computer systems and energy-intensive cash registers," Lehtonen explains.

Eaton also supplied UPS batteries and transformers as well as PowerVision management software for system performance monitoring.

Assembling a colossal puzzle

Oasis of the Seas is constructed of 181 grand blocks, each weighing approximately 600 metric tons. Each block was first finished as far as possible, including the installation of electrical devices, and then the blocks were brought together. This colossal construction puzzle took almost four years from contract to delivery.

"One characteristic of marine projects is that the UPS systems cannot be installed as a whole in one go. Batteries have to be delivered later, a few months before the ship delivery, otherwise they would suffer during the long construction period in the shipyard, with all the dust and dirt. They would also be worn unnecessarily and their service life could not be guaranteed. In the case of Oasis of the Seas, we supplied the UPSs in early 2008 and the batteries in autumn 2009," explains Lehtonen.

Eaton has a long and trusted partnership with both the owner and builder of Oasis of the Seas.

"We have worked with Eaton for over 10 years in all of our most demanding cruise ship construction projects," says System Coordinator Ville Talsi of shipbuilding group STX Europe, Turku, Finland. "Their high quality products and field services around the world have guaranteed an enjoyable cruise experience for passengers and uninterrupted working for the sophisticated technology on board our ships."

Eaton's power protection solutions are employed in five of the Royal Caribbean International cruise line's Voyager-class ships (completed in 1999–2002), three of its Freedom-class ships (completed in 2006–2008) and in both of its Oasis-class ships. Oasis of the Seas' sister ship, Allure of the Seas, is due to be completed in late 2010.



On board Oasis of the Seas, Eaton's UPS System protect critical applications against disruptive power interruptions.

Giant of the seas in a nutshell

- Ordered in February 2006, maiden voyage 5 December 2009
- Length 361 m, width 66 m, height 72 m above sea level (at highest point), gross tonnage 225,000
- Capacity up to 6,360 guests and 2,100 crew members
- 16 passenger decks, 2,704 staterooms
- Total power output 97,000 kW, power protection capacity 2,000 kVA
- First ship to feature the cruise line's neighbourhood concept of seven distinct themed areas
- Cruises the Caribbean from its home port in Fort Lauderdale, Florida, US
- Sister ship Allure of the Seas due to be launched at the end of 2010
- Founded in 1968, Royal Caribbean International is a global cruise brand with 21 ships currently in service and one under construction. The line also offers land-based cruise tour packages in Alaska, Canada, Dubai, Europe, and Australia and New Zealand.



361 metres long, 66 metres wide luxury Oasis of the Seas attracts thousands and thousands of visitors every year.

For more information, visit www.oasisoftheseas.com