ABB has upgraded the complete human machine interface (HMI) system at the Swanbank E power station with the latest control system and IT technology.

Swanbank E is a highly efficient 385 megawatt (MW) gas-fired combined-cycle power station, located in Queensland, Australia. Owned by Stanwell Corporation Limited, Queensland’s largest electricity generator, Swanbank E featured the largest gas turbine in Australia when it was commissioned in 2002.

The control system consists of ABB Advant AC160/AC450 controllers for gas turbines (Egatrol 8), steam turbines (Turbotrol 8), and all DCS applications, including the water-steam cycle and balance-of-plant. The original HMI solution from the late 90s was built on Unix-based Advant OS500 operator stations and an IMS (information management system) with Optimax performance monitoring functions included.

After 10 years of successful operation, the customer decided to upgrade the control system “to ensure continued reliability, availability, functionality, data security, and OEM hardware and software support of the operator interface until the end of the serviceable life of the station 2023.”

Although the plant’s original control system hardware was meeting performance expectations and is actively supported by ABB, on the HMI side the Advant OS500 operator stations and IMS historian were nearing the end of their working lives. In addition, these days Windows-based solutions are more commonly used than Unix-based systems.

An upgrade solution for this plant was found thanks to ABB’s strong commitment to product evolution without obsolescence and the Advant platform. It is ABB’s System 800xA for Advant Master, combined with the Power Generation Information Manager (PGIM).

ABB has installed this combination in many similar CCPP plants around the world, in both OS500 upgrades and greenfield installations. It is the perfect replacement, providing all OS500 and IMS functionality in addition to the full power of Extended Automation System 800xA, but for Swanbank E ABB went even further.

The ABB System 800xA solution is not just a one-to-one replacement of the old operator stations and IMS, but a full system architecture upgrade incorporating the latest technology and concepts. The most radical change includes the complete delivery of HMI upgrade to Swanbank E power station in “virtually” no time.
virtualization of all HMI servers based on VMware ESXi® server technology (see box).

Replacing obsolete PCI-based RTA boards with Ethernet-based PU410 units and completely decoupling the process network from the server hardware meant server virtualization was the way forward. Virtualization simplifies how servers are managed and maintained. Running multiple virtual machines on a single physical machine drastically reduces hardware requirements, operating expenses, and increases availability. All HMI servers including PGIM and Optimax now run on two physical servers, making no compromise in terms of availability and reliability.

Virtualization enables an enterprise to better manage updates and rapid changes to the operating system and applications, and can dramatically improve the efficiency and availability of resources and applications. Following the successful HMI upgrade, ABB optimization and process specialists also retuned the existing Optimax performance monitoring system and upgraded all controllers to the latest firmware versions to improve and correct performance. This also enabled use of the latest Windows-based engineering tools for the Advant platform to simplify maintenance and control application tuning. From the start of the project, it was clear the schedule would be very tight and had to be aligned with the concurrent C-inspection of the turbine itself. In addition, this was not just a case of ABB delivering the new control system hardware and installing it as approved by the customer during FAT. From the beginning, there was also a strong requirement to make use of Stanwell’s existing IT infrastructure. For this, ABB duplicated parts provided by the customer in the test-lab for all engineering and testing activities, including FAT. Again, this task was largely simplified with modern server virtualization concepts.

Close cooperation with Stanwell personnel during planning, testing and commissioning enabled ABB to execute the entire project within 6 months. The upgraded system was installed and commissioned within a fixed three week time limit. As the new system was commissioned, the new virtual servers were integrated into the customer’s network and IT infrastructure, and the complete MB300 process network was upgraded and cleaned up. Plant operation and supervision was not interrupted. In addition to the expertise of many experienced engineers, this achievement relied on the advantages of server virtualization technology combined with the flexible architecture of ABB’s Advant and 800xA platforms.

Benefits of Control System Virtualization

ABB and System 800xA enable customers to turn modern technologies like virtualization to their advantage, by providing a smaller footprint and lower maintenance costs, while increasing availability in a pretested, supported environment.

Full support for state-of-the-art virtualization technology

ABB uses the VMware® ESXi server, which can be used in 800xA systems to combine multiple 800xA server applications on a single computer.

Higher availability and functionality with less hardware

System 800xA can achieve higher availability and functionality using less hardware when installed in a virtualized environment, due to System 800xA’s software architecture and inherent server redundancy.

Smoother installation and upgrades

Virtualization allows ABB to deliver systems that not only provide excellent energy savings and reduced hardware footprints, but also enable efficient support and maintenance of the system over its entire lifecycle.

Higher availability and easier maintenance with Storage Area Network

Virtual machines can either be stored on hard disks localized in the ESX server, or on a network storage device such as a Storage Area Network (SAN) server.
Peter Hoerlein, Senior Electrical Engineer, Stanwell Ltd. says about the project:

The Unix based Historian and OS500 Operator Interface at Swanbank had reached the end of their service life and to ensure ongoing availability a reliability a replacement project was scheduled for the C3 major inspection in 2012.

ABB was selected as sole supplier to upgrade the Unix system to the new 800xA with PGIM. ABB were selected because of their experience and expertise with the Advant control system, the MB300 bus and HMI graphics. One of the key drivers for a successful outcome of the project was the like for like transformation of the Operator Interface Graphics. ABB were able to deliver this to an exceptional standard and it was one of the highlights of the project and the Operators quickly adapted to the new interface. One

of the other key drivers of the project was to leave of the existing VMware ESXi® environment at Swanbank. ABB was able to provide excellent technical support for the integration of this technology into our control system environment.

The VMware solution allowed for faster delivery using a very small amount of onsite real-estate. All the 800xA and PGIM servers were installed into one cubicle.

One of the features of the 800xA system is its ability to interface to multiple control systems using a single operator interface. Part of this project required the implementation of a PLC connect system to interface to the Water Treatment Plant controlled by Siemens PLCs. The control and monitoring of the Water Treatment Plant was easily and seamlessly integrated into the 800xA system giving the operator one interface for the main Combined Cycle Gas Turbine plant and the Water Treatment Plant.

After an initial project delay due to the extended negotiations on terms and conditions, ABB were able to deliver the project on-time and in full. ABB are continuing to support me through the Sentinel Program and plant support service level agreement.

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