

Automation IT implements a Network Control & Energy Management System at Optus Stadium



Optus Stadium is Western Australia's new 60,000 seat premier stadium constructed on the Swan River at the edge of Perth city, it plays host to some of the biggest sporting and entertainment events in the country and has been received with great acclaim.

THE PROBLEM

The main objective of the Network Control System (NCS) is to provide continuous power across site with minimal downtime to avoid power disruptions during major events. This is achieved using a back-up generator system to supplement the main supply from the power utility. The NCS is designed to allow for numerous power loss and/or hardware failure scenarios and react to restore power to the entire site as quickly as possible.

As part of the major construction project, Automation IT provided the complete power Network Control System (NCS) and Energy Management System (EMS). The system is able to provide instantaneous control and monitoring of all devices as well as provide details on the power quality and consumption reporting for all historical use of the stadium.

THE CHALLENGE

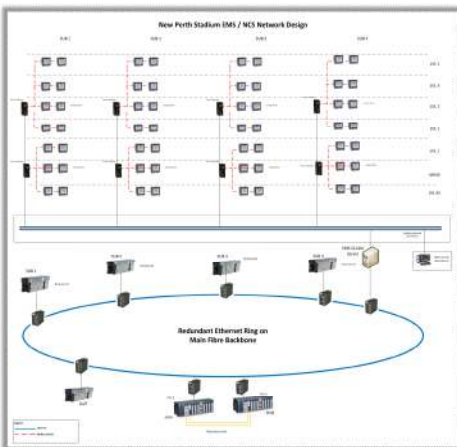
Due to the stringent requirements for power restoration in the event of a loss, the NCS design was required to account for multiple scenarios including full or partial mains failure, generator or transformer failure and/or PLC and network hardware failure and react accordingly.

The system itself had to interface with numerous third-party systems via different communication protocols across the distributed site network infrastructure including Modbus, ModbusTCP, Ethernet/IP, Mbus and SNMP, with each requiring a different method of achieving the correct communications.

All of the devices were spread throughout the precinct across a common active layer 3 network, which provided several challenges establishing and proving reliable communications to all devices.

The project was on a very tight schedule and access to equipment onsite was extremely limited until the active network was connected, which was completed only weeks from final handover to the client.

As such, all commissioning was performed to extremely compressed timelines, which required liaising with numerous contractors onsite and testing after-hours to not obstruct other contractors who required power during the day.



NCS & EMS Network Overview

THE SOLUTION

The solution required a complete Schneider Electric energy monitoring solution including EcoStruxure PowerSCADA Operation which provides fast data acquisition, control and monitoring software for electrical distribution networks. The software gives operators exceptional knowledge and control of their network through an intuitive, interactive and customizable interface.

With fast, consistent access to actionable information, Power SCADA Operation users are more effective at protecting and optimizing their electrical distribution network, improving both its efficiency and productivity.

Utilising Schneider Electric's range of Energy Meters including models PM8000, PM5000 and NMI approved IEM3255 allowed us to simplify the integration and amplified the amount of information available to the reporting system.

This EMS system was complemented by a redundant Omron CS1D PLC and Omron NX remote I/O solution architecture, the PLC was able to communicate with associated devices via a dedicated redundant gigabit fibre ring controlled by Moxa managed switches.



Schneider Electric Power Quality and energy Meters



Omron Redundant PLC System

SCOPE OF WORKS

The NCS scope included control of the internal power network including two mains feeds, four substations, 6x RMUs, 4x generators with a required recovery time of less than 20 seconds. This is controlled by redundant PLC CPUs and 6 x remote PLC I/O drops communicating via a redundant fibre network. In the result of a network or CPU failure, each substation is able to continue processing via a fully redundant communications path.

The system was required to interface with numerous third-party systems across different high-level network protocols including the BMS, 2x UPS, 4x Generators, 189x PDUs, 403x energy meters, 111x water meters, 4x Flow Meters and 39x gas meters throughout the entire precinct.

The EMS portion of the scope allows the system to monitor and analyse all energy consumption across the site to allow the facility owner to pass on costs of supply to building tenants and scrutinize any power quality events. This enables the Stadium to reduce costs, improve energy efficiency, manage their assets and reduce their carbon footprint.

Automation IT also supplied and commissioned the Active Harmonic Filtering system to improve overall power quality of the site, the system consists of 5x AccuSine PCS+ 300A and 5x AccuSine PCS+ 120A harmonic filters

A Power Quality study was performed prior to undertaking any procurement of hardware or engineering of the system, this ensured all of the client's and Western Power's requirements were met along with adhering to all applicable standards and legislation.

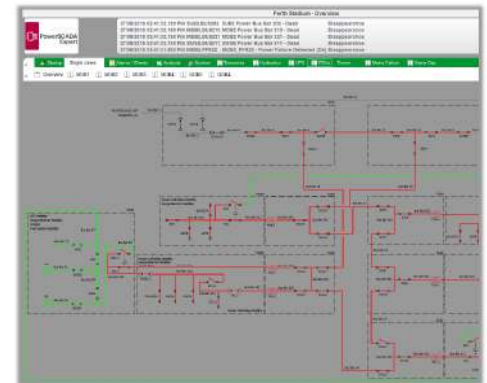
EcoSTRUXURE POWERSCAD A OPERATION

The heart of the system is the PowerSCADA Operation software, this provides granular visibility of the entire power system including real-time energy usage, trending graphs, alarms, historical events and a status of connected equipment such as generators, water & gas meters, UPS's and energy meters.

The user interface has also been configured with the ability to allow the stadium operators to quickly implement specific configurations based on the stadium usage, whether it's a game day or if the stadium is being used during the day or at night.



Advanced Reporting Dashboard



Single Line Overview

COMMISSIONING & DOCUMENTATION

The final commissioning of the NCS and EMS systems required careful planning to overcome system security precautions and also to co-ordinate scheduling issues with multiple contractor's involved in this type of complex project. This was critical to ensure that functional testing of the systems would not cause any unplanned power outages as each part of the system was rolled out.

Testing involved full operational checks of all circuits and metering equipment and testing of all switchboard and field PLC I/O. Utility supply failure scenarios were also tested to confirm a safe power down and restoration sequence, including generator/mains load transfer.

Automation IT provided a fully documented Project Management Plan with monthly progress reports. Functional Design Specification manuals were provided for the PLC, SCADA & EMS systems as well as a detailed Operation & Maintenance manual.

All test documentation and an 'As Built' electrical drawing package was also provided to the client.

CONCLUSION

Automation IT was able to complete the challenging project with zero safety incidents and continues to work with the Stadium operator to further develop the system to assist in future improvements. The combined NCS and EMS provides the stadium operator with not only a high quality reliable solution, it also provides extremely granular visibility of all the stadium's power status and requirements at any one time.

Automation IT keeping the power on at major entertainment centres and sports stadiums.