

Melbourne Airport Tri-Generation Plant Automation

Providing Reliable Grid Parallel and Backup power

Application Bulletin
PMCS-AU-0022



Background

In 2014 AIEglobal was awarded the contract to supply an automated control system for the new Trigenation Power facility at Melbourne Airport. The Trigen Power plant was chosen to provide APAM's new T4 terminal with backup electrical power, plus additional heating and cooling to support their existing HVAC system.

The Trigen facility provides APAM with 8 MW of electrical power, plus high temperature hot water (HTHW) at 165 °C, and chilled water (CHW) at 6 °C. There are four Natural Gas fired 2 MW Gensets with a boiler on each engine's exhaust generating the HTHW, whilst the engines jacket water provides the heat source for a 2.5 MW Absorption Chiller. During winter the HTHW can be fed directly to the HVAC system, or in summer used by the Trigen plant to supply heat for the 2nd Absorption Chiller that also provides chilled water.

Challenge

The tender specified that the engine and circuit breaker control was to be done by the Woodward EasYgen and LS5 system.

As AIEglobal had no prior knowledge or experience with this system they decided to attend the specialised training course held every few months at the PM Controls office in Sydney.

This training and ongoing technical assistance enabled AIEglobal to undertake the detailed electrical design and configuration incorporating four EasYgens plus twelve LS5s.

Solution

- Woodward EasYgen 3500
- Woodward LS5
- ESENET Gateway
- EasYgen/LS5 training by PM Control

Results

- Automated synchronisation, control and protection of 4 Tri-Generation systems.
- Secure control and protection of all bus-tie and feeder breakers.
- TCP Modbus communications with the building Scada systems.

Systems Integrator



AIE Global

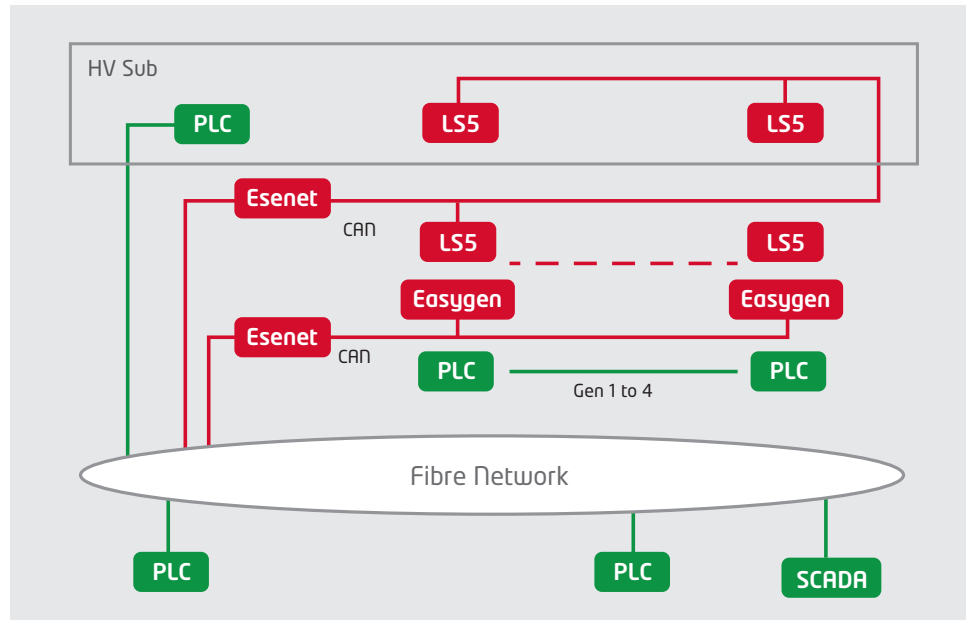
This would not have been possible without the assistance provided by PM Controls during the commissioning, and we thank them for their generous support.

~ AIE Global

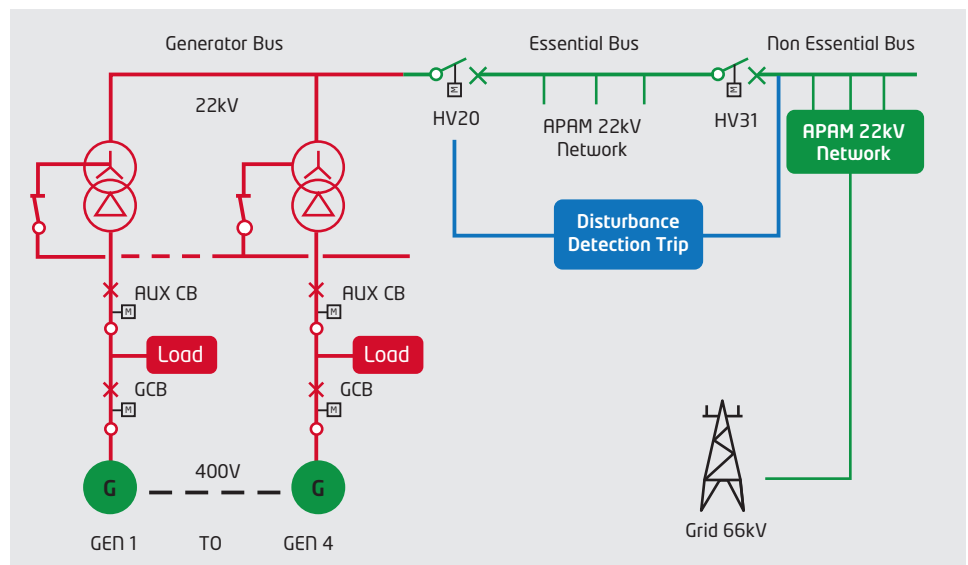


Each genset has its own EasYgen 3500 controller with the 12x LS5 remote breaker controllers housed in the 22KV substation. All units are interconnected via dedicated CAN bus. The EasYgen 3500 takes care of the starting, stopping, protection and control of the Generator Circuit Breaker (GCB) and the LS5 breaker controllers are used for the synchronisation, grid protection and control of the upstream bus-tie and feeder breakers. This complete system provides seamless control of voltage, frequency and load when the system runs islanded or utility parallel.

CAN and redundant fibre communications network.

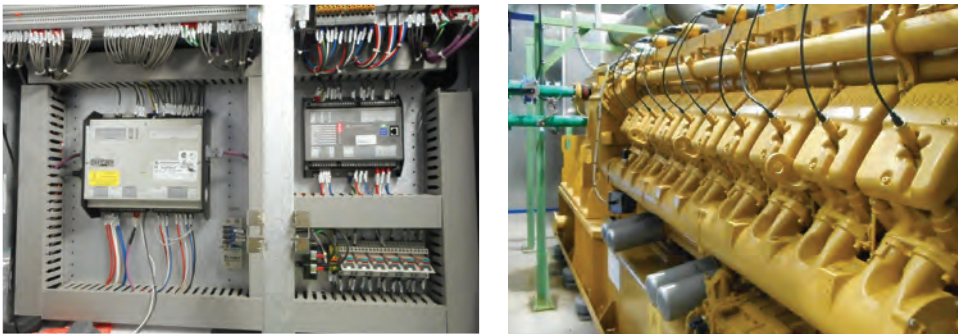


The following single line diagram shows the simplified power distribution network



As reliability and robustness was highest on the requirement list of Melbourne Airport Authority a lot of care and thought went into the program design and associated testing. Of critical importance was the system signal to indicate when the plant was in Island or Grid mode, here a combination of LS5 and hardwired "Loss Of Mains" logic was the solution.

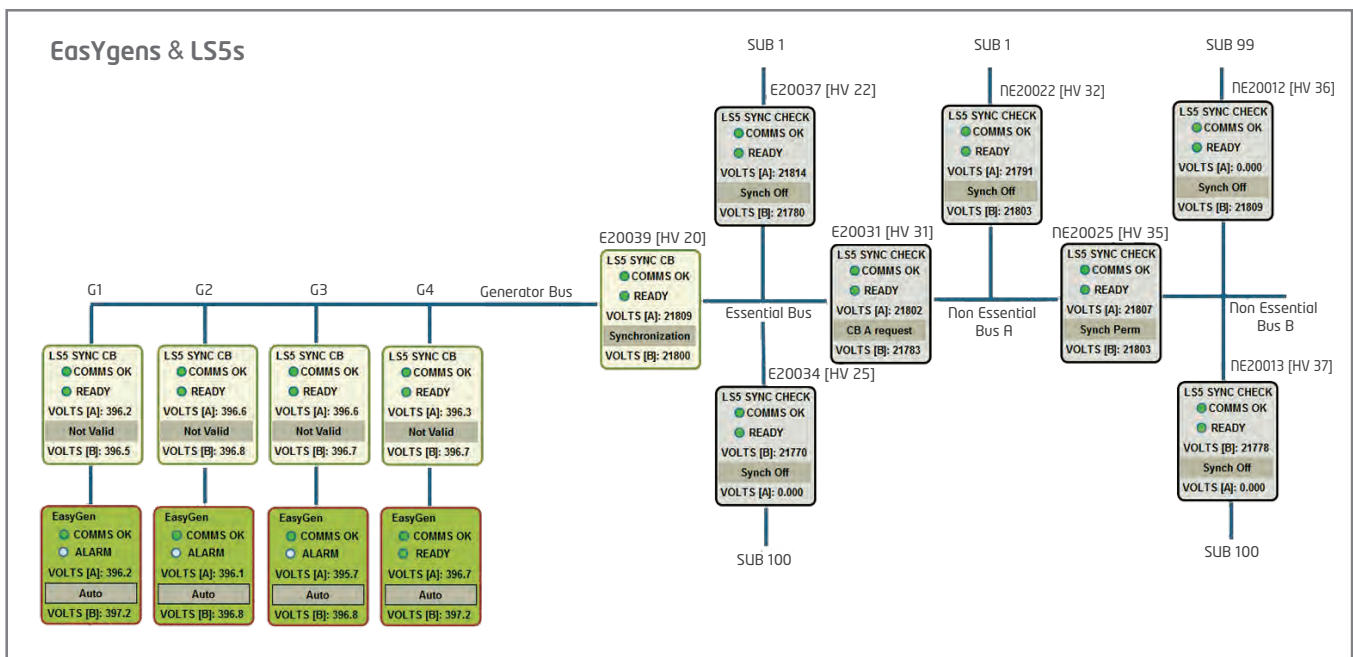
The user friendly programmability of the EasYgen and LS5's with the in-built PLC logic enabled AIEglobal to embed critical logic functions as they were needed. The Disturbance Detection System shown above uses ROCOF on the HV20 LS5 as a primary trip of the HV20 CB, and Distance Protection as a secondary trip to island the plant for grid related faults.



Scada

In order to provide local and remote interfacing to all operating parameters throughout the plant a dedicated SCADA system was installed. The ESENET CAN to Ethernet gateways allowed for easy to interface between SCADA, PLCs and Woodward controllers.

The following diagram shows the SCADA page for the EasyGens and LS5 controllers.



Commissioning

The plant was sequentially commissioned by AIEglobal as the generator sets and switchboards became available. The final major commissioning step was to "black out" APAM's T4 terminal to prove that the Trigen plant would automatically start and provide power to the Essential Bus. Our confidence was not misplaced as the "black start" test worked perfectly.

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