

NASA PM Control and S.E.M.S. Pty Ltd successfully Retrofit Power Management System at the Canberra Deep Space Communication Complex



Background

Canberra Deep Space Communication Complex, owned by National Aeronautics and Space Administration (NASA) and operated by Commonwealth Scientific and Industrial Research Organisation (CSIRO), is an international network of antennas that supports interplanetary spacecraft missions and radio astronomy observations for the exploration of the Solar System and the universe. The Network also supports some selected Earth-orbiting science missions.

Solutions

- Woodward EasYgen 3500
- Woodward LS5
- Woodward 2301A Speed controls
- Overhaul of EG3P actuators

Results

- Automated load control including base load/import control and load-dependent starting and stopping of engines.
- Flexible operation and easy testing of gensets
- Reduced engineering and hardware requirements compared to traditional solutions

Woodward Authorised Systems Integrator



The Deep Space Network (DSN) consists of three deep-space communications facilities placed approximately 120 degrees apart around the world: One is located near Canberra, Australia; a second one in Goldstone, in California's Mojave Desert; and a third facility near Madrid, Spain. This strategic placement permits constant observation of spacecraft as the Earth rotates, and helps to make the DSN the largest and most sensitive scientific telecommunications system in the world.



Location Map

Challenge

Four Caterpillar D399 and four D398 engines have been providing the CDSCC with reliable power for many years using Woodward 2301 LSSC (load sharing and speed control). As those devices as well as the high voltage switchboards were reaching their final stages of obsolescence a retrofit was required. Modernisation, reliability and automation were high on NASA's list of requirements.

The bus arrangement of the system is complex with 4 individual bus segments plus utility feeder mains circuit breaker (MCB). This arrangement enables individual generators, and in groups with up to four load sharing, to be tested and run on a load bank. Effectively this means that all generators will have a double generator circuit breaker (GCB), something that is both rare and a potential challenge for many off the shelf generator controllers.



Radio Antenna

Solution

With those challenges in mind the selection of the class leading Woodward easYgen 3500 plus LS5 breaker controller was the obvious choice. No matter how complex the arrangement, with up to 32 generators and 16 upstream breakers plus isolators the 3500/LS5 system can handle any such system with ease and without the need for complex PLC programming. SEMS Pty Ltd and PM Control were contracted to provide the work.

Four of the D398 engines were replaced by four Caterpillar C18 engines and all 8 generators were equipped with the easYgen 3500 controllers plus LS5 remote breaker controller at the utility feeder.

PM control replaced the old Woodward 2301 LSSC speed controls with the latest Woodward 2301-A speed controls and also overhauled the Woodward EG3P actuators that are fitted on the D399 engines. The C18 engines are so called “electronic engines” with their own on board speed governor system and the easYgens are wired to monitor their J1939 engine data.

Depending on the required operational mode, each EasYgen controlled genset will either share its equal load on the LS5 controlled O-bus or, when in test mode, will run on the restrictive load bank through one of the two T-bus segments. During mains failure and the load requirement by CDSCC the EasYgen system will automatically start and stop engines based on an N+1 logic.

The Woodward LS5 breaker controller supervises and protects the utility high voltage breaker, provides Automatic Mains Failure detection and will command the EasYgen 3500 controlled engines to start upon a mains failure. Together with the EasYgens the LS5 also provides utility base load and import-export control as well as soft load transfer to and from the utility

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PM Control provided a very simple to implement setup whereby most of the logics are provided by the standard Woodward LS5 and EasYgen controls which allows for a simple solution to a complex problem. It also drastically cuts back on the engineering cost for S.E.M.S. by reducing additional programming of logic and algorithms in a PLC.

The system was implemented in three stages. In the first stage the new Caterpillar C18s were installed and operated. The Cat D399s were upgraded in the second stage and full power management integration was achieved in the final stage.

CDSCC is very pleased with the new system.



SEMS Engine control panels



EasYgen control mounting

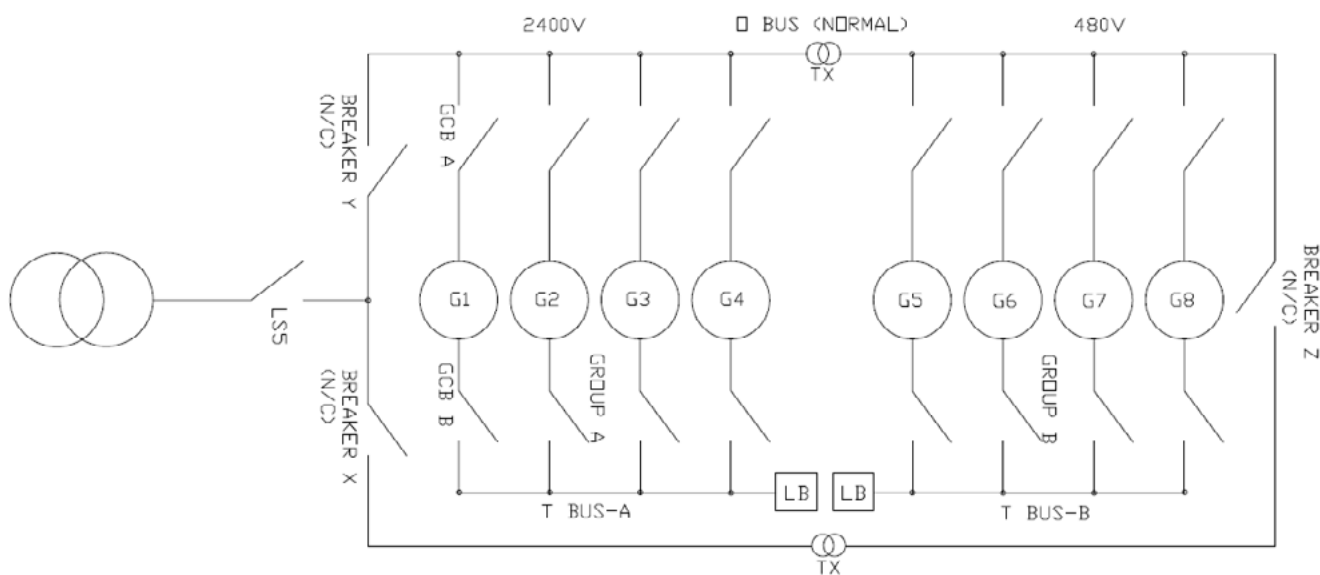


LS5

About PM Control

PM Control delivers energy optimisation solutions that increase efficiency while lowering emissions. Serving the energy, process and transportation markets, PM Control is the appointed distributor and recognized retrofit partner for Woodward Inc., Regional Technical Center for ABB Switzerland and Value Added Reseller for L&S Electric. Through our activities PM Control is having a positive impact on the lives of people across SE Asia, Australasia, India and beyond.

System Overview



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