



Case Study: BNFL Chapelcross

Now we at **WARDPOWER** are good at the unusual and the complicated – it’s what we do – but when we took on the contract to supply 4 x 800KVA sets for British Nuclear Fuel’s Chapelcross even we didn’t anticipate what a school day it would turn out to be...

As a part of the de-commissioning preparations for BNFL’s Chapelcross Magnox Nuclear Power Station, a need was identified to install four new 800KVA stand-by Generating Sets to act as emergency power to the reactor’s cooling circuits. Now with a duty like this, all will appreciate that this was a scheme that was to be reliable by design. Wherever possible, every part of each individual set had a minimum of dual redundancy. Each set was equipped with:

- § 100% over rated alternator (with all TVA’s) to deal with a substantially non-linear load
- § Automatic and Manual AVR’s with logic to allow hot change-over
- § A fully relay based control system to ensure no potentially EMP sensitive electronics
- § 324VDC Control System
- § Dual pneumatic starters, each with access to up to 8 air receivers
- § Access to up to four air compressors, two DC electric powered, two diesel, to charge the air receivers
- § Access to twin day tanks and up to four bulk tanks



One for the Aficionados

The real boffins amongst you might spot that this alternator is very large compared to the engine...

Of course with a unit of this nature, what was in it was only half the story. Some of the design features of the unit were every bit as interesting:



The Finished Article...

Complete with Pneumatic Start package, Day Tanks and 324VDC Rectifier Package

- § The Sets were designed to have a “power safe” design that would start the Generating Sets in the event of loss of control supplies to the Sets themselves
- § Whilst the Generating Sets were rated at 0.8pf, all electrical calculations were performed at 0.6pf to ensure a higher than average thermal safety margin
- § The complete design was subject to a seismic study covering details down to the shock rating of individual component retainers
- § The entire assembly was subject to Vibration survey

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And if we thought that building them was an involved process, it was as nothing to testing them! The first unit was subject to comprehensive Type Testing which involved re-creating the entire emergency power system at **WARDPOWER** works including the Generating Set itself, the air start system, the rectifier that the set would be powering and the DC load bank that would be used for it's weekly testing. Further DC load banks were also hired to over-load the test. With our entire factory turned over to this mock power station, one month's testing ensued in which every conceivable operating possibility was tested, for every piece of involved equipment, along with load runs in excess of 24h.

At the end of the month, a system with 168h run already on it was handed over to the client. Along with a stunning fuel bill!



*A Feat of Engineering in its own Right!
The Pneumatic Starter Pack,
custom designed to work from 324VDC,
dual redundant with quadruple redundant
compressors, supplied by IPU*

Finally to site: Each unit was to replace an existing 1960 Crossley "sunken" set weighing in excess of 20,000Kg (see the green sets in the second picture). Carrier frames were designed for each of the old sets to assist in their removal and storage as they were destined to stay on site and had to be stored in a safe fashion. Under the supervision of the site's Health & Safety inspectors, each old set was moved and the new set moved into place before the long installation process began including installing a highly sophisticated air handling system designed to allow the sets to intake and outlet on the same wall against prevailing site wind conditions. Final commissioning of the system was done jointly with station personnel as a part of a structured training programme.

In all, a 12 month contract, challenging in most areas, but demonstrating why **WARDPOWER** are the best specialist Project Generating Set Company in the United Kingdom today.

Project in Brief:

- 4 x 800KVA Generating Sets
- 463KVA Prime Rated Generating Set in 85dB(A) at 1m Acoustic Container
- Pneumatic Air Start System with redundant compressors and receivers
- Bulk fuel system
- Relay based control system with "power safe" logic
- Comprehensive Type Testing including load, atmospheric, functional, transient, vibration, seismic elements
- Installation
- Commissioning



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