HISTELEC NEWS SUPPLEMENT- ELECTRICITY IN CORNWALL - APPENDIX 1

CARN BREA GENERATING STATION - 1902

The Carn Brea Generating Station, combined with the Tramway Depot, Workshops and Offices, was designed by Edmundsons' Architect, Mr. J.W. Armstrong, and built by Carkeeks of Redruth.

The Boiler House

Initially it had two 30ft x 7ft 6inch Lancashire Boilers, built by the Cornwall Boiler Co. & fitted with Green's economisers, at 160lbs/sq.in. and 21,000 lbs. of steam/hour. They were stoked by hand with coal brought by cart from the nearby North Crofty siding of the G.W.R. Feed-water was initially taken from the Water Co. & stored in a 250,000 gallon masonry tank.

The Engine Room

No.1 Set 45kw - Parker Dynamo. driven by Bellis & Morcom 70 B.H.P compound steam engine @ 500 rpm. Built 1901.
No.2 Set 90kw - Parker Dynamo driven by Bellis & Morcom 135 B.H.P compound engine @ 450 r.p.m. Built 1901.
No.3 Set 90kw - Parker Dynamo driven by Bellis & Morcom 135 B,H.P. compound engine @ 450 rp.m. Built 1902.

The dynamos generated at 480 volts D.C. Two sets condensed into Coles Marchant & Morley surface condensers. The 90kw set was a size in common use in the Edmundson Companies and obviously had been ordered in bulk. It is evident that the windows in several generating stations were also of the same make.

The L.V. Board

This board was clearly one of a bulk order from Messrs. Charrington and built to suit the requirements of the station from standardised items, Photographs from Stamford and Dartmouth show the identical clock with scroll and the same instruments, fuses and switches. It consisted of the following panels:-

4 Generators, 4 Lighting Feeders, 4 Traction Feeders, B.O.T. Test Panel.

The dynamos could each be selected for lighting or traction; since there was a battery for each function. A Highfield Booster was used on the traction system, so that the load on those generators remained constant and there was a negative booster to meet the B.O.T. requirements regarding permissible voltage on the tracks. The lighting system was 240 volts 3 wire, with a motor dynamo for balancer and differential booster for battery charging. There was also a battery at West End, Redruth, for lighting and in 1908 a booster was added to that feeder.

Operation of Carn Brea Generating Station, 1902-1909

Tramway Load

On peak traffic days, with eight 50 HP cars and two 50 HP mineral locomotives, total 500 HP the load on the station rarely exceeded 200 HP due to diversity.

Station Load

Initially the installed capacity was 225 kW, (one 45 kW, and two 90kW). The combined traction and lighting load gradually increased and additional plant was added.

	Installed Capacity	*Load kW*	*Sets added*
1904	*425.kW*		No.4 Belliss & Morcom triple exp. 300 H.P with 2 x 100 kW Parker dynamos in line @ 476 rpm
1906	*825 kW.*	*326*	
1907	*825 kW.*	*750*	No.5 Bellis & Morcom triple exp.580 H.P with 400kw. Crompton dynamo@ 375 rpm
1909		*924*	

No.4 set could be run with the dynamos independent, i.e. one on tramway and the other on the lighting bus-bars, or with the dynamos in parallel on one bus-bar. It was the only such combination in the Edmundson's Group though at Newport I.O.W., they had the same size engine coupled to one dynamo and one alternator. Two Babcock & Wilcox Boilers were also added in 1909 and the additions necessitated the extension of the Engine Room and the Boiler House to level with the end of the Tramshed. The additional water requirements at Carn Brea extenuated the earlier difficulties, and on 7.10.08 an Agreement was signed with the Scott-Thompson Syndicate Ltd. to pump water from North Crofty Mine, where two pumps and stand pipes were installed. The consideration for this was that 4000 units and the first 5 kW. of their M.D. be credited to the mine, who insisted that all water not evaporated be returned to the adit. They were probably the only mine, who ever got some of their water pumped out for free and then insisted on getting it back! They in fact had an agreement with East Pool that their drainage water went by leat to Tolvaddon Stamps.

This syndicate had planned ahead as regards a supply from CEPCo, All their motors were 25 cycles AC, supplied by a British Westinghouse Alternator Set 16inch x 16inch stroke 2-crank 4-cylinder vertical tandem 4-cycle single-acting gas engine, 240 BHP @ 300 rpm coupled to 150kW 500/440v 25 cycle alternator.

Generation Costs
In 1904, Carn Brea had the lowest costs in the Urban Company group. Writing on this in Edmundson's Monthly Magazine, the Engineer and Manager said that, due to combined generation, distribution and the tramway, they were "fortunate in having a wider range of repairs (trams, locos, batteries, etc.) over which we write off fitters' and assistants' time".

Carn Brea Generating Station - Details of plant installed (SW 66394134)
All engines were by Belliss & Morcom, vertical, totally enclosed with pressure lubrication, 160psi condensing 25"vacuum except, No. 1. All dynamos by Parker 500v DC, direct-on. Travelling crane above.

1902 No. I Serial No.1450. Compound 7'½" & 12" x 6" to atmosphere. 550rpm.45kW. Nos. 2 & 3. Serial Nos. 1570 & 1618. Compound 9inch & 15inch x 8inch 450rprn. 90kw. Two Lancashire boilers by Cornwall Boiler Co and coal brought by cart from nearby North Crofty siding.
1904 No.4 Serial No.2988. Triple expansion 11inch. 15inch & 23inch x 10inch, 475rpm. Two 100kW in line.
1907 No.5 Serial No.3466. Triple expansion 14inch, 20½inch & 30inch x 12inch 375rpm. 400kW.
1909 Two Babcock & Wilcox boilers added. Engine-room extended and additional water obtained from North Crofty Mine, Nos. 1, 2, 3 & 4 Sets removed. Dynamo on No.5 Set replaced with 400kW 3000v 25cycle alternator, with 3/10kV transformer and Reyrolle 10kv switchboard. Parsons turbo-alternator installed - 500kW 3000v 25 cycles with 3/10kV transformer.
1910 Two BTH Rotary Convertors, 275kW 3000v 25 cycles to 500v DC, were installed, to maintain supply to Tramway and Camborne & Redruth networks.
1922 Camborne and Redruth networks converted to single phase 25 cycle AC 3-wire, using the same LV cables.
1927 Tramway closed on 24th September.
1929 Parsons 500kW Set moved to Hayle. No.5 Set removed and sent to Grantham.
Remaining boilers removed.
1932 One Rotary Convertor removed and installed at Ncwquay Power House.
1933 Preparation for Change of Frequency. Mercury Arc Rectifier installed to supply Mineral Line, and closed next year.

The DC Distribution Board, by Messrs. Charrington, had four Generator panels, four lighting cable panels and four Traction cable panels. A Highfield Booster was used on the Traction system. The Lighting system was 240v 3-wire, with motor dynamo for balancer and differential booster for battery charging. There was also a battery at West End for lighting and in 1908 a booster was added to that feeder cable. Similar Charrington boards were used on other Urban ESCo networks, including Dartmouth and Grantham. The LV cables were laid by Callender's Cable & Construction Co., and were of the system known as Vulcanised Bitumen, or VB, being three insulated wires lying on porcelain supports in a wooden trough, which was filled with bitumen and protected by earthenware tiles. The Tramway feeder was a single heavy cable carrying the positive feed, the negative return being the tramlines, on which every fish-plate was bonded across. The Tramway Feeder, Lighting Feeder, Lighting Distributor, telephone & pilot cables, and a spare duct for future HV cable, were laid to West End, Redruth, and Commercial Square, Camborne. The overhead trolley wires for the Tramway were connected in sections of under half a mile (BOT requirement). The sections out of Carn Brea from that LV Board, and then from the Tramway Feeder at Pool Chapel, Illogan Highway Chapel & Blowinghouse and Pendarves Street, Tuckingrnill & Wesley Street, Camborne.

In 1936 the Reyrolle 10kV switchboard was replaced with an English Electric double bus-bar board and the Engine-room was then used for storing, repairing & painting transformers and switchgear, the crane being still available. The large stack was demolished prior to the building of the Office extension. The Boiler House became the garage after a floor had been added for workshops and cooker store, and the Tram Shed became the Stores. The three tanks below the cooling towers were roofed over to form stores for transformer oil and indoor transformers. The Canteen was built on the North Crofty burrow. The Blacksmith Shop in the centre of the yard was demolished in 1938 after a replacement. The substation building from Cornwall Tailings at Tolskithy had been erected by the Pole Dump.

The switchboard was removed after all the cables on it had been diverted to the new Carn Brea 33/11kV S/S. In 1960 the Garage was moved to a new building in the Lower Yard and that space was then used as an Engineering Store, until the new Control Room was set-up in it in October 1971, prior to the closing of Hayle Generating Station. The Fitters and Carpenters had also been moved to the Lower Yard and that floor had then been made into the Drawing Office.

Reorganisation of SWEB in the early 1980's included the closing of the Meter Room, which had been operating, since the early days of CEP Co. The Superintendent for many years was Mr. F. Ripper, who was succeeded by Mr. D. Burgoyne. Reorganisation included the moving of West Cornwall District Office from Redruth, and so a new office was built in Tolvaddon Lane for Cornwall Group, the Control Room and Canteen, and West Cornwall District. The upper yard and original buildings were fenced off in 1983. All those buildings were vacated and the remaining distribution equipment removed from the Engine-room. The buildings were purchased by the County Council, for use as an extension of the adjacent Cornwall College, renamed The Trevithick Centre, and used to accommodate the Institute of Cornish Studies. The original Canteen was demolished and the North Crofty Mine burrow was reduced to the level of the Lower Yard to extend that area. The County Council had a reorganisation and vacated these buildings. They were sold to a developer, who demolished the lot in 1999. Soon a MacDonald's was built in that corner!