POWER SUPPLY for VICTORIAN RAILWAYS, ELECTRIC STREET RAILWAYS.

During the taking of evidence by the Parliamentary Standing Committee on Railways in 1903 into the proposed electric tramway from St Kilda to Brighton, Mr Stone, V.R. electrical engineer proposed the following for a local power house on this line:-

Two generators of equal capacity; Water tube boilers of the best construction with superheaters, but no economiser (condensor). He advised that condensing gear requires a supply of cheap cooling water, which was not readily available on this line. Reciprocating engines were more suitable because of the small scale of the installation and the temporary nature of the whole installation as a power house for this tramway. (P.S.C.R., 1903, Appen. xxi cl. 67 & 80)

As the Victorian Government was deliberating whether to electrify the Melb. suburban railway system, it was known that this project would require a large central power station to be built. The provision of power for this tramway could easily be taken care of by the large power station. Consequently, any immediate supply of traction power was seen to be of a non-permanent nature.

As the public debate about a St Kilda to Brighton tramway progressed, Mr Stone in a memo. to the V.R. Commissioners dated 7 Dec. 1904, (soon after the enabling Act for a St Kilda to Brighton E.S.R. was passed) wrote and strangely headed:- "Village Belle to North Road, Brighton Tramway" that there were 3 practicable sources of power for the above tramway:-

(a) from a local power house (b) from the Electric Lighting & Traction Coy.of Aust. Ld. (Richmond)

(c) from the Railway Department's elec. light & power plant at Spencer Street.

Rough estimates of the above options were:-

(a) £7,580 - cost of operation not estimated as the car service to provide for not given.

(b) The Electric Light & Traction Coy. is prepared to supply at once at a cost not exceeding two pence a unit and possibly a little lower. The Gov'ment to supply, erect and run all transforming plant. A buffer battery to be put in. Rough estimate of a transforming plant:-

	£
TRANSFORMERS	900-
Battery, erected	1,700-
Booster (for charging battery)	275-
Building, switch gear & erecting	1,500-
£	4,375-

(c) The practicability of transmitting power from Spencer St at a cost competing with that of the E.L.&T. Coy offer depends on the car miles required per ann. and the distribution with respect to time. Under the above conditions the cost per/u delivered from the Railway P/house at Spencer St would be as follows:- next page

POWER SUPPLY for VICTORIAN RAILWAYS - ELECTRIC STREET RAILWAYS.

continued-: Cost per unit.

	pence
Coal	0.40
Oil & stores.	0.10
Upkeep	0.20
Interest on transmission lines- high tension to St Kilda station and low tension for 2 miles. Total cost of £4,000 @ 4% and upkeep all-round @ 5%	0.21
	0.91 p. per unit

If the actual cost of current including Head Office & all other charges be taken it would be 1.79 at Sp. St.

Transmission charge 0.21

2.00 p. per unit

(Taken from a memo. W Stone to Chairman, V.R. Commissioners, 7 Dec. 1904) Apparently the cost of power from V.R. Spencer St P/H would be comparable to cost of supply from E.L &T Coy.)

As the Board of Land & Works (Railway Construction Branch) was the constituted constructing authority of new government railways in Vic. since 1892, Premier Bent directed the Engineer-in-Chief, as follows:-

Premier's Office

Melbourne , 15 Mar. 1905.

The ACTING Engineer- in-Chief,

Proceed with preliminary work for St Kilda to Brighton Tramway so as to be ready to start construction whenever that is authorised. Mr Bradford to advise as to electric equipment.

signed Thos. Bent.

As is known, Premier Bent appointed Francis E Bradford as consultant to Eng'r-in-Chief to advise on electrical equipment owing to B. of L&W not having previous experience in the matter. Bent did not want the V.R. electrical eng'r - Wm Stone, who was subject to the Railways Comm'rs, being appointed to advise on the design & construction of the electrical part of the tram line. The Commissioners had already expressed their opposition to the construction of the tramway. Therefore Bent was afraid the Commissioners would not have the inclination to have the line built for the sum provided by Parl. and to operate it efficiently. Indeed, the Commissioners had already arranged with Bent and the State Treasury for funds to purchase steam motor omnibuses for use on ~~the route of the St Kilda-Brighton tram.~~ SUBURBAN ROUTES. The Commissioners intended THAT the buses to be a substitute for the ST KILDA-BRIGHTON tramway. In April 1905, Mr Bradford's estimate for the construction of the tramway was made public. His total was £18,966-10-0, not including anything for rolling stock, which was to be funded from a different source.

(3) (3)

POWER SUPPLY for VICTORIAN RAILWAYS - ELECTRIC STREET RAILWAYS.

Mr Bradford's estimate included an amount of £4,000 for the power house, i.e.

	£
Building	300
Generating set, (1)	1,000
Battery & booster.	1,000
Switchboard, wiring, piping & smokestack.	500
Boilers (2)	1,200
Power house complete,	4,000
Car shed ,complete	1,400
Total, car shed & power house.	£5,400

By these figures, the Commissioners were concerned that Bradford could achieve Bent's goal of building the line for less than £20,000. Accordingly, they instructed elec. engineer Stone to draw up an estimate to see if Bradford's was a realistic one.

Mr Stone's estimate, dated 3 Apr. 1905, provided for a power house as follows:-

	£
Two generating sets, 100 Kw each, (1 spare)	2,400
Two boilers, erected	1,900
Feed pumps & feed heater	300
Chimney	325
Switchboard & cables	180
Steam exhaust, drain & water pipes	400
Storage battery, erected and housed	2,000
Power house buildings & foundations	900
Total for power house	8,405
Car shed	1,100
Total for power house & car shed	£9,505

It is interesting to note that in a memo dated 27 Mar 1905, Mr Stone advised the Commissioners that the cost of a local power house at Elwood would be about £10,500. After Bradford had published his much lower estimate for a P/H at £4,000, Mr Stone produced his revised estimate of 3 Apr. above. It should be pointed out that Bradford originally estimated for only one generating set in his total of £4,000. When the extension of the tramway from the Village Belle to St Kilda stn looked imminent, a second generating set was provided for and approved by the Minister of Railways (Bent) in Aug. 1905. ✓

VICTORIAN RAILWAYS ELECTRIC STREET RAILWAYS, POWER SUPPLY

The building was a barn like structure of a timber frame and clad with corrug. iron. It was one large building divided internally for the various functions. Detailed knowledge of its internal layout is today unclear. From the St Kilda Street frontage, its facade facing roughly west consisted of two bays with unequal gables. The wider and higher gable spanned the entrances to the car shed (on the south side) and the end of the battery room. The smaller gable on the north side surmounted the bay which contained the engine room. Immediately behind the engine room was located the boiler room. The battery room was a long narrow compartment 74 ft long X 11 ft 4 in. wide, located between the power rooms and the car shed & having a wooden ceiling 10 ft 10 in. above its wooden floor.

Approx. dimensions of power house & car shed :-

Frontage - car shed & battery room	c@	53 ft	c@ 79 ft.
" - engine room	c@	25 ft	
Length of car shed	c@	225 ft	
Width of " "	c@	40 ft	

The car shed contained three tracks on 12 ft centres.

Engine room, length x width	c@ 25 ft 6 in x 24 ft 6 i
Boiler room, length x width	c@ 48 ft 6 in x 24 ft 6 in
Battery room, " "	c@ 74 ft. x 11 ft 4 in.

The roof over the car shed was surmounted by a lantern containing windows & louvres in the sides. The roof tie beam in the car shed was 19 ft above rail level and the top of the roof lantern was 36 ft above rail level.

In the engine room the two generator/ engine units were positioned side by side on an east-west axis. The switchboard was placed against the front (west) wall; the booster machine stood along the south wall near the front of the room. Behind the engine room back wall was the boiler room containing two Babcock & Wilcox water tube boilers also side by side. The engine room flooring was jarrah t&g boards and the walls & ceiling were lined with t & g red deal boards.

In the battery room, the walls and ceilings were lined with 4 in x ½ in t&g red deal. Four 4 in. gal. iron ventilators through the ceiling were carried thru' the iron of the main roof by one ft and finished with a cowl.. All the woodwork and ventilators were given 3 coats of "acid proof paint". Battery stands of 3 in x 3 in. oregon, consisted of two long forms each accommodating ca. 133 cells each. Each of the length of stands consisted of 4 sections of 16 ft = 64 ft long overall and the tops were 2 ft above the floor. The provision of accommodation for storage batteries required special arrangements in the building to deal with the effects of the fumes from the sulphuric acid in the batteries. The first battery room, which was burnt in the fire had only minimal protection to this end, i.e. the timber lining boards was given 3 coats of acid proof paint.

POWER SUPPLY for VICTORIAN RAILWAYS, ELECTRIC STREET RAILWAYS.

After the construction of the line was completed by B of L&W, Mr C W Fourd, an officer, advised his Chief on 30 May 1906 the figures on the actual cost of the power house and car shed:-

	£
Power house building	658-
" " generating sets (2)	1,676-
Storage battery & booster	1,219-
Switchboard & wiring	305-
Boilers (2)	1,003-
Pumps & feed heater, piping & smokestack	643-
Total cost for power house	5,504-
" " " car house	1,168-
" " " power house & car house	£6,672-

Adding another £1,000 for a second generating set to Bradford's £4,000 in the original estimate, makes a total of £6,400 for power house & car shed. The final actual cost of £6,672 was not very much more than Bradford's estimate.

On 18 Dec 1906, an Order-in-Council approved the purchase of 2 N° Babcock & Wilcox patent chain grate stokers for a total of £431-16-1. (vide Final Return, St Kilda & Brighton E.S.R., dated 15 Aug 1907, (page 4) Act N° 2042
The stokers were installed during 1906.

DESCRIPTION of POWER SUPPLY PLANT & EQUIPMENT.

Two water tube boilers:-

Manufactured by Babcock & Wilcox Ltd. U.K.

Heating surface, in tubes alone,	920 sq. feet.
" " , total	1,098 " "
Grate area, total surface	23 " "
Working steam pressure	150 pounds per sq. in.

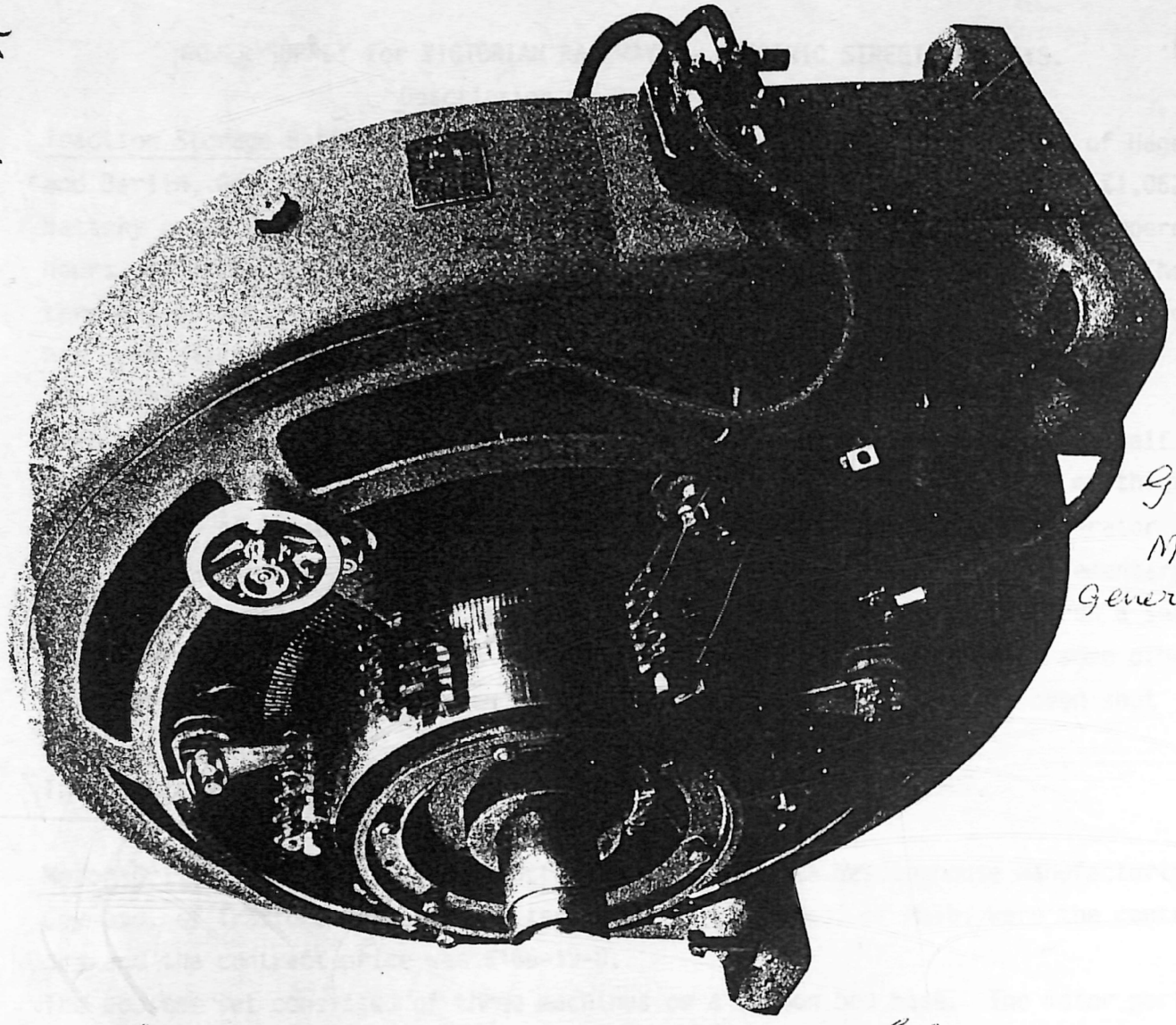
Water feed pumps, standard, 2 N° by C & J Weir Ltd, Glasgow, U.K.
Tender price, £892-10-0 each.

TWO GENERATING UNITS : ENGINE & GENERATOR on COMMON BASE.

Engine :- Belliss & Morcom Ltd. U.K Type "C", Two crank, vertical, enclosed, compound, self lubricating, quick revolution steam engine. Developing 180 b.h.p., non condensing, 450 r.p.m. with 160 pounds pressure of steam at stop valve.

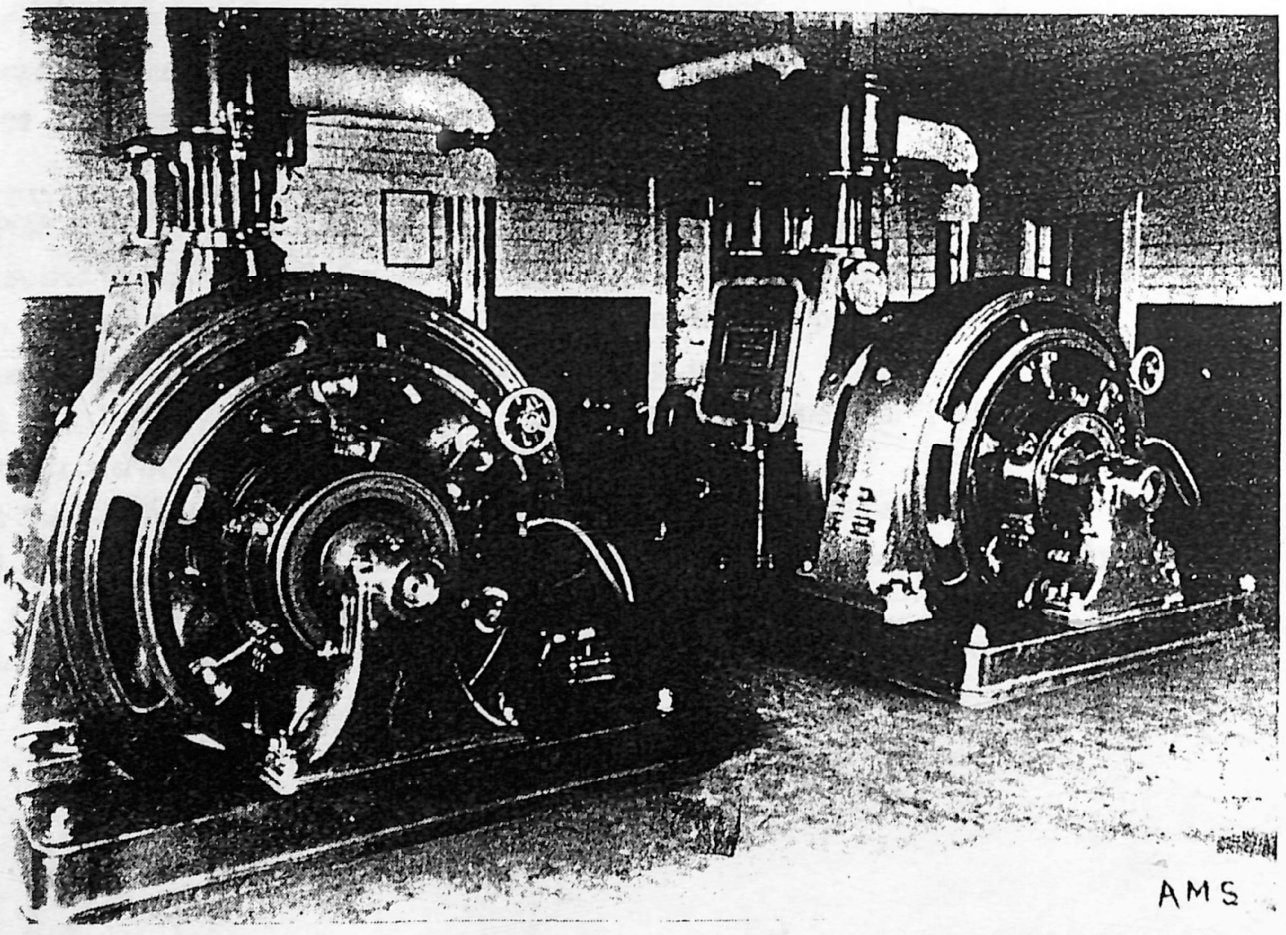
Generator:- General Electric Coy. U.S.A.. Direct current, compound wound generator, multipolar, 6 pole, 100 Kw, 450 r.p.m., 550/550 volts - 182 amperes.
Weight of armature and commutator - approx 2,200 pounds.
Total weight of machine, approx. 8,500 pounds.
The contract price for the first set was £827-8-0, the second cost £332-

N°2 GEN'R SET AT ELWOOD P' HOUSE { BELLISS & MORCOM ENG.- SERIAL N° 2958 / G.E. COY. M.P. 6 GENERATOR - " N° 125447 } BRADFORD INQUIRY APPENDIX "A" PAGE 363



G.E.
M.P. 6
Generator.

Engines and generators at Elwood Power House - 1906



AMS

POWER SUPPLY for VICTORIAN RAILWAYS - ELECTRIC STREET RAILWAYS.
Description of Equipment . cont.

Traction Storage Battery:- was manufactured by Akkumulatoren Fabrik A.G. of Hagen and Berlin, Germany, and supplied through Noyes Bros, Melb. Contract price £1,062-12-0. Battery power capacities:- 185 ampere hours if discharged in one hour; 220 ampere hours if discharged in two hours, with a maximum charging rate of 90 amperes. The terminal potential of each cell was not less than 1.75 volts after the full capacity has been discharged at the maximum rate.
The battery consisted of 265 cells with the JS 10 type plates in glass boxes. Each cell contained five positive plates, four full negative plates and two half end negative plates. Approx. dimensions of plate- 13½ in. x 6¾ in. x 12 mm thick. The purpose of the battery was to provide a constant full load on the generator when only a light tram service was in operation, and also provide a supplementary power source when there was a heavy service running. The battery could run a service alone for a limited time in the event of failure of the generator(s) or some other accident, or to provide power to trams at times after the boilers had been shut down for the night.
This battery was destroyed in the car depot fire on 10 March, 1907.

Motor Driven Booster:- was manufactured by the British Westinghouse Manufacturing Coy Ltd. of Trafford Park, Manchester, U.K.. Noyes Bros. of Melb. were the contractors and the contract price was £166-19-0.
The booster set consisted of three machines on a common bed base. The motor portion was a multipolar type to operate on the 550 volt d.c. circuit. The generator (booster) portion was a differential multipolar type with a capacity of 90 amps. at any pressure from - 150 to + 150 volts. The third component was an exciter for the generator. All machines ran at a commonspeed of 925 rpm. The purpose of the booster was to charge or discharge the storage battery.

THE POWER STATION SWITCH BOARD:- was manufactured by the General Electric Coy. of U.S.A.; and supplied through the A.G.E. Coy. of Melb. & Sydney. At the opening of the St Kilda - Brighton line in May 1906, the switch board consisted of four panels and the total price was £216-14-10.
Each panel controlled particular functions of the plant as under:-
Panel One - generator panel, rated " continuous d.c. generator", 550 volts, 100 Kw, for the control of N° 1 generating set.
Panel Two - similar panel as above for control of N° 2 generating set.
Panel Three - a panel for the control of the motor driven booster & battery charging set, rated at 550 volts, 185 amperes.
Panel Four - a two circuit feeder panel, rated at (c.s.f.2.) 550 volts, 200 amperes.

POWER STATION SWITCHBOARD . (cont.)

GENERATOR PANEL.

The Generator panel will consist of one Blue Vermont Marble Main Panel, 62" x 24" x 2" with 3/8" bevel, and one Blue Vermont Marble Auxiliary Panel, 28" x 24" x 2", with 3/8" bevel. This panel will be rated [illegible] and will have mounted upon it the following :-

1 - Swinging bracket on side of panel, complete with insulating washers, bolts, nuts and fibre support for meter leads, having mounted upon it :-

1 - Thomson Illuminated Dial Voltmeter of the Astatic type, 750 Volts Scale,

1 - 4-point hard-rubber Potential Receptacle,

1 - 4-point Potential Plug,

1 - 300 Ampere, 650 Volt, Single-pole, Type "C", Form "P" Circuit-breaker with auxiliary switch,

1 - Rheostat Hand-wheel with Dial-plate, pointer, shaft-extention, coupling and tripod for mounting rheostat on back of panel,

1 - 300 Ampere, Thomson, Illuminated Dial Astatic Ammeter, with lamp, reflector, shunt and meter leads,

1 - Single-pole 100 Ampere Carbon-break, Field Discharge Switch with Discharge Clips and Discharge Resistance,

2 - Single-pole, Single-throw, 300 Ampere, 600 Volt, Quick-break "C" Switches,

1 - 100 Ampere, Single-pole, Double-throw, Quick-break, "C" Switch,

1 - M.D.2 Lightning Arrester with all necessary line and ground connections.

1 - Generator Field Rheostat.

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14351 The Australian General Electric Company.

Contract No 14351

(Special Specification (contd) Milk 10

One cast-iron pedestal will be supplied having mounted thereon one single-pole, single-throw, 200 Ampere, 600 Volt Equalizer Switch, Quick-break, Type "C".

MOTOR-DRIVEN BOOSTER AND BATTERY CHARGING PANEL.

The Booster and Battery charging panel will consist of one Blue Vermont Marble Main Panel 62" x 32" x 2" with 3/8" bevel, and one Blue Vermont Marble Sub-base, 28" x 32" x 2" with 3/8" bevel. This panel will be rated C.D.B. (Continuous Direct-current Battery) 650 Volts, 185 Amperes, and will have mounted upon it the following :-

1 - 50 Ampere, 650 Volt, Single-pole, Type "C" Form "P" Circuit Breaker, fitted with Low-voltage Release, Resistance and Auxiliary Switch,

1 - 200 Ampere, 650 Volt, Single-pole, Type "C", Form "P" Circuit-breaker with Shunt Trip Coil and Auxiliary Switch,

1 - 50 Ampere Thomson Feeder Type Astatic Ammeter with Shunt and leads,

1 - 200-0-200 Ampere Thomson, Feeder Type, Astatic, Differential Ammeter with Shunt and Leads,

2 - 4-point Potential Receptacles,

2 - Rheostat Hand-wheels complete with Dial-plate, pointer, shaft-extension, insulated coupling, and tripod for mounting rheostats,

1 - Motor Field Rheostat mounted on Tripod at back of panel,

Milk

1 - Booster Field Rheostat to be mounted on tripod at back of Panel. This mounting for one Rheostat is included with the Booster Set Contract 14349.

Milk

1 - Motor Starting Rheostat to be mounted at back of panel,

1 - Single-pole, 100 Ampere, Carbon-break, Field Discharge Switch, with Discharge Clips and Resistance,

4 - Single-pole, Single-throw, 200 Ampere, 600 Volt, Quick-break, Type "C" Switches,

1 - Single-pole, Double-throw, 200 Ampere, 600 Volt, Quick-BREAK, TYPE "C" SWITCH.

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Australian General Electric Company.

Contract No. 1435.

MOTOR DRIVEN BOOSTER AND BATTERY CHARGING PANEL (CONT) (Specification cont'd)

1 - Single-pole, Four-throw, 200 Ampere, Motor Starting Switch. This Switch will be mounted, as shown in Print No. 202846 on the sub-base.

1 - M.D.2 Lightning Arrester, complete with line and ground connections.

1 - Double-pole, Double-throw, Quick-break, Type "C", 50 Ampere Field Reversing Switch.

FEEDER PANEL.

The Feeder Panel will consist of one Blue Vermont Marble Main Panel, 62" x 24" x 2", with 3/8" bevel, and one Blue Vermont Marble Sub-base, 28" x 24" x 2" with 3/8" bevel. This panel will be rated G.E.F.2 (Continuous Single-circuit Feeder) 550 Volts, 200 Amperes, and will here mounted upon it the following :-

2 - 200 Ampere, 650 Volt, Single-pole, Type "C", Form "P" Circuit Breakers with auxiliary Switches,

2 - 300 Ampere, Thomson Feeder Type Astatic Ammeters, complete with Shunts and Meter Leads,

2 - Single-pole, Single-throw, 200 Amperes, 600 Volt, Quick-break, Type "C" Line Switches,

2 - M.D.2 Lightning Arresters, complete with Kicking-coils, mounted on the back of panel as shown in Photograph No.300587.

G E N E R A L.

The above Panels will be mounted on suitable Angle and T-iron frame-work, suitable drilled, and supported from the floor by means of foot-irons, and held distant from the wall by tie-rods fitted with clevises, necessary adjustable turn-buckles and wall lag bolts. The panels will be fitted with all necessary ~~busbars~~ busbars, busbar-supports, clamps with bolts, and all necessary nuts and terminals. A general view of the back of the panels can be obtained from Photographs Nos. 301207 and 300587, showing angle and T-iron frame-work, and the method of supporting marble panels to the same.

On the Generator Panel, shown on Photograph 301207 can be

POWER SUPPLY for VICTORIAN RAILWAYS, ELECTRIC STREET RAILWAYS.

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Australian General Electric Company.

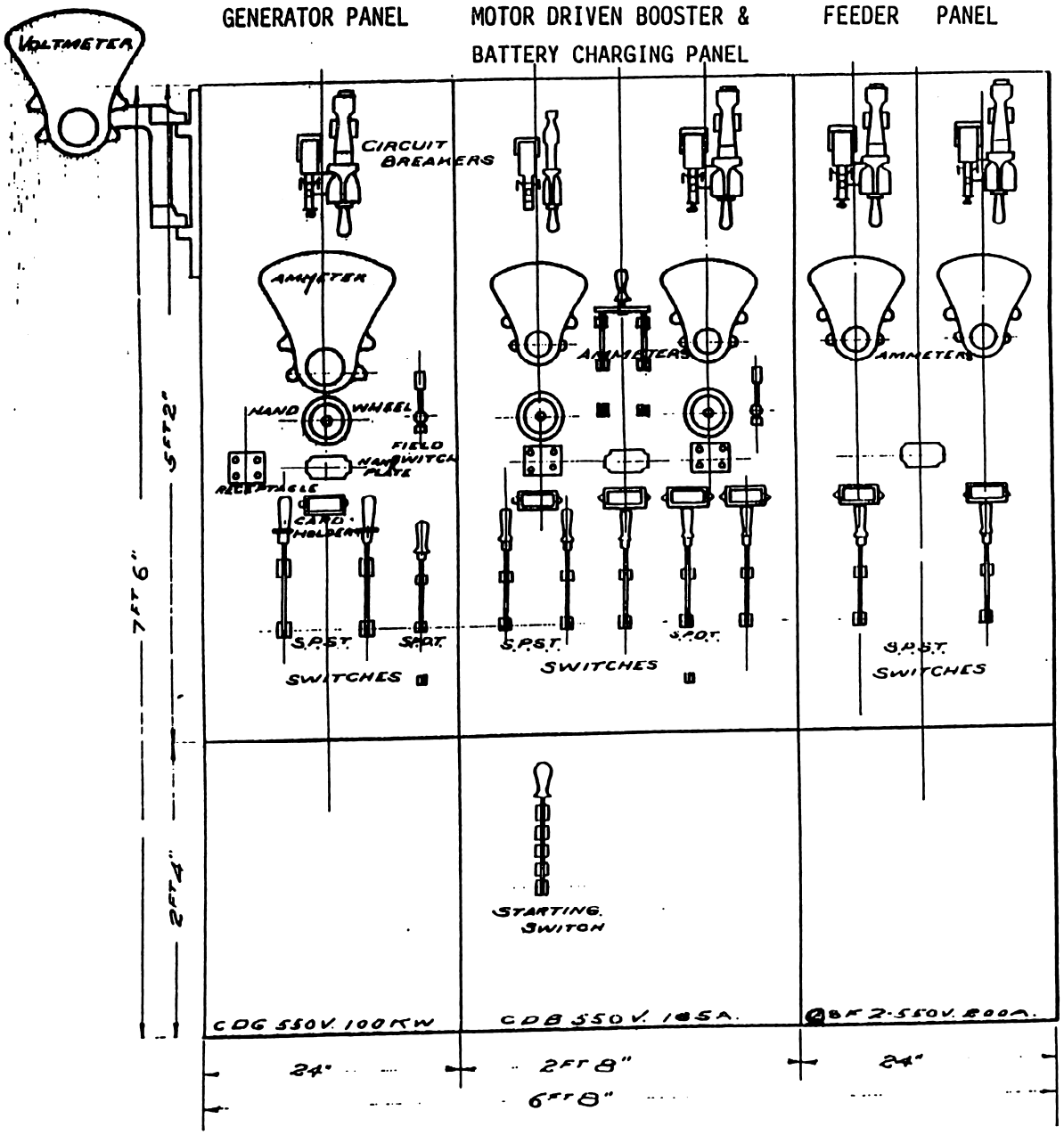
EXCLUSIVE AGENTS OF GENERAL ELECTRIC Co'Y U.S.A.
THOMSON HOUSTON AND EDISON SYSTEMS.

Electric Railway Lighting, Power and Mining Apparatus and Electrical Supplies of all kinds.

Castle Address.

Melb

Contract No 1435/
(Special Specification Cont.d)



SWI

202846 SWITCHBOARD FOR BRIGHTON SECTION OF VICTORIAN RAILWAYS.

Switchboard for Brighton Section of Vic. Rlys.

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POWER SUPPLY for VICTORIAN RAILWAYS, ELECTRIC STREET RAILWAYS.

Fire - Elwood (Elsternwick) Power House & Car Shed, 7 March 1907.

The disastrous fire which occured in the early hours of the morning destroyed the car shed including the whole fleet of 17 trams (9 motor & 8 trailer cars), the traction storage battery, office & the repair and store rooms.
The only part saved from the flames was the power house, comprising the boiler room, generating room which also housed the switchboard; some damage was caused to the southern wall. Consequently the generators were covered with tarpaulins for protection from the elements.

The resumption of the tram service after the interval of only 10 days was only possible because of the survival of the power house and the purchase of second hand rolling stock from Sydney. (see chapter) However, absence of the battery required that at times of heavy traffic both generating units had to be in operation. The result was that a generator could not be out of service for any reason without affecting the running of a normal tram service.

Such a situation arose on the fourth day after the resumption of service (Wed 20/3/ '07) (Argus- 21/3/'07 & S.M.C. 23/3/'07). One boiler and engine was in use in the early morning, and the second boiler was to be brought into service in addition prior to the starting of the second generator. Owing to a circumstance regarding the opening of a valve on the piping connecting the two boilers, water was carried over into N° 2 engine prior to it being started, which brought about the cracking of the top of the valve chest by the compression of the water. Until the damage was repaired the service was reduced by half for about four days. (Bradford Inquiry, Jenkins, P 88, cl. 2272 & B.I. Bradford, p 234, cl. 48)
Had the battery been in service the problem would PROBABLY not have affected the service.
The replacement storage battery for the one destroyed was supplied by Noyes Bros., and of 'Tudor' make and contained 265 cells. (Vic. Gov. Gaz.) According to Gordon Massey, Assistant Manager at the Power House, in evidence at the Br. Inq. p.175, cl. 5888, stated "of course, we had a battery of larger capacity than we originally had". (350 amp/hr.- Aust Mining Std. p. 58, 5/5/'09) The new battery room was built onto the back of the existing boiler house. The space previously taken by the burnt battery room was used as clear space between the power house and the new car shed, which was built on the site of the burnt car shed.

The British Westinghouse booster was troublesome from the outset owing to the motor portion burning out six times. (Br. Inq.- Stone, xxviii) To maintain its battery charging function an elec. motor (assumed to work off the 550 v. d.c.) was hired from A.G.E. Coy. with which to drive the booster via a belt. Mr Stone, V.R. elec. eng'r considered that this booster was too small for the work required of it. (Br. Inq.- Stone, xxviii). The motor hiring was during the reign of Mr Bradford.

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The Second Battery Room:- this was the same width as the boiler room, viz. 27 ft. (outside) and 40 ft long. It was timber framed & gal. iron clad with a full length ventilator along the ridge similar to that on the boiler room. Inside lining consisted of vertical oregon 5/8 in. thick boards covered with fibro. cement sheet. The underside of the roof purlins was lined with fibro cement only. The battery stands were of timber, in three rows each 31 ft 6 in. long x 2 ft 6 in. wide and two feet high from the floor. The new storage battery was of "Tudor" make of 265 cells and installed on Oct 1, 1907 (B.I. page xiv of Report)

It appears that storage batteries had a working life of about 5 years. Therefore around 1912 (check) the Dep't arranged for a replacement. For some unexplained reason there was a need to relocate the battery house. Maybe the '07 one, tacked onto the back of the boiler house, proved to be unsatisfactory . As far as I know there was no permanent additional boiler plant installed during that period. However, the temporary use of the boiler from locomotive N° Y - 415 would have to be accommodated somewhere near the main boilers. Maybe the second battery room was incorporated into the orig. boiler room for that purpose.

The new (third) battery house was entirely separate from other buildings and was located about 100 ft east of the rear of the depot office and between N°s 1 & 2 car sheds. An underground cable apparently connected the battery to the engineroom switchboard. (E E Bch drg N° 1321A, dated 20/4/1915) On the same drg, the old (2nd) battery room was labelled as a 'store'.

The new battery house had internal dimensions of 65 ft 6 in long x 30 ft 8 in. wide. It too was a substantial timberframed structure clad with corrugated gal. iron. A concrete floor, coated with Trinidad asphalt was level longitudinally, but had a 3 in. fall from each side to a central gutter falling to a drainage pit at the east end. Extra precautions were taken to protect the building from the acid fumes. All internal surfaces of the external corrugated iron had 2 coats of "P & B" paint before fixing. Both internal walls and ceiling had 6 in x 7/8 in. t&g 'v' jointed red deal lining. The tongues, grooves & joints of the lining boards were painted with anti-sulphuric acid paint before fixing. Six large ventilators were provided on the roof ridge. (info. taken from drg N° 697.12 - "New Battery House" and dated 14/3/ 1912.)

POWER SUPPLY for VICTORIAN RAILWAYS ; ELECTRIC STREET RAILWAY.

After Mr Bradford's services were terminated by the Commissioners in Oct. 1907, the responsibility for the power supply became that of Mr Stone, V.R. elec. engineer, who reported to the head of the Telegraph Branch, Mr W.A. Holmes, Telegraph Superintendent. The residential development along the Brighton tram route and the seaside traffic increased the patronage of the E.S.R. to the extent that the power supply system was becoming fully extended.

By 1912, the situation regarding the power was causing Mr Stone concern. Bearing in mind the Government's decision in Dec. of that year to electrify the suburban railways, any strengthening of the Elwood power supply would have to be financially viable and therefore be critically examined. Accordingly on 25/11/'12, Mr Stone wrote an urgent memo. to the Telegraph Sup't in which he requested that the Chief Engineer of Way & Works submit an estimate for extensions to the Elwood power house buildings. "The (extension) including flooring to harmonise with the present with the exception that I think the new outer wall which will come nearer to the car shed should be of brick to form a better fire break."

A projection of traffic increase to 1914 showed:-

Year	N° of Motor Cars	N° of Trailer Cars	Car Miles- for heaviest 6 hours service.
1910	6	2	480
1911	6	5	660
1912	6	6	720
1913**	9	6	900
1914	12	6	1,080

** Refers to service estimated for when duplicated track - St Kilda to Power House is brought into use.

"The present power plant is now taxed to the limit during the periods of heavy service on Saturdays & Sundays.....in the event of a breakdown.....no spare plant available for use.....it is extremely difficult at the present time to effect.....overhauls & repairs to the plant". If the traffic expands as predicted for 1913/14....."necessary to increase the power plant by installing a new boiler and engine driven generator of about 150 Kw, which would only provide for about three years at the estimated rate of growth of traffic or till about the end of 1915. A larger (generator) unit would not provide for a greater growth of traffic because if it broke down the balance of the plant (the present plant) could not carry the load." Estimated cost of plant - approx £5,440.

Mr Stone, still pursuing the Elwood power problem in a memo to the Tel Sup't, dated 16 Jan 1913 reported on his latest investigations. There were, he wrote, only two sources of elec. power in the district for Elwood P/H :-

1/ The Railway Dep't's own power House at Elwood

2/ The Melb. Elec. Supply Coy., whose power house was at South Yarra. (sic) (Richmond ?)

(formerly The Elec. Lighting & Traction Coy. of Aust. Ltd.)?

As the M.E.S. Coy already supplied current to the Prahran & Malvern Tramways Trust, Mr Stone canvassed the possibilities of obtaining power direct from the M.E.S. Coy or indirectly through the P & M.T. system where it crossed the E.S.R. at Carlisle St; OR by increasing the plant at Elwood. The disadvantage of seeking power from the P & M at Carlisle St would be the very heavy loading added at the end of the P & M line remote from the source of power.; particularly in the event of failure of any Elwood existing generating plant. A second difficulty was the commercial arrangement between the P & M and the M.E.S. Co. - re the resale of power. Mr Stone understood after consultations with P & M officers that an agreement between the Trust & M.E.S. with the present rates of wages, unduly favourable to the Trust and would not be repeated in a new agreement.

POWER SUPPLY for VICTORIAN RAILWAYS; ELECTRIC STREET RAILWAYS.

This power requirement sought was purely extra power to supplement the existing Elwood power. Stone was also looking for the M.E.S. to be able to supply power at any time to meet an emergency demand in 1913 of c@ 100 Kw and in 1914 of c@ 150 Kw in the event of a breakdown of any Elwood generators. The M.E.S. was duly approached in the matter and their reply, dated 13 Feb. 1913 was to the effect that they could supply the power sought principally for use on Sats, Suns & hols for the years 1913/14 to the max. extent of 40 Kw subject to 5 conditions. The conditions briefly were:-

1/ that a sufficiently large secondary cable, supplying current at "400 volts, monophase, 50 C.P.S., be run from our nearest substation, say, that at the corner Beach St. (sic) and Ormond Rd, Elwood to your power house."

2/ in consequence of the work being purely of a temporary nature and requirements being very small, V.R. to pay for cost of labour of erection & taking down at the end of the contract period, the necessary cable & insulators lent for the purpose by M.E.S. Co.

3/ energy supplied be metered at rate of 2 pence "per kelvin".

4/ liberty to discontinue supply on 31 Dec. 1914.

5/ that the electricity so supplied be used in such manner as not to interfere with the regularity or quality of the supply to other consumers.

The M.E.S. letter continued --" with regard to the large emergency requirements reaching as high as approx. 150 Kw.....our distribution arrangements.....have been laid out.....for supplying a purely residential area.....little margin would be left for any increase unless special extra high tension underground mains were run at certain points." ".....it would be quite impossible to afford the V.R. a standby supply.....whilst at the same time fulfilling the statutory obligations to the inhabitants of the large area at present supplied." The extra mains necessary "would be very costly.....would be merely of a temporary nature.....and might not be required once during the two years." "It is with much regret....." etc.

signed, W.J.Mountain.
Secretary for Australia.

The Prahran & Malvern T.T. responded to the official enquiry about a supplementary power supply in a letter dated 19 March, 1913. The Trust stated that after communications with the M.E.S. Coy it is found impossible for this Trust to undertake to supply the power required by the Commissioners.

By the 1 Apr. 1913, with the above conditions in mind, Mr Stone submitted a memo to senior management on the alternatives and his recommendations (see photo copies on 2 following pages) (Nos 12A + 12B.)

The Commissioners apparently approved of Stone's plans for he supplied detailed estimates.

In a memo dated 20 June 1913, he summarised as under:-

	£	s	d
1/ extension of buildings , foundations etc.	323	4	10
2/ provision of motor generator & apparatus for which tenders should be called	603	2	11
3/ provision of switchboard which should be an extension of present one.	31	7	0
Total	957	14	9

Stone also asked the Commissioners for special permission to call for tenders & take all steps to proceed with the proposed small addition to the power plant without waiting for the passing of the new loan Application Bill by Parliament. .."If such permission is granted it is desireable that the extension to the building be put in hand at once so that the new booster which has been lying idle for some months may be installed and brought into use. The installation of this booster which is urgently required has has been held over pending the decision as to the method of obtaining additional power."..... page No 19

T.L. 89A.

VICTORIAN 13 2414.

V. R. 5922 12.09
Electrical Engineers
Office 13
19

TELEGRAPH CODES: Nos. 3861

Please refer to
B 7 140/1
in your reply

17

ELECTRIC LIGHTING, POWER AND PINTSCH GAS STATION,

SPENCER STREET, MELBOURNE. April 1st 1913.

MEMO.

POWER SUPPLY TO ELWOOD.

Your minute of 22/3/13.

I have looked into the matters referred to in the Melbourne Electric Supply Co's letter of 13/2/13 attached. The proposal made by this Company is the only alternative method of obtaining a supplementary supply of power for the St Kilda Brighton Line to that of the Department extending the Power plant at Elwood.

The position at present stands as under :

POWER SUPPLY FROM THE MELBOURNE ELECTRIC SUPPLY COMPANY.

The Railway Department would have to supply a suitable motor generator to convert the single phase current to direct current, this motor generator would have to be installed at Elwood. To provide accomodation for this motor generator and also for the new booster which has not yet been installed (pending a settlement of the source of the supply of extra power) the power house would have to be extended. The Capital cost of providing the motor generator, switchgear, foundations, extensions of the power house and erection of cable as required by the Company would be approximately £1100-0-0.

PIRANI BOOSTER

The cost of current purchased from the Company and computed at the rate quoted by the Company on the Department's estimated requirements would be about £333-0-0 per annum.

ADDITION TO THE DEPARTMENT'S POWER PLANT AT ELWOOD.

The Capital cost of providing the requisite additional Boiler, engine driven generator, switchgear & extension to the buildings would be approximately £5440-0-0. The cost of the extra power supplied from the Department's power House would be on the same basis of demand as previously used about £800-0-0 per annum. In both cases interest has been excluded.

Comparison of costs /

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COMPARISON OF COSTS.

	Power purchased from Company.	Power produced by Department.
Capital expenditure	£1100-0-0	£5440-0-0
Cost of current excluding interest. ...	333-0-0	200-0-0
4% Interest on Capital	44-0-0	217-0-0
Cost of current including interest. ...	377-0-0	417-0-0

As it is anticipated that the Yarraville power plant will be in operation about the middle of the year 1915 and that power could then be obtained from that source at a low cost the question of the loss on the capital value of the new plant which would be required for so brief a period becomes a more important factor than the actual cost of current.

Although the plant would not suffer material depreciation in that time it is extremely doubtful whether a purchaser could be found for it in Melbourne or even in Australia and the added loss when the plant at Elwood is thrown out of use would I consider be of the order of £4000.

Besides the financial aspect of the question that of the continuity of the service has to be considered. The proposal of the Melbourne Electric Supply Co. provides for the extra power required on Saturdays, Sundays & Holidays but makes no provision for a larger demand in the event of a breakdown of one of the Department's present generators. On the other hand the proposal to add another boiler and generator not only gives the additional power but provides the necessary stand by or spare plant to ensure continuity of service.

With respect to the risk of failure of supply in the event of the Company's offer being accepted I desire to say that although no one can make predictions on such matters I do not consider it will be much greater during the next 2 to 2½ years than it has been in the last 2 years, but of course the inconvenience to the public caused by failure increases with the business done on the line.

In view of the expected early supply of power from Yarraville and the considerable loss which would be incurred if the plant were extended I recommend that the Supply Company's offer be accepted.

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