THE ORGANISATION OF ELECTRICITY SUPPLY

IN TASMANIA

A dissertation presented to the Faculty of Arts of the University of Tasmania in partial fulfilment of requirements for the Degree of Master of Social Sciences (Admin.).

by

Peter Read
charles

PETER READ, BSc. 1985.

DECLARATION

I, Peter Charles Read, hereby certify that this dissertation represents my own original work and that it contains no material which has been published or used by me and that it contains no copy of paraphrase of material previously written by another person or authority except where due acknowledgedment is made.

PETER READ

CONTENTS

INTRODUCTION

In Australia there is only one electricity supply authority that carries out all eight facets of public electricity supply throughout a whole state. Tasmania's Hydro-Electric Commission (H.E.C.) investigates, designs, arranges finance, constructs, generates, transmits, distributes and regulates. To the public the H.E.C. must look like a monolithic technological bureaucracy; purposeful, effective and reaching out into every corner of the state. To anyone under 30 this has always seemed the case. However, it is merely the present form of an industry that has changed and continues to change.

There have been five phases in the organisation of electricity supply in Tasmania. The H.E.C. and its predecessor the Hydro-Electric Department (H.E.D.) have been involved in four of them and have modified their policies and organisation to fit the needs of the times. This dissertation traces the evolution of one of Australia's better known quangos,[1] documents its unplanned emergence from a failed commercial venture and the fundamental events that shaped the organisation of electricity supply in Tasmania and eventually produced the H.E.C.

The overriding conclusion is that technology has shaped the organisation. Not just the technology of electricity supply, but the supporting technologies, particularly communications and electro-metallurgy. There are, however, other influences; personal, economic, social and political, that have shaped various phases of the organisation's evolution and remain in its present structure.

At the definative times there were men of vision; William Corin, John Butters, almost certainly Robert Cosgrove and Allan Knight. The built an organisation that has been a major force in the development of Tasmania.

(1) Tasmanian Year Book 1973, p.326, describes the H.E.C. "as an autonomous statutory authority, responsible almost entirely for the conduct of its own affairs. -- answerable to Parliament -- not directed or responsible to a Minister -- power exerted by Parliament is mainly financial -- it is not the Crown -- its servants are not civil servants and its property is not Crown property" i.e. a quasi-autonomous non-government organisation - quango.

P R E L U D E

Innovation never comes automatically. There must always be reasons for change and preconditions before it can occur. The main reason is need. If things are fairly satisfactory few will bother to spend the time and effort seeking improvement. It needs to be remembered, however, that 'satisfactory' is a relative term. There are three main pre-conditions; the availability of the technical solution, the people to implement it and the money to obtain and install the hardware. The introduction of electricity into Tasmania was no exception.

The seeds of the need had been sown and matured elsewhere; in England in the first half of the 19th century when the growth of the factory system, the development of the railways and the introduction of public health measures allowed and fostered the industrial revolution and the growth of England's cities.(1) Between 1801 and 1861 the population of Great Britain rose from 10,501,000 to 23,217,000 or 121%(2) and the country itself became the most important of trading nations and the leader in the economic development of the world.

Most of these people lived in the cities by 1851. Then between 1851 and 1871 the numbers of people employed in agriculture fell by 500,000 to 1,423,854 and the numbers employed in industry rose formidably. In coal mining from 193,111 to 315,398; in iron and steel from 95,350 to 191,291; in machinery making and ship building from 80,528 to 172,948 and in cotton textiles 414,998 to 505,715.(3) The cities and towns grew bigger.

This created three needs; a cheap convenient source of artificial light for public places, factories and dwellings; a source of distributed power for machines and a source of motive power for the transport of people that was compatible with city streets and importantly, horses.

To appreciate these needs one must envisage the world of the cities of mid 19th century England. Light was by candle or whale-oil lamps. Kerosene lamps were introduced in the 1860's as was town gas. These however were not

incandescent mantles but the less brilliant wick type kerosene lamps and plain 'fan-tail' flame gas lights. Transport was by foot or by horse within the cities and by coach or railway between cities. There was no real source of distributed power. Machines were powered by windmills or water-wheels, factories by steam engines with overhead belt drive to individual machines. Many small machines were human powered by treadle or later pedals. Most of these were ineffective, expensive and inconvenient. One need only think of traction-engines, extremely slow, very heavy and seldom more than a few horse-power, and of the mounds of manure, flies and early rising associated with the use of horses for city transport.(4)

The technical solutions evolved over ninety years between 1800 and 1890. They took three separate but inter-connected paths; electric batteries, electric light and electric generators/dynamos/motors.

In 1800 Alessandro Volta learnt that the chemical action of moisture and two different metals, such as copper and iron, produced electricity. He built the first battery, then called the voltaic pile, of stacked copper and zinc plates separated by paper or cloth moistened with a salt solution. These were the first sources of steady electric current.(5) The first moderately efficient battery, the Daniell cell, dates from 1836 and the first dry cell from 1866.(6)

It was the development of a vital service, fast communication in the form of the electric telegraph, however, that encouraged the development of all three aspects of electricity. This was the first commercially successful use of electricity and led to the manufacture of electrical components and the first significant group of electrical technicians, telegraphists. In 1820 Hans Oersted in Denmark found that an electric current can produce a magnetic field that will turn a compass needle.(7) This led both to the electric telegraph and the electric motor and generator. In 1825 William Sturgeon invented the

electromagnet and in 1837 William Cooke and Charles Whealstone in England patented an electromagnetic telegraph. About the same time Samuel Morse in the U.S. also developed a practical electromagnetic telegraph and soon afterwards a relay device plus a procedure - the Morse Code, that enabled messages to be sent over any desired distance.(8) By 1851 there were fifty telegraph companies in the U.S.A. and in 1866 the first successful trans-atlantic cable was laid. In 1872 Australia was linked to London(9) and by 1877 all Australian capital cities were connected.(10) Thus from the 1850's there was a profitable industry that soon spread world-wide and demanded the development of improved electrical equipment and the training of large numbers of competent electrical technicians.

In 1821 Michael Faraday built an apparatus that demonstrated the principle of the electric motor(11) and in 1835 Thomas Davenport, an American blacksmith made and patented a rudimentary but workable electric motor. The first electric motor of commercial significance was demonstrated in 1873 in Vienna by Zenobe Gramme. This incorporated a ring armature, which enormously improved the efficiency of early electric generators. He had discovered that if a large 'dynamo' (the early name for generator), were electrically connected to a smaller one and the larger one rotated, the smaller one would revolve also and act as an electric motor.(12) Conrad Cooke recognised that this made direct-current (D.C.) electricity generation practicable as it gave a uniform current and made and introduced such a generator in England, using it to power a searchlight on the clocktower of the House of Commons(13) about 1873. This contained an arc lamp as single carbon arc lamps had by then been in use for some years after having been discovered by Humphrey Davy in 1800.

Arc lamps, however, had one major drawback. Only one could be struck, i.e. lit from a single source of current. This sufficed for searchlights, theatre arc lights and lighthouses but a major drawback in domestic and public lighting. In 1877, however, Jablochkoff, a Russian engineer developed a "candle of two carbons placed side by

side and separated by and enveloped in an isolating and fusible substance."[14] This allowed several lights of different sizes to be lit from a single generator and indeed fifty lights were used when the shops of the Louvre in Paris were so lit. By 1879 trials of numerous generation plus lighting systems were being made in London.[15] These worked, but not very reliably and perhaps more importantly "could only compete in economy with gas, in large open spaces where a light of about 6000 candle power might be wanted."[16]

Incandescent carbon filiament lamps were independently developed by Joseph Swan in England in 1878 and Thomas Edison in the U.S.A. in 1879.[17] In 1880 lamps constructed in accordance with Edison's method were shown in action in London and forty-five 25 candle power lamps of Swan construction were used by Lord Armstrong in his home at Craigside, Rothbury, Northumberland.[18]

The first public supply of electricity was in 1881 when Siemens Bros. took water power from the river Wey to drive an electric generator for the lighting of the streets of Godalming, England.[19]

The people to implement technical change seem to have evolved in two ways. Education, either University in Science or Mathematics,[20] apprenticeship with a company making engineering or telegraph components,[21] or self-education, initially through periodicals such as the Engineer (first published 1856), Engineering (1866), The Electrician (1861) and The Telegraphic Journal (1872).[22]

The big spurt however came when technical classes were started in 1879 at the City and Guilds of London Institute.[23] These were so successful that by 1882 "some hundreds of men .... have thought it worthwhile to come regularly, night after night."[24]

The Society of Telegraph Engineers, which was formed in London in 1871, had a membership of 650 in January 1875.[25] It became the Institution of Electrical Engineers in 1887 and by 1985 had 2448 members, 177 of which were foreign members.[26]

In Tasmania, the needs were the same. Light, distributed power and motive power. By 1881, the population was 114,790,[27] with Hobart (including New Town and Queenborough) containing 23,633 and Launceston 12,752.[28]

Light in 1881 was supplied by candles, kerosene lamps and, in Hobart and Launceston, gas lamps. One can infer that most houses were still lit by candles as there was a Soap, Candle and Soda Crystal factory in Launceston in 1878,[29] whereas the advertisements for kerosene lamps have the prominence that infers that it is rather a special thing.[30] Launceston had gas lights from 1860. In 1900 Hobart's streets were still lit by gas, with twenty-six incandescent mantles only in the city centre and 338 ordinary 'fan-tail' burners.[32] The cost to the council was £2200, i.e. about £6 per light per year. This was expensive as, at that time a fitter earnt 11/- per day.[33] (In 1985 dollars a fitter earns $50 per day and those gas lights would cost $600/year each).

Power for machinery in Tasmania was predominantly from watermills, with fifty-one water mills in existence totalling 393 H.P.[34] Steam mills totalled 346 H.P., probably totalling about thirty (there were twenty-nine steam mills in 1868). There were also some traction engines.[35]

Motive power was even more of a problem in Tasmania than in England for two reasons. The density of population and the rainfall. Population density was low and rainfall high. Low population density meant services were uneconomic and high rainfall turned the unmade roads into bags. Coaches ran daily between Hobart and Launceston, and to Green Ponds, New Norfolk and Browns River and after 1870 to Huonville. In 1876 the coach fare from Hobart to Launceston was 30/- outside the coach,[36] equivalent to $150 today and in 1881 cab fares in Hobart[37] and Launceston,[38] 1/- up to one mile and 6d every half mile thereafter.

Apart from the convict-built road from Hobart to Launceston, there were few good roads. Successive Tasmanian governments had attempted to raise funds for road construction, to be consistently vetoed by the Legislative

Council until 1877 when £140,000 was allocated.[40] What roads there were were often impassable due to the wet weather. In 1871 the one "steam threshing machine" (a traction engine!) in the Port Sorell district could not be moved from place to place because the roads were in such a bad state.

There were bicycles in Tasmania, but these were penny-farthings, which were not as well suited to Tasmania's hilly terrain as they were to the flatter roads of Adelaide or Melbourne.[41] They were not common, the very first bicycle, a penny-farthing, being brought to the Huon in 1882.[42]

The main method of transport was the horse, of which there were 22,000 serving a population of about 100,000 people in the early 1870's[43] and coastal shipping. In the early 1870's the main connection to places such as Port Sorell, Circular Head, the Huon was by sea.[44] A good appreciation of the transport situation is to realise that in 1901 Australia had 1,662,000 horses, one for every two people and that the horse population reached a peak in 1918 when it was 2,527,149, still about one horse for every two people.[45]

That the high rainfall had its effect is shown by the large number of light railways/tramways built almost everywhere in the north, northwest and west coast areas,[46] in the 1890's. The main advantage of a tramway is that instead of having the weight carried on a narrow carriage or bullock cart wheel it is spread by the rails and sleepers over a much wider area. Thus the wheels do not sink into wet ground.

The technical solutions to the problem of lighting, power and transport suprisingly were almost as available as in Europe.

This was mainly due to three factors. The gold rushes, starting in the 1850's had brought many competent mining engineers and managers to Australia as had the development of railways and tramways in the 1860's and 1870's.

There were also forty telegraph stations in Tasmania in 1881.[47]

W.H. Knight,[48] sent out in charge of four skilled men to erect machinery for a water-powered sawmill at Pipers River in the 1860's is a good example. In the 1870's he founded his own engineering workshop in Launceston and this supplied the iron and pipes for the Duck Reach Power Station in 1894.[49]

With two railways, the Launceston and Western and the Hobart-Launceston "Main Line" railways under construction in the 1870's, gold, iron and most importantly tin mines and smelters in the '70's plus the telegraph stations, there were significant numbers of tradesmen, technicians, engineers and managers who were interested in the latest technical news.

This was undoubtedly the reason for the founding of Mechanics Institutes, which were to be found in most towns. In the 1870's Launceston had its Public Library and its Mechanics Institute had a reading room with English American and Colonial newspapers and periodicals as well as a library of 5000 volumes.[50] Waratah in the 1880's also had a Mechanics Institute "well supplied with British and colonial newspapers and magazines and had a library of 1500 volumes."[51] Thus there was a significant number of technical men plus up-to-date information available regarding the latest developments in engineering in Europe and America.

A second factor was that it was not uncommon for successful Tasmanians to visit Europe and America once the passenger services improved in the 1870's following the opening of the Suez Canal in 1869.[52] A good example is T.W. Monds of Launceston who made a good living operating watermills and grinding flour. In 1885 he made a world tour, visiting exhibitions of flour milling in Paris and Glasgow. His diary notes electric light in England and

America.[53] These were the years of the great Exhibitions, with the first British Exhibition of Electrical Enginering held at the Crystal Palace in 1882.[54]

A third factor was the practice of European Companies to have active sales offices in Australia.[55] The large expenditure on mining equipment and the development of railways and cable and steam tramways, lifts etc., made Australia a good market. Thus City Engineers, Mine Managers and the like in Australia in the 1870's and 1880's were well aware of the latest technical developments overseas.

The people to actually install the machinery and get it operating were usually part of the package. It was normal for the contractor to "furnish a thoroughly competent engineer for the erection of the plant" and that "before leaving he will be held directly responsible that the employees detailed by you to run the electrical plant have been trained so that they can handle it intelligently, and mechanics instructed in simple repairs."[56] That was in 1904, but a similar practice existed in 1892[57] when Siemens set up the Hobart Electric Tramway Company and the reason for the 1860's arrival of W.H. Knight to set up a water powered sawmill. Obviously it was the only way to sell relatively complicated machinery. It still is.

The final precondition for innovation is the money to buy and install the hardware. This was provided in Tasmania in the early 1880's from three sources. Mining was the main source of money. Beginning in the 1850's, but markedly accellerating with the big tin discoveries at Mt. Bischoff in 1871,[58] Ringarooma 1874,[59] and gold at Beaconsfield in 1876,[60] it was "the mainspring of Tasmania's revival in the late 1870's and the continuing prosperity which followed."[61] These mining companies paid lucrative dividends to their predominantly Tasmanian shareholders. Mt. Bischoff had already paid £1 million in dividends by the end of the 1880's.[62]

Agriculture also contributed. In the 1870's Tasmanian

wool growers eliminated scab, with consequent increases in productivity, in the 1880's fruit growing became well established as did potato growing, both industries exporting more than 100,000 worth of products annually,(63) wheat was already profitable.

The Tasmanian Government also borrowed freely and this was a vital factor in the continued affluence of the 1880's. With £300,000 in 1881, £500,000 in 1882, £800,000 in 1884 and £1 million in 1886, the government nearly doubled the length of railway lines in the decade to nearly 400 miles.(64)

Thus in the early 1880's there was a big need for a source of light and power, the technical solution had been found, the people were available to implement it and the money was there to install it. It needed only one thing. The man to put it all together.

1. Court, W.H.B. A Concise Economic History of Britain. Cambridge University Press, 1967. Chapter 1.

2. Ibid, p.5.

3. Ibid, p.183.

4. Blainey, G. The Tyranny of Distance, p.295. Sunbooks, Melbourne, 1966.

5. World Book Encyclopedia, Vol.6, p.153. Field Enterprises, U.S.A., 1974.

6. Encyclopedia Brittanica, Vol.E, p.542. Uni. of Chicago, 1982.

7. World Book Encyclopedia, Vol.19, p.75.

8. Ibid, p.75.

9. Blainey, op. cit., p.223.

10. Younger, R.M. Australia and the Australians, p.419. Rigby, Adelaide, 1970.

11. Encyclopedia Brittanica, 1982, Vol.E, op. cit., p.610.

12. Ibid, p.610.

13. Obituary of C.R. Cooke, Journal of the Institution of Electrical Engineers, Vol.64, 1926, p.1203. Institution of Electrical Engineers, London.

14. Appleyard, R. History of the Institution of Electrical Engineers, p.58. I.E.E. London 1939.

15. Ibid, p.63.

16. Ibid, p.66.

17. Ibid, p.67.

18. Ibid, p.68.

19. Ibid, p.68.

20. Obituary of Sir David Solomons. Journal of the Institution of Electrical Engineers, Vol.63, 1925, p.1158.

21. Ibid, Vol.65, 1927, p.1021.

22. Appleyard, op. cit., p.70.

23. Ibid, p.73.

24. Ibid, p.74.

25. Ibid, p.53.

26. Ibid, p.133.

27. Tasmanian Year Book, p.152, 1973.

28. Blainey G. Population Movements in Tasmania 1870-1901. Journal Tasmanian, Historical Research Society, p.62, Vol .

29. Walch's Almanac 1878, p.62.

30. Walch's Almanac 1878, p.52. W.A. 1877, p.57 and p.56. W.A. 1876, p.56. W.A. 1875, p.59 and p.61.

31. Cyclopedia of Tasmania. Maitland and Krone Hobart, 1900, p.31.

32. Ibid, p.169.

33. Correspondence between Noyes Bros. and Mt. Bischoff Re Electrical Installation, Waratah, 1904. Examiner (Tasmanian Collection. State Library, T.C.P. 622.48. Nov).

34. Dallas, K.M. Waterpower in Tasmanian History. Journal of Tasmanian Historical Research Society, Vol. , July 1959, p.59.

35. Townsley, W.A. Tasmania and the Great Economic Depression, 1858-72. J. Tas. Historical Research Society, Vol. , p.45.

36. Ibid, p.35.

37. Walch's Almanac, 1881, p.184.

38. Ibid, P.195.

39. Townsley, W.A., op. cit., p.42.

40. Beaver, E.A., Launceston Bank for Savings 1835-1970, p.83.

41. Carrol, B. Getting around Town: A History of Urban Transport in Australia. Cassell's Australia 1980, p.109.

42. Huon and Derwent Times. Huon Centennary Settlement Issue, December 1936.

43. Townsley, W.A., op. cit., p.40.

44. Ibid, p.42.

45. Carroll, B., op. cit., p.65.

46. Rae, L. A History of Railways and Tramways on Tasmania's West Coast.

47. Walch's Almanac, 1881, p.204.

48. Dallas, op. cit., p.87.

49. City of Launceston Electric Light Works - 1896.

50. Townsley, W.A., op. cit., p.44.

51. Godfrey M. Waratah-Pioneer of the West. Published by Municipality of Waratah 1984, p.18.

52. Blainey., op. cit., p.219.

53. Dallas, op. cit., p.86.

54. Obituary of W. Howard Tasker. J.I.E.E. Vol.62, 1924, p.985.

55. Obituary of J.R. Bainton. J.I.E.E. Vol.62, 1924, p.979.

56. Noyes Bros. (Mt. Bischoff correspondence, op. cit.)

57. Cyclopedia of Tasmania, p.374.

58. Reever, op. cit., p.82.

59. Ibid, p.83.

60. Ibid, p.84.

61. Ibid, p.84.

62. Ibid, p.85.

63. Ibid, p.85.

64. Ibid, p.85.

BEGINNINGS

Kayser; Heinrich Wilhelm Ferdinand Kayser, was that man; Mt. Bischoff the place. The need was for light, the money came from tin. The year was 1883.

Kayser had been born in Germany in 1833, the third son of a Mining Engineer and educated at the Bergakademie Clausthal. Arriving in Adelaide in 1853, he was in Melbourne in 1854. He worked on various goldfields and became a Mining Manager in Bendigo in 1863. In 1875 he was chosen from some ninety applicants to be Manager of the Mt. Bischoff Tin Mining Co. at Waratah.(1)

Mt. Bischoff had been discovered in 1871 by James 'Philosopher' Smith. The claim however was fifty miles from the coast, with many miles of impenetrable scrub and heavily timbered country(2) in between. A considerable amount of money was obviously necessary just to start and Smith was not very successful in raising it. In 1873 he was still hawking his claim around Launceston, but in August 1873 William Richie, a Launceston solicitor floated the Mt. Bischoff Tin Mining Company, taking over Smith's claim for cash and shares.(3) Preliminary work was enormous, including the necessity to clear a track from Emu Bay to the mine, to clear the mine site in a very heavily timbered area, to construct tramways, water races and flumes and ore-dressing appliances to make the ore marketable. The road alone cost £10,000.(4) The original Mine Manager resigned in mid 1875 and Kayser was appointed.

He immediately started to lay down a system for working the mine. By the time the first dividend was declared the company had spent all its initial funds and was £40,000 in debt to boot. That initial dividend, however was £12,000(5) and was declared in 1878. The first battery, a small second hand five head unit powered by a steam engine, was put into operation in December 1876.(6) A fifteen

head battery, powered by a water wheel started in September 1879. By then Kayser had already found the River Waratah insufficient to supply all the power required and, after a lengthy consultation about the merits of steam power vs. water power, he commenced building a four metre embankment on Falls Creek. This was finished in the summer of 1881.(7) By then a forty head battery had been installed at the bottom of Waratah Falls,(8) the mine was yeilding over 220 tons of ore a week, three dividends of £5,000 had been declared and shares were selling at £62.10.(9) Par, remember was £5.(10) Then came the breakthrough. In the minutes of the Mt. Bischoff Directors meeting held on 25 January 1883; under 'correspondence' is recorded; "To the Australian Electric Light Co. Ltd., 19th inst. Ordering a dynamo machine and fifty lamps in lanterns etc." Now whether it was coincidence or whether the Australian Electric Light Company did some promotion is not known, but in May 1883 the Australian Light Company of Melbourne gave a demonstration by lighting the windows of several Launceston shops. The Launceston Council had voted 50 for the first public test of electric lighting.(11) This was the first time electric light was seen in Tasmania.

Kayser installed the 'Swans Electric Light' direct current dynamo, driven off the forty head main battery and held a trial run on Tuesday 19th June 1883. This supplied power for some 50 lamps in the mill, workshops, offices and stores. A line was also run to provide lighting for the Mine Manager's residence and St. James Church.(12) However, the dynamo did not work to Kayser's satisfaction and he wrote to the manufacturers for further information,(13) and it is this, together with the curious fact that it was driven directly from the main water wheel shaft "so that when the machinery stopped the light went out",(14) that inclines me to wonder whether a technician was sent out to instal

it? He must have received a satisfactory reply however as by 31st December 1884 Kayser could write "after a great many trials and unpleasantness I am pleased to say that the light is a grand success. All the Waratah sheds, workshop, store and office are supplied with lamps with the very best results and no difference is perceptible in the light of the lamps close to the dynamo and those furthest away."(15)

By December 1885 it was clear that "an additional dynamo will be needed when the new sheds require lighting."(16) By the end of 1886 "the recently installed 100 lamp dynamo" had "given every satisfaction."(17) Accumulators were added in 1889 and in 1897 another dynamo was installed in the Ring-tail plant further downstream, this later having its own Pelton wheel drive so the lights could continue when the main drive was stopped.(18) By 1904, there were three dynamos. All had "given every satisfaction."(19) The whole system appears to have lit about 250 lamps.(20)

The whole system was put in to replace kerosene lamps and an insight into its economics is given in the 1904 correspondence between Noyes Bros. and Mt. Bischoff regarding the installation of a vastly upgraded system. In their proposal Noyes quotes the example of Totlans Hotel which would need thirty lights of which an average 20 would be in use each night. At £2.10 per lamp per year this would cost £50 for electricity. At that time Totlans were apparently paying £104 for kerosene and candles(21) alone. Thus Totlans could halve their lighting cost and provide much better lighting, with Mt. Bischoff still making a profit.

In 1904-6 the whole system was vastly upgraded to allow for more lights, twenty-four electric motors and three electric locomotives, one of which would be an 80hp engine. This would haul 20 two ton trucks from the mine to Waratah.(22), (23) This was estimated to cost £13,260, save £1,492 per year in labour, wood. kerosene and candles

and earn £414 per year from Town lighting.[24] This 1904 system was an alternating current system (AC).

It was a hydro-electric system with two reservoirs, and a storage/surge tank on the south-eastern slope of Mt. Bischoff. A 480mm diameter steel penstock with a head of 180m drove two Escher Wyss pelton wheel turbines each coupled to a 140KVA, 2200 volt Westinghouse generator running at 750rpm. Two transmission lines were installed, operating at 2200 volts with step down transformers at the mines and sheds to reduce the voltage to 440 volts for motors and 220/110 for lighting. A substation together with a motor-generator set of 100KW transformed the power to 600 volts DC for the 80hp electric locomotive and another motor-generator supplied 110 volts DC for the two smaller electric locomotives used in the mine. A third generating unit consisting of a Voith turbine and a 375KVA AEG generator was installed in 1909 and a similar unit in 1912. By 1912 the installed capacity 1-MW but it was not possible to average more than 390KW due to limitations in water supply.[23], [24]

Thus from a relatively simple DC system with one dynamo and fifty lights in 1883, which was less complicated than the electricity system on a 1970 semi-trailer, the Mt. Bischoff electricity generation system had grown by 1904 to one that was conceptually almost the same as todays with multiple reservoirs, surge tanks, controlled hydro-electric generators, switchboards, multiple transmission lines and substations.

Despite the success at Mt. Bischoff it was some time before anyone else installed electric light. Dallas records a small temporary installation at Terry's mill at New Norfolk in 1886, but there was insufficient

power to light anywhere other than the owner's house.[25]

In 1889 however an installation comparable to Mt. Bischoff was made at the Waverley Woolen Mills on the outskirts of Launceston. Not only was it installed but it was demonstrated with flare. Mr. P. Bulman, a senior proprietor had been thinking about electric light "for some years" but had been discouraged by the talk of local experts. In late 1885 or early 1886 however he wrote away to ten or twelve American and English companies for estimates. When these estimates had arrived he was rather at a loss to choose one but, possibly by coincidence, a Mr. W.C. Prousty was in Launceston and was able to advise him. Prousty recommended the tender of the Anglo-American Brush Company of London and by the end of July 1889 had installed one of their B2 Victoria Dynamos which was "compound wound" and 60 seventeen candle power incandescent lamps. This was driven by a Leffell ten inch turbine working off a 100ft head of water drawn from Distillery Creek. Running at 1140 rpm it generated 100 volts, probably D.C. Not only did Bulman install the lighting, he made a public demonstration of it, inviting the Mayor and Alderman to a ceremonial switching on followed by a demonstration of the lead fuses.[26] The dynamo was only lightly loaded and had a capacity of 116 lamps. The sixty installed in 1889 were mainly in the mill, though twenty-five were in Bulman's house. Although this installation does not seem to have been enlarged its success must have had some influence on the Launceston Council in their development of Duck Reach.

Over the next few years small lighting plants were installed in mills and mines. Dallas mentions Monds mill at Carrick in 1890,[27] the Golden Gate Battery at Mathinna in 1891 and a gold mine at Lefroy in 1894.[28] None of these were public supplies.

The first application of electricity that touched the public arena was the setting up of the Hobart Electric Tramway Co. in 1893.

The legislative context of this enterprise, however, is rather curious. When Tasmania attained "Responsible Government" in 1856 most of the Acts of Parliament were either local and specific or quite fundamental. Moreover, the fundamental ones, though quite predictable for a community that had just emerged from being "administered by a Governor with autocratic power",[29] tended to reflect the rural activities of the times. There were however two 'technological Acts', the Hobart Town Gas Co. Act of 1854[30] and an Act for Electric Telegraph 1857.[31] These two Acts set one most important precedent; they put the control and regulation of these utilities firmly in the public sector. The Hobart Gas Co. was authorised to break soil and lay pipes in roadways etc. but only with the permission of the City Surveyor and the Mayor and Alderman i.e. Council permission.[32] The Electric Telegraph Act set up the Office of Inspector of Telegraphs to supervise their construction, establishment, maintenance and operation.[33]

The Hobart Tramways were really set up under the Hobart Tramway Company Act of 1884.[34] This is really one of the last of the older fairly general acts that envisages a tramway for passengers (the more common meaning in Tasmania in the 1890's meant a narrow gauge railway for the carriage of goods, mainly mineral ore), allows construction in city streets, spells out how interference with other property rights and services e.g. gas, water and telegraphs will be handled, but is not specific as to motive power. It does

however place tramways in Hobart clearly under the jurisdiction of the Hobart City Council under the general oversight of the Minister of Lands and Works. In 1891 when the Hobart Electric Tramway Company was set up that Company made an agreement with the Hobart City Council which was legitimised by the Hobart Tramway Company Act of 1891. This said, amongst other things, that the provisions of the 1884 Act still held.(35)

There were plenty of tramways in Australia in 1891. The first was opened in Sydney in 1861. This operated in Pitt Street from Circular Quay to the railway station in Devonshire Street and was worked by horses. It was closed in 1866 due to opposition by shopkeepers and drivers of other vehicles and the rails removed.(36) In 1879 steam trams were introduced. The N.S.W. Government decided to build a temporary steam tramway to service the 1880 International Exhibition and ordered 4 Baldwin Standard gauge steam tram motors and 6 double decker bogie trailers from the United States. The government had intended to operate the service only for the six months of the Exhibition but it proved so popular that Sydney people pressed not only for its retention but for its expansion.(37) By 1898 there was 63.5 km of track and 114 motors.(38)

Melbourne had opted for cable trams. The cable ran in a slot between the rails and was kept moving by an engine house somewhere along the route. Each tram was composed of two cars. The first, called the "dummy" had a gripping gear in the centre. This was rather like an iron hand which passed through the slot and gripped the cable below. This became rather complicated on corners and intersections where cables crossed or were led around large drums.(39) The first line was opened in 1885 and eventually the system became the fourth largest in the world with 75km

of double line and 1200 cars.[40] Adelaide was served by horse trams. These commenced in 1878 and ran for nearly thirty years.[41] Brisbane, too, had an extensive horse tram system which commenced in 1885.[42]

Hobart was the first Australian city to have a complete electric tramway. In fact it was the first in the southern hemisphere. There had been a demonstration tramway with one tram at the Centennial Exhibition in 1888. When this was over the tram and all its generating equipment was taken over by a land development company and run over a 3km track between Box Hill and Doncaster. This was hardly a tramway system and what's more after the initial enthusiasm it didn't prosper.[43] Fortunately for Hobart, the London firm of Siemens wanted an advertisement for its products[44] in Australia and set up a particularly effective case of innovation. They set up a company in London with a capital of £95,000. There were three local directors, one of whom happened to have been Minister of Lands and Works in 1887-8 and was to become Premier in 1894, Edward Braddon. Braddon was Tasmanian Agent-General in London for several years after 1888. Well connected and highly regarded in London, he was very effective in obtaining London capital for developing the proven mining fields of the north west and west coast. Energetic, popular and a Director of Mt. Lyell, Emu Bay Railway, etc. he was an ideal man for the job.[45] Siemens also attracted two other very useful local Directors, C.H. Grant, another Member of Parliament[46] and David Barclay who in 1911 was the Managing Director of the Commercial Bank of Tasmania[47] and twenty years earlier probably already an up and coming businessman.[48] Perhaps they knew something as there was severe opposition and a crowded public meeting was held at the Town Hall to oppose the proposal. The tramway

system was started in spite of the complete disapproval of the government of the day.(49)

Siemens provided and installed the complete system. Nine miles of track extending from the Railway Station, to Newtown, Cascades and Sandy Bay. They sent out an experienced mechanical engineer who had already erected Siemens electrical plants in Guensey in the Channel Isles and the West Indies, Arthur Parker. He installed the whole tramway in 1892, and then became its Engineer and General Manager. This was a direct-current system, operating at 500 volts D.C. The generators were driven by three Willans and Robbins compound single acting steam engines of 200 bhp each. The generators gave 250 amps. Works and offices were situated in Lower Macquarie Street, on the site of the present Metropolitan Transport Trust garages.

On 8th August, 1893 a trial trip up Elizabeth Street was made, the cars travelling the full length of the track without mishap or the discovery of any faults but it did cause serious disturbances to Hobart's telephone system. The Superintendent of Telegraphs informed the Company "that it would be impossible to permit the running of the trams for traffic purposes under such circumstances." However, he promised co-operation with further experiments, the problems were overcome and the trams started operation on 21st September, 1893.(50)

Although the tramways brought electricity to Hobart, this did not directly lead to the further development of electricity supply. The 1884 Act did not really envisage an electric tramway so did not provide for the supply of electricity to others. In 1902 the Tramway Company did persuade the Government to amend their Act to allow them to sell electricity within fifty yards of the tram tracks but by then they had competition. In addition the Tramways

Act provided for either the Government or the Hobart City Council to buy the tramways at valuation, probably after twenty years. This is in fact what happened in 1913.

Thus for their first ten years of operation the Hobart Electric Tramway could not sell electricity and when they could sell electricity after 1902, the limitations of D.C. power were becoming evident and it was probably becoming clear that the Council would exercise their option.(51) There were thus marketing difficulties in expanding and little long-term advantages in doing so.

The real break came in Launceston in 1895. Launceston was Tasmania's "Silicon Valley" in the later years of the 19th century. Its state of the art industrial centre.

The State's two railway lines were terminated there; the standard-gauge Launceston and Western Railway in 1871 and the narrow-gauge Main Line Railway which wound the 122 miles from Hobart, in 1876.(52) Both were finished by the Tasmanian Government. By 1886 a branch of the Main Line reached St. Mary's and by 1890 the Western Line extended to Ulverstone. It was no accident that the main railway workshops were established in Launceston.

Launceston was also one of the largest telegraph offices in Tasmania. It is relevant that whereas the Superintendent of Telegraphs was paid £250 a year in 1876 and was located in Hobart, the "Clerk and Operator" i.e. Officer in Charge, Launceston was paid £225 a year.(53) Only three offices; Hobart, Launceston and Zeehan, operated the more complicated quadriplex instruments in 1891.(54) At this time there were 179 telegraph offices in Tasmania.(55)

Launceston was also at one end of the two successful demonstrations of the telephone in 1878, one of which

(Telecom are not sure which) was probably the first occasion a telephone was used in Australia. Alexander Graham Bell had written a detailed article on the telephone in the magazine "The British Mechanic" in 1877 and Alfred Biggs, Head Teacher at Campbelltown had constructed three sets. They worked perfectly using the fifty miles of telegraph line between Launceston and Campbelltown.(56) The first two telephone exchanges in Tasmania were opened in 1883; a ten line exchange in Hobart in the August and a thirty-five line exchange in Launceston in December. In 1891 there were 300 subscribers in Hobart and 200 in Launceston.(57)

There were four tin smelters too; three operated by Mt. Bischoff Tin Mining Company and the other by Messrs. Gardney and McKenzie.(58) From the mid-1870's Launceston made notable advances in manufacturing; Salisbury's foundry and engineering works, a pottery works, a woollen mill, a chemical works, a factory to make galvanised iron products, a specialised biscuit factory and a large brewery.(59) In the summer of 1886-7 there was an Industrial Exhibition at which local manufacturers included a wide range of ironmongery, sewing machines, furniture, tobacco, pottery, jewellery and excellent tomato sauce. This was so successful that it was followed by the Tasmanian International Exhibition. This occupied no less than three acres of pavilions in the City Park plus the Albert Hall. This latter edifice was especially built for the occasion, would seat 2000 and was claimed to be the eleventh largest hall of its kind in the world at that time. 262,059 people visited this exhibition, which featured the products of seven overseas countries and four Australian states.(60)

By 1891, there were 20,000 people living in the Launceston area. It had long been the "mining capital" of Tasmania and was now styling itself the commercial capital also.(61) In 1883 the Australian Electric Light Company

had demonstrated electric lighting in some Launceston shops and by 1889 there were two private working hydro-electric plants in northern Tasmania, one at Mt. Bischoff and the other much closer to Launceston, at the Waverley Woollen Mills. The Cataract Gorge is on the very outskirts of Launceston and "ever since Launceston was first settled, the residents recognised what great power was available from the South Esk River, which rushes in a series of cataracts for miles above the gorge".(62)

In May 1887 a group of leading citizens of Launceston tried to form a company. They issued a prospectus for 'the Launceston Electric Light and Motive Power Company Ltd.' whose bold objectives were:-

1. To construct, erect, maintain, alter, lay down, or discontinue such machinery, lamps, wires, supports, conductors, communicators, distributors, electric lines, buildings, apparatus, engines, and things, and all other works necessary and convenient for supplying the inhabitants of Launceston and the vicinity thereof, within such radius therefrom as the Company may from time to time determine, with electricity for lighting and motive power and other purposes.
2. To take and use such water from the South Esk River, not interfering with existing rights, as may be required for power to work the machinery for generating and transmitting such electricity.
3. To break up any road or street for the purpose of fixing supports, wires, and lamps, after notice to and under the superintendence of the local authority; such road or street to be reinstated.
4. For the purpose of supplying electricity, to borrow money on mortgage, with consent of general meeting, to acquire such land by agreement, acquire such patents or licences for the use of such patented or protected processes, inventions, methods, or materials, or other things, to enter into such

contracts, and generally to do all such acts and things as may be incidental or conducive to the attainment of the above objects.(63)

The Municipal Council in the meantime had applied to Parliament for legislation to secure the use of the water of the South Esk for the city. This 'Launceston Electric Light Act' 1887, essentially meant that: "The Council is hereby empowered and authorised from time to time to take, divert, and appropriate such quantity of the water of the South Esk River, at a point not exceeding Three miles from the present South Esk Bridge, not exceeding Two-thirds of the quantity or volume of water flowing at such time, as shall be required by the Council for any of the purposes hereinafter mentioned; and from time to time to enter upon the said river, and upon the banks and bed thereof, and to construct and erect on and in any portion of the banks and bed of the said river such works as shall be necessary for the purposes of such taking and diversion and appropriation of so much of the said water of the said river as aforesaid: Provided that nothing herein contained shall abrogate any existing rights vested in any person or persons to take, divert, and appropriate any water from the said river.

It shall be lawful for the Council to use all or any portion of such water as aforesaid for any of the purposes hereinafter specified; viz. :-

(1) To work any machinery that may be erected by the Council for generating and transmitting electricity for the purpose of lighting the Town of Launceston and the buildings therein with Electric Light.

(2) To work any machinery that may be erected by the Council for generating and transmitting electricity for the purpose of supplying the inhabitants of the Town of Launceston and the vicinity thereof with electricity, for producing light, or for motive power, or for any other purpose.

(3) To work any machinery that may be erected by the Council for drawing or propelling tramways in and

upon and along the streets of the Town of Launceston.

(4) To work any machinery that may be erected by the Council for the purpose of exercising or executing any of the powers, functions, duties or authorities now vested in or imposed by law upon the Council.

(5) To supply the inhabitants of the Town of Launceston with water for domestic purposes or for motive power."

and,

The Council shall have power from time to time to make, alter, modify, amend, or repeal by-laws for the following purposes:-

For regulating the description of pipes, conductors, wires, and other apparatus by means of which Water or Electricity may be laid on, distributed, or supplied by the Council, and for inhibiting the use of any other description of pipes, conductors, wires, or apparatus:

For preventing injury to the waterworks or any of the works or machinery or apparatus erected by the Council for the generation of transmission of Electricity:

For regulating all or any matters and things whatsoever connected with the supply of Electricity or Water under this Act:

And otherwise for the better effectuating any of the purposes of this Act in any matter not otherwise sufficiently provided for.

And to provide that any such by-law may be enforced by cutting off the wire or conductor or pipe or turning off the water, or by such pecuniary penalty, not exceeding in any case the sum of Twenty Pounds, as the Council thinks proper."

This was the first Act that conferred local control of electricity supply.

It was some time before the Council actually did anything, but gradually the focus of thought shifted to the

South Esk River, alternatives and estimates were considered and experts brought in and their opinions evaluated. It is not surprising that the Council was cautious. They were breaking new ground as what they were intending was a good deal bigger than any other power station in Tasmania at the time. It was almost state of the art in terms of alternating current transmission technology. The Council had had the benefit of an actual demonstration, on a small scale, at the Waverley Woollen Mills however and so knew the potential benefits, first hand. So they pressed on.

The estimates indicated a likely cost of about £44,000; perhaps equivalent to $5,000,000 in 1985 dollars. A large expenditure for a city of less than 20,000 people. In 1891 the Council appointed an expert consulting engineer from Victoria and 3 months later appointed a new City Surveyor and Engineer, C. St. John David. These two cross checked the various alternatives available and a scheme conceptually similar to Duck Reach, but including a passenger tramway option was put to the Council and approved.

The Launceston Electric Light Act required that a poll of ratepayers be made and this was carried out in June 1892. It is a curious fact, that development of public electricity supply has usually seemed to be a controversial matter. Duck Reach was the first of these.

There were a flurry of letters in the papers, paid advertisements, notices and pamphlets. Safety, local jobs, health and cleanliness, whether it was really needed, allegations of rubbery estimates, even the impact on taxation, all were argued.(64) The poll was held and 2173 ratepayers voted for the scheme. Only 690 voted against.(65)

In July 1892, after surveying the pipe track, David had suggested a tunnel instead. This was approved and a contract let. The 840m tunnel, 168mm diameter tunnel was

driven from both ends and took sixteen months to drive. It was complete on 20 March, 1895. The Consulting Engineer, Mr. K.L. Murray wrote the specifications for the supply, erection and operation for six months of all the necessary machinery and the City Engineer designed the civil works and supervised their construction. Tenders were called throughout Australia and in England and America and four were received. Siemens were successful, though at £32,021/15/- they were not the lowest tender by some £2,500. In March 1894, the Mayor of Launceston signed the contract. It was a quality job. The contractors even shaped the poles. Several hundred were trimmed, octagonal from the ground up to eight feet and circular and tapered above that point. A special trimming machine, effectively a giant lathe, was imported from Sydney. Not only were they trimmed, the poles were then painted![66]

Initially eight turbines were installed, all of the Thomson Vortex type. They were adapted for a fall of 100ft and coupled direct to the dynamos. The outer eases were of cast iron and the revolving blades of brass. They were controlled by "fixed guide blades of Delta metal -- movable for adapting the entrance orifices to any quantity of water below the full supply." The turbine "wheels worked vertically and the draft pipes were fixed so that part of the fall acts by suction." This is the same concept as the latest Strathgordon machines. It was real state-of-the-art in 1895. Five of the dynamos were Siemens HHD type giving seven amps each at 1750 volts DC when running 800 rpm. These powered the 120 arc lights. The other three turbines drove alternators at 460 rpm and each generated 100KW at 2000 volts AC.

There were separate switchboards for the DC arc lights and the AC incandescent lights plus a well thought out cross connection system that ensured that only every

alternative arc light went out should a dynamo fail. The alternators were set up to run in parallel and "the boards -- fitted with all necessary lighting arrestors, switches, fuses, ampere and volt metres and indeed all arrangements necessary for safety, as well as for making the various changes in the different circuits always found desirable for securing regularity and certainty of supply of current to the lamps."(67)

For an installation set up amidst changing technology it was well thought out. The arc lamps required DC and were necessary for effective lighting of the Central Business District even though they would only burn for sixteen hours before being recarbonned.(68) The alternating-current was clearly the coming technology, even if the distribution high voltage was only 2000 volts. Conceptually this distribution was quite modern and would have been even more so if it had been possible to ascertain the initial lighting load with any accuracy. Originally it had been intended to use the transformer substation system, i.e. "to divide the city into sections and in some fairly central portion of each have one or more transformers fixed to which the high tension mains should be brought by the most direct route. The electricity at the reduced voltage would then be distributed from the transformers over the section."(69) This is how Hobart is reticulated today. However the necessary information was not available and so the 'distributed transformer system' embodying far more, but much smaller, transformers was used.

On December 10th 1895 "the arc lamps which stud the centres of the principal thoroughfares were lit up at 8 o'clock, the current being turned on at the distributing station -- their radiance cast a lurid brilliance over the city -- the rays shed by the arc lamps mingled with each other and the ordinary gloom of the city at night was dispelled -- darkness was turned into light."(70) Within five months of the starting of the alternators nearly 5000 incandescent

lamps had been installed.[71] Public electricy supply had arrived in Tasmania.

The public supply of electricity in Hobart started in a curious way. The City had been lit by gas for many years but by the late 1890's clearly there was dissatisfaction on two counts; the quality of the lighting and the fact that it was operated for profit by a private company. The tone of the paragraph in the Cyclopedia of Tasmania is quite unmistakeable.[72]

In 1894 the Minutes of the Directors Meetings of the Hobart Gas Company of 25 June record that "in consequence of H. Higgins, butcher of Elizabeth Street, having had shop fitted with electric light and his having offerred to supply other shops in the same block - Bathurst to Liverpool Streets with motive power."[73] One can surmise that this was probably an indirect result of the Tramways setting up in the previous year. It would be most surprising if the Tramways had not installed some arc lights in their sheds. The Gas Company, after some other enquiries approached the Attorney General to introduce a Bill to allow them to supply electricity, initially for lighting. This rather surprised and upset the Hobart City Council[74] who petitioned Parliament to throw out the Bill. The upshot of all this was two Acts. The Hobart Lighting Act 1896, passed on 24th October 1895, gave the Council overall control and regulatory authority.[75] The Hobart Town Gas Company's Electric Light Act allowed them to supply electricity.[76]

Initially the Gas Company started with a 52KW alternator which they obtained from Siemens. This would supply about 1000 sixteen candle-power lamps.[77]

They engaged A.C Parker, the Tramways Electrical Engineer to "supervise the erection (of the works) at 2½% on cost of construction."[78] This generator was driven

by a 90 bhp Crossley Gas Engine.[79]

Now this is a type of power plant, quite common in the early years of this century, that has quite disappeared from the Australian engineering scene. Commonly they were a single cylinder engine with a bore of seventeen inches (43.2cm) and a stroke of twenty-six inches (66cm). Running on producer gas made from anthracite, bituminous coal or wood fuel the maximum load is 95 bhp at 190 revolutions per minute.[80] These engines had an enormous flywheel perhaps two metres in diameter with a starting handle on its perimeter. One opened the compression relief valve, two men got that big heavy flywheel turning and once the decompression lever was dropped, the engine would start. Governing was by the quantity method the ratio of air to gas remained practically constant, but the amount of 'charge' was controlled by varying a compound admission valve. The mechanism was simple and very effective and would run with a speed variation from full load to no load of plus or minus two percent.[81] They were called 'Suction Gas Engines' and were a good power plant for a Town Lighting undertaking due to their constant speed, longevity (due to their low operating speed) and relatively simple technology, plus the fact that their fuel, gas, could be produced locally, especially by a Gas Company. This was delivered on April 7th 1898 and the first trial run held on November 18th 1898.

On 19th November the Gas Co. commenced a single-phase supply to six customers at 110 volts and 90 cycles/second. Distribution was at 2.2KV.[82] Twenty customers were being supplied by 31st December 1898. The first recorded interruption to power supply in Hobart occurred on 24th February 1899 when the "outer bearing (became) too hot to continue running."[83]

On 24th April the Gas Company received a letter from the Town Clerk, advising that there had been complaints

to the Local Board of Health re the noise of the electric light engine.(83) This was referred to their solicitor. Soon afterwards the bearings of the Gas engine again ran hot necessitating a cessation of supply for two days, presumably to replace or more probably to "run", i.e. build up then turn or scrape to a close fit, the bearings, which were probably white metal bearings. The power station was located in Lower Macquarie Street and its site is still marked in 1985 by the tall brick chimney. This was built in 1901 when the power unit was changed to steam. In June 1901, the power station went on to two shifts, and changed to three shifts June 1902. By 1903 they needed a second steam engine, by 1907 the 52KW generator was supplemented by a 100KW set. This was changed in 1907 for a 250KW generator and a 500KW turbo-generator added in 1913.(84)

However the Gas Company had been having other kinds of problems as in May 1899. "In order to ensure good workmanship and materials being supplied to customers by EL (electric light) fitters when wiring buildings the following regulations were adopted :- That only persons approved by the Company shall be allowed to undertake the wiring of buildings for electric lighting supplied by the Company. That Certificates of Approval renewable yearly and terminable at the pleasure of the Board be granted to such Contractors as in the opinion of the Company's Electrical Engineer are capable of carrying out the work of wiring. A fee of five shillings may be charged for each Certificate.

A Certificated Contractor, before commencing to wire any premises or to make any alterations or additions to premises already wired shall fill up and lodge with the Secretary Form A which shall be provided the purpose, giving the name and address of the consumer, the number and candle power of the lamps and details of any other apparatus he may

have undertaken to fix and the date on which he commenced work. He must also supply samples of the wire he intends to use. If asked upon to do so he must submit for the approval of the Company's Electrical Engineer a diagram of the connections, samples of the switches, cut outs and other fittings or apparatus which he proposes to use. When he has completed the work he shall lodge with the Secretary Form B, filled up and signed by himself containing a notice to the effect that the work has been completed and is ready for inspection."(85) Applications for certificates for wiring houses were granted to Mr. Russell Allport and Messrs. Collis and McDonald.

For the first ten years there were surprisingly few customers, only 197 being connected at the end of June 1907 and 339 in 1912.(86) In 1910 the supply frequency was changed from 90 cycles/second to 50 cycles/second to conform to British practice.(87) In 1912 the Gas Company contracted with the Hydro-Electric Power and Metallurgical Company (HEPM Co.), who were then building their Great Lake Scheme for a supply of three phase power at £3 per KW of maximum demand per annum plus ½d per unit, subject to a minimum demand of £5000 per year. This contract was for ten years. HEPM Co. in 1911, had had built a separate distribution system that was far more extensive than the Gas Company's. When HEPM Co. experienced financial difficulties in 193, the Gas Co. was able to buy that distribution system for 16,844 and secured a near monopoly of electricity supply in Hobart. They changed to three phase supply in 1914 and to 220 volts AC single phase power about the same time.(88) From 1912 the number of customers started to rise dramatically, rising from 339 in that year to 1999 in 1916.

That year the Gas Co. made a gross profit (revenue - working costs) of nearly £5,000 on its Electrical

Undertaking.[90] They never seem to have been very enthusiastic about it however. Butters in his report to Parliament in 1915 records that the recent growth in the number of customers "has been almost in spite of the efforts of the Gas Company, as it has not pushed the sale of electricity in any way - and has been forced to refuse a very large number of customers.[91] The Minutes of the Gas Company's Board of Directors in those years show that their Electrical Undertaking occupied a great deal of their attention. Requests for service, discounts, supply of materials, industrial matters and requests for staff loom large. It is clear that electricity supply was much more of a problem to them than gas. In early 1914 the Hobart City Council, who had just acquired the tramways, approached the Gas Company to buy their electrical plant. The Gas Company Directors seemed quite eager to sell, asking only £80,000, but the Council were not interested at that price.[92] That was probably one of the definite decisions in the organisation of electricity supply in Tasmania.

Once Hobart and Launceston had electric light, other Towns started considering it; some actually installed it. Zeehan installed a steam-driven unit in 1900, Devonport in 1903 and Queenstown in 1903. All of these were municipally owned schemes.

In Latrobe, however, there was an electricity supply entity that was probably unique in organisational form, plant and method of operating. It was called the Latrobe Hydro-Electric Company. Originally this was a watermill for grinding grain, and although on a low head site was described in 1900 as one of the finest waterpowers in Tasmania.[93] This mill was taken over by the Latrobe Hydro-Electric Co. in 1908 who then supplied power to the town of Latrobe under license from the Municipal Council. This license was

paid in the form of street lighting, sixteen street lights being supplied with current free of charge. The powerhouse was half a mile from the Latrobe Post Office by road and was supplied with water from the River Mersey by a race sixteen chains (about 3km) long. There were two vertical shaft turbines, aggregating 90HP which drove the generators through gearing and belts. The power station site was prone to flooding and the generators were located above high flood level on massive concrete foundations. Current was supplied at 240 and 480 volts DC (but by 1930 240 volts AC was available on request). There was a backup steam engine to drive the system when flood waters put the hydro-system out of action or the water level was too low. The supply was inaugurated on 17th December 1908 by Harold Lord and eventually supplied Latrobe for twenty-five years, serving about 300 customers plus 62 street lights.(94)

By 1910 building hydro-electric power stations was becoming commonplace, if you had the money and a need for the power fairly close by. Ever since mining began on the West Coast promoters developers, and engineers had proposed hydro-electric schemes. In 1892 a Tasmanian Water Power Company had been formed and had actually begun construction of a power station near Zeehan but had been delayed by a lawsuit and the bank smash, which froze their funds. Despite several other attempts, most of which got no further than Acts of Parliament, the West Coast resources were initially developed by steam power.(95) By 1901 the steam power (at Mt. Lyell) consumed 36,000 tons of wood; the hot blast for the smelters 50,000. Coal was being imported for smelting at the rate of 1800 tons a year. By 1909 the easily accessible timber was used and it was estimated that the mines had used 1,250,000 tons of wood, denuding forty square miles in the process.

By 1911 Mt. Lyell Manager Sticht estimated that

hydro-electric power would save £50,000 a year. The Company had the water-rights under the Mining Act and estimated that ample hydro-electric power could be obtained from Lake Margaret for £164,000.(96) Lake Margaret was a natural lake, with only a small catchment area of 8 square miles. However the average rain fall in that area is one of the highest in Tasmania at 147 inches per year and the lake is at an altitude of 2168ft giving a head of 1034ft. The original dam was small, the natural storage of the lake itself was used for generation by means of a channel cut through the natural rock dam giving a net storage depth of five metres. Initially four 1200KW three phase, 50c/s, 6600 volt alternators were installed each direct coupled to a Pellon Wheel of 1750 bhp. The power was transmitted at 6.6KV on two wooden pole translines, the 6.5 miles to the smelters at Queenstown. Transmission losses were 8.3%. At the smelter a substation stepped the power down to 3KV for distribution. 500V was used in the works for motors and 220V and 110 volts for heating and lighting. The power station was commissioned in 1914.(97)

Now these were all local schemes. Most had DC or low voltage Ac distribution systems. Even when one would expect higher voltages to be advantageous, they were not used when Mt. Bischoff, Launceston and the Hobart Gas Company upgraded their electrical undertakings about 1904-07 they went to 5.5KV, 5.4KV and 2.2KV respectively. Mt. Lyell built its 6.5 mile transline using 6.6KV in 1912 and accepted the 8.3% transmission losses. There were five large systems i.e. large for their times, Launceston, Mt. Bischoff, Mt. Lyell and the Hobart Tramways all had multiple generator systems set up for light and motive power. All operated trams or light railways. The Hobart Gas Company supplied electricity for lighting but did have some customers using small motors. However, before 1910 or so there was no need for any of these

undertakings to transmit even ten miles. They were all relatively isolated.

Similarly the organisations were small and localised. Although nominally electricity undertakings were operating under the Town Boards Act of 1891 or the Local Government Act of 1906, these were rather general acts. Many undertakings had their own specific Acts. There were several "professional engineers" heading their own electrical undertakings. Not all were university graduates, but intelligent, well read men with lots of practical experience. At this time there were at least four such organisations led by "engineers". William Corin headed probably the biggest in Launceston, Henry Spencer was Electrical Engineer to the Hobart Gas Company, A.C. Parker was General Manager of the Hobart Tramways, and George Lofts Manager of the Devonport Councils Electrical Undertaking. All except Parker must have had similar organisations. They all had multi generator power stations, all had wooden poles and conductors to erect and maintain, all had customers installations to inspect before connection to the mains and all had meters to install, maintain and read.

Launceston also repaired appliances, distributed lamps[98] and leased electric motors. They seem to have had a technical staff of six in 1906,[99] three at least were "professional engineers". Corin himself, R.J. Strike, who was an M.I.E. (Aust.) in 1927[100] and W. Pennefather who managed the Power Stations. It seems reasonable to assume that by 1910 the organisation was much the same as that taken over by the H.E.C. in 1944. At the top would be City Electrical Engineer who was also Tramways Superintendent and an Assistant Engineer who probably directly supervised the Electrical Undertaking. Functional Supervisors would be a Power Station Superintendent, a Works (or Mains) Superintendent who constructed and maintained overhead mains, a Substation and underground Superintendent and a Meter Superintendent. The appliance repair was carried out by the sub-stations people. There was probably also a group of clerks to prepare accounts, handle installation notices etc.

The Hobart Tramways had an Assistant Engineer in 1895 who was an Associate Member of the Institute of Electrical Engineers. Russell Allport in his application for the Launceston City Electricians job mentions that he had worked 4 years in England and was currently working in Hobart.(101) The Tramways had twenty trams in 1893, and employed 16 motormen, 12 conductors, fitters and carbuilders.(102)

There seems to have been no formal coordination. There was neither the need nor the procedural machinery for it. The supporting communications technology would make it awkward. There were few telephones, very few cars and poor roads. The only fast communications were by telegram and railway train. There was however some interaction William Corin acted as a consultant(103) setting up Devonport's electricity undertaking, A.C. Parker was retained to supervise the setting up of the Hobart Gas Company's Electricity undertaking. Russell Allport held a Gas Company Wiremans licence. There were at least three "consulting engineers". Harold Masters worked out of Launceston and had a hand in the early Longford scheme and was writing to the Scottsdale Council about that time. Harold Lord, once Latrobe was established was consulting engineer to Burnie, Longford and Wynyard councils. George Lofts designed and installed several schemes for mining companies.

Thus at this stage the organisation is purely local. It is not dictated by the technology but it is certainly shaped by it, as is the legislation.

1. Australian Dictionary of Biography Vol 5. 1851-90 Melbourne University Press 1974, p.3.

2. Kayser, H.W.F. Mt. Bischoff, Australian Association for the Advancement of Science, Hobart 1892, p.343.

3. Beaver, op. cit., p.82.

4. Kayser, op. cit., p.345.

5. Ibid, p.347.

6. Ibid, p.347.

7. Ibid, p.349.

8. Ibid, p.349.

9. Australian Dictionary of Biography, Kayser, op. cit., p.3.

10. Kayser, op. cit., p.343.

11. Dallas, op. cit., p.90.

12. Private correspondence from Jim Wilson, Power Station Superintendent, Tullah, 31/5/83.

13. Mt. Bischoff Half-Yearly Report, 30th June, 1883.

14. Groves, Martin, Murchie and Wellington, A Century of Tin Mining at Mt. Bischoff, Tas. Dept. of Mines, 1972, p.70.

15. Mt. Bischoff Half-Yearly Report 31 December 1884.

16. Mt. Bischoff Half-Yearly Report 31 December 1885.

17. Mt. Bischoff Half-Yearly Report 31 December 1886.

18. Wilson, op. cit.

19. Mt. Bischoff Half-Yearly Report 31 December 1904.

90. Correspondence between Noyes Bros and Mt. Bischoff Tin Mining Co. 1904.

21. Ibid, p.12.

22. Ibid, p.7.

23. Wilson, op. cit.

24. Noyes/Mt. Bischoff correspondence 1904, op. cit.

25. Dallas, Waterpower, op. cit., p.85 (Dallas quotes the Mercury of 4/1/1886 in an advance copy held on HEC file AX/4(2).

26. The Tasmanian, 3/8/1889, p.8.

27. Dallas, Waterpower, Advance copy p.2, op. cit.

28. Ibid, p.8.

29. Green, F.C., A Century of Responsible Government 1856-1956, Tas. Govt. Printer, p.1.

30. Tasmanian Acts of Parliament 15-19 Victoria, pxxix.

31. Tas. Acts of Parliament 20:22, Victoria, p.54.

32. Hobart Town Gas Co. Act 1854.

33. Electric Telegraph Act 1857.

34. Hobart Tramway Company Act 1884. Tas. Acts of Parliament 1884, p.745.

35. An Act to confirm the agreement between the Hobart Tramway Co. and the Mayor, Alderman and Citizens of Hobart. Tas. Acts of Parliament 1890-91, p.745.

36. Grolier Australian Encyclopedia 1965, "Tramways", p.17.

37. Carrol, Getting around Town, p.43.

38. Grolier 1983, p.99.

39. Carroll, op. cit., p.51.

40. Ibid, p.51.

41. Ibid, p.27.

42. Ibid, p.35.

43. Ibid, p.67.

44. Hobart Tramways Jubilee Booklet, 1893-1943, Hobart City Council, 1943, p.6.

45. Green, Responsible Government, op. cit., p.196.

46. Ibid, p.310.

47. A.J. Gillies, Tasmania's Struggle for Power, Francis and Lillas, Hobart 1984, p.55.

48. Cyclopedia of Tasmania, p.374.

49. Hobart Tramways Jubilee Booklet, op. cit.

50. Ibid, p.9.

51. Ibid, p.17.

52. Beaver, op. cit., p.80.

53. Ibid, p.83.

54. A History of the Post Office in Tasmania 1975, Telecom, p.43.

55. Ibid, p.44.

56. Ibid, Appendix p.9.

57. Ibid, p.52.

58. Beaver, op. cit., p.53.

59. Ibid, p.87.

60. Ibid, p.89.

61. Ibid, p.87.

62. Ibid, p.89.

63. City of Launceston - Electric Light - 1897.

64. Supplement to "The Daily Telegraph" 25 June 1892.

65. Kozakiewicz M., Duck Reach and the Electric Light. A major project submission for BA in Environmental Design, TCAE, 1982.

66. City of Launceston, Electric Light, op. cit., p.12.

67. Ibid, p.18.

68. Ibid, p.18.

69. Ibid, p.16.

70. Launceston Daily Telegraph, 11th December 1895.

71. City of Launceston, Electric Light, op. cit., p.21.

72. Cyclopedia of Tasmania, p.187.

73. Hobart Gas Company Directors Minutes 25 June, 1894, Tasmanian Archives.

74. Ibid, 14/1/1895.

75. Hobart Lighting Act 1896. Tas. Acts of Parliament, 1895-6, p.257.

76. Hobart Town Gas Company's Electric Light Act, Tas. Acts of Parliament, 1895-6, p.xxxiii.

77. Gas Co. Mintues 7/6/1897.

78. Ibid, 2/8/1897.

79. A.P. Binns, Record of Progress, (handwritten notes found after his retirement in 1973).

80. Low, D.A., Heat Engines, Longmans, Green & Co., 1920, p.485.

81. Low, op. cit., p.486.

82. Binns, A.P., The Development of Retail Supply in Tasmania, H.E.C. Bulletin, 1973, p.6.

83. Gas Co. Minutes, 27/2/1899.

84. Ibid, 24/4/1899.

85. Binns, Record, op. cit.

86. Gas Co. Minutes. 22/5/99.

87. Hydro-Electric Department Report for 1916-17, p.43.

88. Binns, Development, op. cit., p.7.

89. Ibid, p.7.

90. H.E.D. Report 1916-17, p.43.

91. Parliamentary Paper 33 of 1915.

92. Gas Company's Minutes 26/1/10914, 23/2/1914 and 2/3/1914 State Archives.

93. Dallas, Waterpower (advance copy) quoting the Cyclopedia of Tasmania, 1900 Vol. 11.

94. Cyclopedia of Tasmania, 1931, p.376.

95. Dallas, Waterpower, op. cit., p.89.

96. Ibid, p.91.

97. Lake Margaret Scheme, Hydro-Electric Power in Australia and New Zealand. A booklet published by 'The Electrical Engineer & Merchandiser 1946, p.15, copy held by H.E.C.

98. Launceston City Elec. Engineers Report 1913-14.

99. Examiner 30/10/1906.

100. Correspondence Launceston Council to Siemens 6/4/1927, held in Q.V.M. Archives.

101. List of Applicants for Position of City Electrician 1895, held in Q.V.M. Archives.

102. Hobart Tramways Jubilee Booklet 1943, op. cit., pp 9-10.

103. Examiner 30/10/1906.

TECHNOLOGICAL CHANGE AND A MAN OF VISION

The water power potential of the Central Highlands had been known since the mid 1800's. Once one sees the Great Lake and its surrounding rim of mountains and realises that this is a high rainfall area situated at a relatively high altitude, its potential for water power is obvious. Major Cotton in 1844, surveyed the catchment of the Macquarie River and proposed a system of reservoirs and channels that would irrigate 7000 acres and provide twenty watermill sites. This report was reprinted by the government in 1879.(1)

The Central Plateau however had one major drawback. It was well away from any potential large users of power. All the early electricity generation schemes in Tasmania had been close to the market. Mt. Bischoff and Waverley Woollen Mills used the power on-site. Duck Reach was almost on Launceston's doorstep. The Hobart Tramways extended no more than a few miles from the power station.

This was no accident. It was due to a fundamental limitation of the technology of that time. These were all direct-current (D.C.) stations. D.C. was quite satisfactory for lighting, indeed it was essential for arc lights, which were often used for public lighting in the central business districts. D.C. power was also quite satisfactory for power and motive power. It is still used for trams. However, the service areas were limited by the short distance over which this D.C. power could be economically distributed. Transmission losses made service to another township prohibitive. Too much power was dissipated in the transmission line. This had been clear in the very early days of electricity supply systems and equipment slowly developed to overcome it.

In 1881 Lucien Gaulard and John Gibbs had obtained English patents for a "series alternating current of distribution" in which the current alternates from positive

to negative a number of times each second. These patents were purchased in 1885 by the American inventor and manufacturer George Westinghouse. William Stanley working with Westinghouse then developed a transformer and an alternating current (A.C.) generator. In 1886 they transmitted electric power 1200 metres using step-up and step-down transformers with a 3000 volt transmission voltage.

No really successful A.C. motor then existed, but in 1888 Nikola Tesla, proposed a new system for electric motors. Known as the polyphase A.C. system, this consisted of an induction motor with a rotating magnetic field. Westinghouse realized its fundamental importance and bought these patents also. At Chicago in 1893, at the World Columbian Exposition, he demonstrated a two phase generator, with voltages 90° out of phase with each other, together with A.C motors and lamps.(2)

In 1893 the International Niagara Power Commission, amongst whose members was Lord Kelvin, selected A.C. transmission to carry power from a large scale hydro-electric development at Niagara Falls to Buffalo, a distance of twenty-two miles. They had been looking at possible systems for six years, and at one time offered a prize of $100,000. By 1899 a 40KV seventy mile transline was opened in California.(3)

Wooden poles and crossarms were satisfactory for transmission voltages up to about 66KV, but as these voltages began to be exceeded about 1901, serious arcing phenomena were encountered which destroyed wooden poles.(4) The development of steel transline towers(5) in 1903 and, more importantly, suspension-type insulators (rather than pin-type insulators) in 1907,(6) made practical the consideration of higher transmission voltages.

The calculation of transmission losses is a complicated matter(7) but broadly speaking the higher the transmission voltage the lower the transmission losses. Thus sheer economics drove transmission voltages up.

These advances were not slow in reaching Tasmania.

Duck Reach was partially A.C. at 1900 volts in 1895, Mt. Bischoff changed to 5.5KV in 1904 and Lake Margaret was built at 6.6KV in 1912. It is relevant that power losses in Mt. Lyells short 6.5 mile Lake Margaret to Queenstown 6.6KV transline were 8.3%.[8]

In summary it can accurately be said that development of Great Lake hydro-electric power for use in Hobart would have been impossible before 1895, risky before 1903 and uneconomic before 1907. The development of high voltage alternating current transmission technology changed the whole nature of electricity supply in Tasmania. The quantum leap from Lake Margaret's 6.6KV transmission line to Waddamana's 88KV transmission line shaped the future in a way no development, before or since, has done. It paved the way for a statewide system and eventually the H.E.C.

As Dallas,[9] points out "the interest of engineers and investors abroad in the power possibilities of the Tasmanian highlands was evinced well before the turn of the century, but investors are not interested in power alone." There had to be a profitable market as well.

In 1891, a Select Committee reported upon a Bill which proposed to give a Victorian Syndicate, which included three B.H.P. directors, water rights over four West Coast rivers on the western escarpment of the Central Highlands "for the generation of electricity and its transmission and sale to mining companies.[10] Transmission distances of up to twenty-one miles were proposed. In 1896, when his syndicate sought an extension of its franchise,[11] in 1897 when Mr. A. Mault, Engineering Inspector to the Central Board of Health made a report on the Water Power of the Great Lake and submitted it to the Minister for Lands and Works[12] (Mault really did a conceptual feasibility study), again in 1899 when the Great Western Railway and Electric Ore Reduction Company had a bill introduced into the Tasmanian Parliament empowering them to "build a railway

from the Derwent River to the West Coast, using the electric power generated from lakes and rivers on the way to work the railway, supply the mines and to manufacture chemicals",[13] companies were proposed or studies were made. Clearly it was a time when interest in electricity development was intense.

Where the power could be generated and marketed profitably or saved money as at Mt. Bischoff in 1904 or Mt. Lyell (Lake Margaret) in 1911, as has been described in the preceeding chapter, power development went ahead, even when the 1985 cost of the development was $16,000,000 e.g. Lake Margaret.[14 & 15] Neither the West Coast rivers idea nor the Great Western Railway etc. went ahead, but in 1909 one of these speculative/visionary/grandiose schemes did get off the ground as the Complex Ores Act 1909. This fundamentally shaped the form of the organisation of elecricity supply in Tasmania and that aspect is worth tracing.

The basic background to this was that certain complex zinc ores mined at Broken Hill could not be refined by existing methods. West Coast ores were similar. J.H. Gillies developed an improved process for the electrolytic deposition of metallic zinc and had built and successfully operated a pilot plant at Richmond, Victoria.[16] The process used a large amount of electric power. At that time electricity cost £55 per horsepower in Melbourne. In Broken Hill it cost £75 per horsepower.[17] Far too expensive. These further investigations were supported by all the large shareholders of the Gillies Sulphide Concentrating Company, as it was then called, and once the process had been successfully demonstrated, this syndicate formed themself into another company, Complex Ores[18] and started looking for cheap electric power.

Gillies arrived in Tasmania in 1908 and first looked at the West Coast, but found too many disadvantages. In Launceston he met the then Premier J.W. Evans and in due

course was invited to come to Hobart. The services of the Surveyor-General were placed at his disposal and he looked at the Derwent River and the Lake Country.[19] Having found a suitable site, Complex Ores must have done a costed feasibility study (though I can find no trace of it) and in 1908 placed two proposals before the Tasmanian Government. The first proposed that the Government undertake the Great Lake Scheme and supply power to the company, the second that the company "be given the right to do so on certain terms and conditions."[20] Gillies favoured the former, but as the cost involved was of the order of $15,000,000, in 1985 prices, and at that time Tasmania was a less than prosperous state of some 180,000 people only, the Government declined and put the onus back on the Company in the shape of the Complex Ores Act 1909.

This act empowered the taking and conserving of the waters of the Great Lake, the construction of works for the supply of electrical energy, and the construction of transmission lines. It also empowered the promoters to supply electrical energy to any local authority, including the Hobart and Launceston Councils, and to any company or persons (outside a radius of 10 miles of the City of Launceston).[21]

Now Complex Ores was a parent company whose main asset seems to have been the patent rights to the extraction process.[22] A reading of Gillies "Tasmania's Struggle for Power" J.H. Butters "The Great Lake Hydro-Electric Scheme"[23] and the prospectus of the Hydro-Electric Power and Metallurgical Company Limited,[24] is confusing, but the upshot of it all was that Complex Ores floated a special company to take over the rights conferred by the Complex Ores Act. This Company, Hydro-Electric Power and Metallurgical Company Ltd. (H.E.P.M. Co. hereafter), engaged Merz and MacLellan as their London consulting engineers,[25] had a scheme designed and obtained two costings, both about £160,000 (about

two costings, both about £160,000 (about $16,000,000 in 1985 dollars), one from F.A. McCarty & Co., Consulting Engineers of Melbourne[26] and the other from Siemens Bros.[27]

There obviously had been a significant amount of opposition in Tasmania to the granting of the concessions, for varying reasons,[28] and so Complex Ores took the precaution of including three influential Tasmanians on the H.E.P.M. Co. Board of Directors. These were Henry Jones (Chairman of Jones & Co.), Norman Ewing (a Member of Parliament) and George Brettingham-Moore (a Civil Engineer),[29] H.E.P.M. Co. also negotiated with the Hobart City Council regarding the supply of street lighting.[30] This was, all in all, a sound proposal. Merz and McLennan were the worlds leading power system designers of that time. In 1904 Charles Merz and William McLellan presented a paper entitled "Power Station Design" to the Institution of Electrical Engineers, which drew such interest that two further presentations had to be made. The paper became a classic on the subject.[31] The two sets of local estimates are fairly consistent, with that of Siemens well thought through with regard to expansion in the immediate future.[32]

Now this is an organisational treatise and the detailed commercial rivalries etc. are not really relevant. Gillies, in "Tasmania's Struggle for Power" gives one version, Butters glosses over a second, and Green a third. Suffice it to say that £215,000 was raised in England and Australia and work started in August 1911. Somewhere along the way H.E.P.M. Co. decided to enlarge their plans. Butters[33] and Green[34] give different reasons, but owing to the delays in floating the Company in the first place, and the time limit imposed for the construction (in the Complex Ores Act four years from 10 January 1910 was allowed for the establishment of electrometallurgical and smelting works or the powers, authorities and privileges conferred would cease and be void[35]), it became necessary to try to work through the bitter[36] 1912 winter. What between the bitter winter, the

enlarged plans, the difficulty in raising further capital because "at the physchological moment the bottom dropped out of the (London) money market due to the Balkan War",(37) the impending deadlines and, it seems, some infighting between the Directors,(38) H.E.P.M. Co. ran out of money and stopped work in late 1912. All through 1913 H.E.P.M. Co. tried to keep the scheme alive and raise the money abroad, but in late June 1913 it was realised in financial circles that the outbreak of the World War I was inevitable(39) money was unavailable in Europe and negotiations were opened with the Tasmanian Government. By early 1914 H.E.P.M. Co. were in receivership.(40)

The story of the next year is long and convoluted. The Government moved slowly getting reports on the value of the works etc. The Government could have left H.E.M.P. Co. to go bankrupt and forget the whole thing but there were several good reasons why it should not do this.

(1) Most of the difficult and expensive civil engineering work was complete, the machinery manufactured and paid for, and the transmission line towers either in Hobart or awaiting shipment.
J.H. Butters, then working for H.E.P.M. Co., made out an "Inventory of Material and work to be sold by the Company and purchased by the Government of Tasmania",(41) and this is shown clearly.

(2) Mr. Parry, Engineer in Charge of the New Zealand Hydro-Electric Department had been seconded to the Tasmanian Government to value and report upon the work done. On 14th April, 1914, he reported basically that the work had been well designed and constructed. What's more, it had all been done cheaper than could be expected at April 1914. Parry valued the work done at £140,000 and estimated that another £96,449 would see it complete.(42)

(3) There were two certain big customers in Hobart, one very probable big customer and, in hindsight,

the Baillieu Electrolytic Zinc interests as a big customer in the forseeable future.[43] Probably this was known at the time.

The two certain customers were the Hobart Gas Company's Electrical Undertaking and the Hobart City Council, who by then had taken over the trams. Both had come to agreements for the supply of electricity from H.E.P.M. Co.[44]

H.E.P.M. Co. were still intent on establishing their zinc refinery and carbide works at North-West Bay.[45]

(4) Last, but not least, was the presence of John Henry Butters. Someone always has to make things happen and Butter's hand can be seen behind what must have been a difficult transition.

John Butters was a pivotal figure in the organisation of electricity supply in Tasmania and so it is worth looking at him, his origins and his expressed values in some detail. He was born in 1885 at Alverstoke England and graduated in Engineering Science from the University College of Southampton in 1904. He then commenced an 'apprenticeship' with Thornycrofts and continued it with Siemens Bros. Siemens was then one of the biggest manufacturers of electrical equipment in the world. It seems unlikely that this was an apprenticeship in the modern Australian sense, but more like the period of practical engineering experience required by today's engineering graduates for qualification. In 1907 he was appointed Assistant Engineer-in-Charge of estimating and design in the Works Cost Section of Siemens Technical Department. Butters was then transferred to their Head Office in London, responsible for Power Station design and estimates, for technical advice and the supervision of contracts until handed over.

He came to Australia in 1909 as Chief Engineer to take charge of Siemens engineering works in Australia and New Zealand.[46] In 1910 he visited Tasmanian and "As

suggested by you (Complex Ores) -- took the opportunity -- of going over the sites and route of your proposed Hydro-Electric Scheme."[47] This was as Siemens Engineer. In August, 1911, he was appointed Chief Engineer of H.E.P.M. Co.[48] He was just twenty-five.

He was clearly a man of vision. In 1915 (at thirty) he recommended the purchase of the Hobart Gas Company's Electrical Undertaking for 108,000 ($8-10,000,000 in 1985 dollars). At thirty-two he was negotiating with Electrolytic Zinc Co., with the remains of H.E.P.M. Co. (now Electrona Carbide), was discussing an appropriate Depreciation Fund for the Hydro-Electric Department, appointing London representatives, setting up a joint apprenticeship scheme with the Railways, initiating a water power survey of Tasmania (including the Franklin River!), discussing the supply to Launceston and the establishment of electrochemical industries in the north of the state, a regulatory 'Electric Light Act', hire purchase schemes and a three man "Commission", in the sense that the H.E.C. operates today.[49]

The Earle Labour Government came into power on the 6th April, 1914. John Earle, the new Premier, was then fifty, Tasmanian born on a free-settlers farm at Bridgewater. In 1881, at the age of sixteen, he went to Hobart to become an Apprentice Blacksmith with an engineering firm. After hours he attended the early engineering classes at the Hobart Tech and the scientific and literary lectures at the Mechanics Institute. In the late 1880's he read widely and became politically active in the early efforts to organise craft unions. In the mining decade of the 1890's Earle wandered and worked on practically every mining field in the state as a blacksmith or mining his own lease, finally settling at Zeehan. Still politically active as a union leader, he was elected to a West Coast seat in 1903 and to a seat in the then new Franklin electorate in 1909.

The Earle Government was severely frustrated by the Legislative Council but did secure the passage of much reformist legislation. Some of the forward-looking legislation passed included the extension of the education development, reorganisation of the Public Service, regulation of the hours and conditions of mining work and scenery and town planning bills.(50) It also passed the Hydro-Electric Purchase Act 1914, and on 5th October, 1914 signed an Agreement with H.E.P.M. Co. that purchased the Great Lake Scheme, its transline and substation, i.e. all its hydro-electric rights and equipment.

This purchase was largely paid for by the Government agreeing to "give to the holders of First and Second Mortgage debentures of the Company Tasmanian Government Local Inscribed Stock at par, reedeemable in twenty years and bearing interest at the rate of $4\frac{1}{2}\%$."(51) This stock totalled £140,750. The government also paid H.E.P.M. Co. £50,000 cash, £25,000 of which was to be held by the Treasurer until "Great Britain shall have ceased to be a state of war" or the Company "requiring any portion or portions of the said sum for the purchase or erection of plant or machinery."(52)

So the Tasmanian Government bought the Great Lake Scheme for a down payment of £25,000 and virtually committed H.E.P.M. Co. to spend £25,000 to develop Carbide and Zinc companies.

At the Executive Council meeting of 23rd October, 1914, it was decided to constitute a Hydro-Electric Department. John Henry Butters was appointed Chief Engineer and General Manager as from the 1st October, 1914.(53) He was then just twenty-nine years and two months old. In seven months the fledgeling Hydro-Electric Department completed almost all of the civil engineering parts of the scheme and by July 1915 was only awaiting arrival of machinery and transline towers to complete the scheme.(54) This took a great deal longer than Butters or anyone else ever thought

it would. The last item of the power station machinery arrived in June 1916.(55) The material necessary for the transline was obtained through the British Westinghouse Company from R. Milliken & Sons and the Thomas Insulator Company of U.S.A.(56) The three special towers for the Bridgewater crossing of the Derwent River, the central one 160ft high, were manufactured in England during the early stages of the Great War. The ship carrying some of this was wrecked near Capetown and so temporary structures had to be made and erected.(57)

However, on Saturday 6th May, 1916 the turbines were started and the power switched through to Hobart.(58) The Department had a power station capable of generating 10,000 HP or about 7.5 Megawatts (MW), an 88KV transmission line to Hobart. A ring main 6.6KV distribution system in Hobart complete with three main substations and another to produce DC power (59) and a 1.2MW steam power station.

The Department's possession of this Hobart Distribution system had most important organisational ramifications, so it is interesting to consider how it came about.

In 1910, as was detailed in the preceeding chapter, there were two distribution systems in Hobart. The Tramways reticulated DC power for its own purposes and by the Hobart Tramway Company Amendment Act 1902, was empowered to sell electricity within fifty yards either side of their tramlines.(60) The Hobart Gas Company's Electrical Undertaking had expanded slowly until in 1910 it had 271 customers, a revenue of £6385 and a nice little profit of £1821.(61)

H.E.M.P. Co. had had built a brand new distribution network in Hobart. On 14 June 1911 H.E.P.M. Co. had signed a contract with the British Insulated and Helsby Cables, of 493 Collins Street, Melbourne for a DC and AC distribution system covering Queenborough, Hobart, Newtown and Glenorchy. This was those municipalities as in 1910, i.e., mainly today's main roads, but it was an extensive and well built distribution system. British Insulated were obviously a careful, competent

company as they tendered on a unit cost basis, got the contract, and built it on time with no fuss. This distribution system cost about £18,000.(62) The contract provided that it be completed by the end of 1912 and apparently it was.

In mid 1913 "£15,000 was available to H.E.P.M. Co. from the sale of the reticulation side of the project. This sale included all street lighting equipment, purchased by the Hobart Gas Company, together with the lighting contracts with the City Council and other local bodies, with all advantages and liabilities. The Gas Company had agreed to take all its power in bulk, at a minimum cost of £5,000."(63)

In September 1915 Butters, as Chief Engineer and Manager, had recommended to the Government that the Gas Company's Electrical Undertaking be purchased for £108,000. £100,000 was to be in Treasury bills bearing 5% interest, £8,000 in cash.(64) This was a stiff price, but Butters could clearly see a potential four-fold expansion in customers in Hobart,(64) plus the acquisition of the Gas Company's steam driven AC 1.2MW power station, a most valuable standby plant in cases of emergency or to enable the hydro-electric plant or the sixty-two mile single circuit transmission line to be shut down for inspection or maintenance.(64)

Thus in mid 1916 there were four big hydro-electric schemes (by 1916 standards) which had some interactions with the public.

(1) Mt. Bischoff Tin Mining Company had 4 generators totalling just over 1MW installed capacity, with a 2.2KV transline. 440 volts AC was used for motors and 220 and 110 for lighting. This system also supplied the Town of Waratah.

(2) Launceston Duck Reach Power Station contained twelve generators. Five produced 100KV of DC power for street lights. Five produced

500KW of single phase AC power at 1900 volts and 92 cycles/sec. for other lighting. Two produced 600KW of three phase AC power at 5.2KV and 50 cycles per second for power. Low voltage was 110 volts AC. All told some 1.2MW. There was also a backup steam power station. This system supplied Launceston.

(3) Mt. Lyell's Lake Margaret Power Station was equipped with four machines each of 1.2MW. Transmission was at 6.6KV. Distribution was at 3KV and low voltage; 500V three phase AC for motors and 220 volt and 110 volt AC for heating and lighting. All power was used in Mt. Lyell's Mine and smelters at Queenstown and probably, selected offices and management houses.

(4) The Hydro-Electric Department's Great Lake Scheme of 7.5MW, transmitted to Hobart at 88KV, distributed at 6.6KV. Low voltage was 415V three phase for power and light, 550V DC for tramway purposes plus 480V DC for other DC purposes within the (1916) Hobart City Area. Frequency was 50 cycles for AC power.

There were quite a number of "Town Electric Light" schemes, some AC, some DC. Some were powered by water, others by steam engines, petrol engines or 'suction gas' engines. Most were operated by the Municipality. One at least by a private company. There were also quite a number of power generation schemes operated wholly within mines, on private estates or in mills or factories.

Legislatively it was a mess. The mining companies were generating power under the Mining Act which provides that "the holder of any mining tenement shall have the right to take, divert and use any water within the boundaries of such tenement ..... for mining purposes upon such tenement

or for the domestic purposes of any person engaged therein."[66]

Launceston was well controlled, and self contained. As was detailed in Chapter Two, the Launceston Lighting Act 1887 gave the Council "power ... to make, alter, modify, amend or repeal by-laws ... for regulating pipes, conductors wires and other apparatus ... for preventing injury to ... apparatus ... for the generation or transmission of electricity ... for regulating all or any matters and things ... connected with the supply of electricity."[67] More to the point Launceston had had a City Engineer in the early years of its electricity undertaking who was a "member of the Society of Engineers of England" and, as consulting engineer "laid the whole of the lines, constructed car-sheds" etc. for the Brisbane Tramway Co., C. St. John David.[68] He had optimised the Duck Reach Scheme.[69] David also had some staff. The "City Electrician is listed with the Town Clerk, City Engineer and City Treasurer as a permanent officer of the Corporation in 1896.[70] Obviously the City Electrician was Senior Staff. Not only did the Launceston Council have the authority to regulate electricity supply, they also seem to have had the qualified people to do it effectively.

Outside Hobart and Launceston the Town Boards Act 1891 allowed "Town Boards" to "regulate the lighting of public streets or other public places with gas or otherwise."[71] Similarly the Local Government Act 1906 allowed Municipalities to carry out permanent works and undertakings or borrow to carry out "the construction and purchase of Electric Light Works. They could also make by-laws for the supply of electricity. The indications are however, that although there were plenty of Electric Lighting Schemes there was insufficient expertise to keep them in good working order, let alone lay down and enforce adequate standards of equipment.

In Hobart the Council had the Regulatory authority under the Hobart Lighting Act 1896. The Hobart Tramway Company was supplying power under its Amendment Act 1902. The Hydro-

Electric Department was operating under a combination of the Complex Ores Act 1909, the Hydro-Electric Purchase Act 1914 and the legislation enabling the purchase of the Gas Company's electrical undertaking.

The building of the 88KV transline, the setting up of a government department, the Hydro-Electric Department (H.E.D.) and its acquisition of the Hobart distribution system really destabilized the system of local electricity supply existing in 1914. The local electricity undertakings were all still in the era of district electric light schemes. Some were starting to augment their generation equipment and Launceston had changed its frequency and voltage but none had expanded

Somebody however, knew full well the potential of organisational changes made possible by the new transline technology, as a state-wide system is clearly foreshadowed in clauses 42-64 of the Complex Ores Act 1909. Electricity could be sold to any local authority and the Launceston Council was specifically included. Regulations could be made regarding conductors and equipment and these regulations had to be approved by the Governor and had to be laid before both Houses of Parliament within fourteen days. These are quite remarkable clauses for an Act involving a private company.

Somebody had thought through the implications of the 88KV transline and it is possible that John Butters may well have set up a golden opportunity for himself in 1909 before leaving Siemens.

The H.E.D. Report for 1915-16 contains an organisation chart in the modern sense. Fig. 1. redraws that chart. This shows an H.E.D. that has just commissioned Waddamana and just taken over the Hobart Gas Company's Electrical Undertaking. the "Hobart District Staff" appears unaltered from its Gas Company origins. There are clearly a Power Station staff at Waddamana, a skeleton transline

staff, a substation staff, plus some left over contruction people to tidy up. There is also a Chief Accountant and his staff including Works Bookeepers and storekeepers.

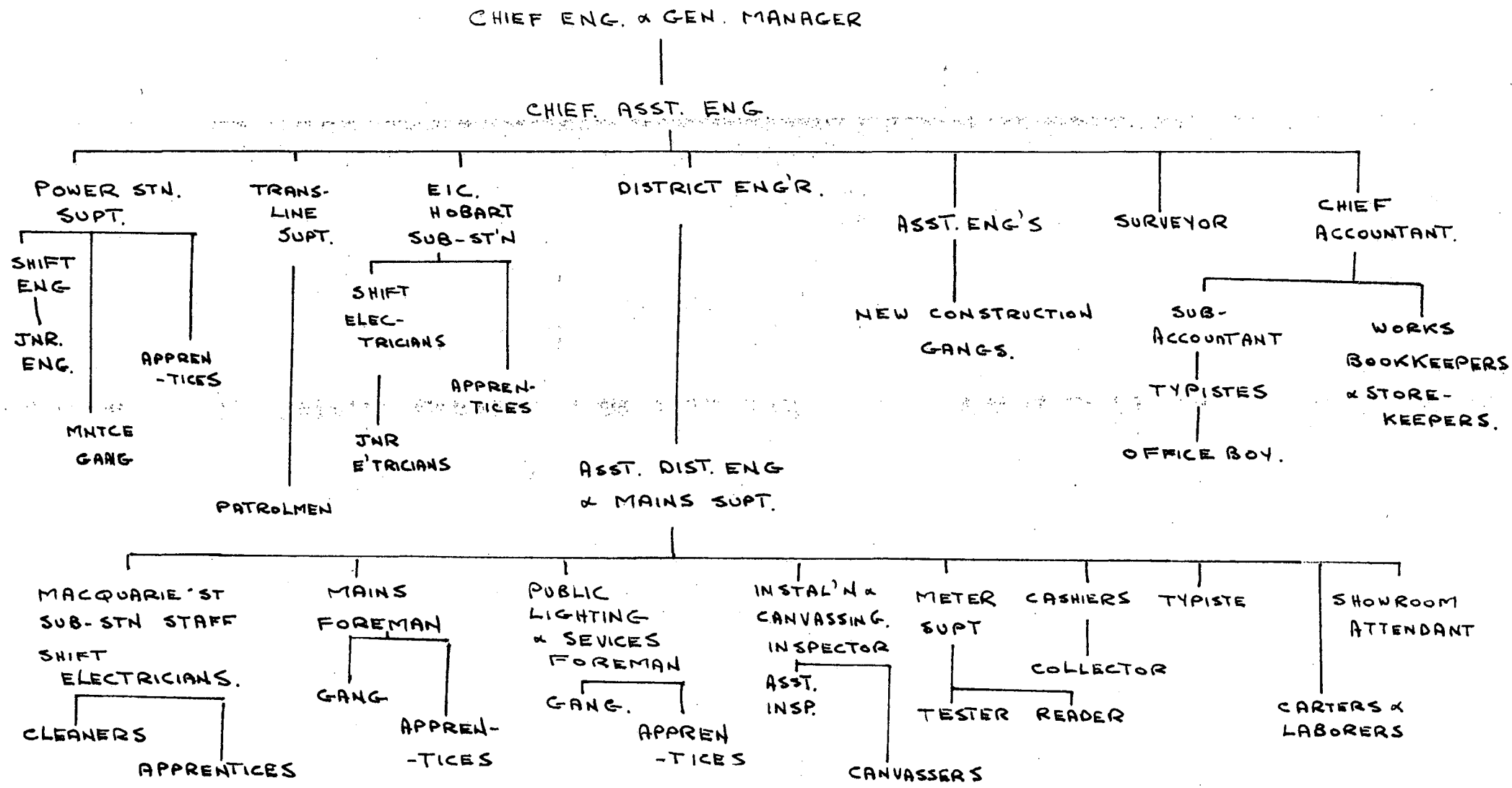


Fig. 1. HED Organisation July 1916.

1. Dallas, op. cit., p.87.
2. Brittanica, op. cit., p.617.
3. Brittanica, op. cit., p.209.
4. Taylor, W.T. Overhead Electric Power, Transmission Engineering, Griffin, London, 1927, p.15.
5. Ibid, p.15.
6. Brittanica, op. cit., p.210.
7. Taylor, op. cit., p.212.
8. Lake Margaret Scheme, op. cit., p.15.
9. Dallas, op. cit., p.91.
10. Ibid, p.89.
11. Ibid, p.89.
12. Parliamentary Paper No. 59 of 1897.
12. Gillies, op. cit., p.3.
13. Dallas, op. cit., p.91.
14. Noyes Correspondence (fitters wage 11/- a day).
15. Dallas, op. cit., p.90 (Lake Margaret cost £164,000)
16. Gillies, op. cit., p.9.
17. Dallas, op. cit., p.91.
18. Gillies, op. cit., pp 9-11.
19. Ibid, p.11.
20. Ibid, p.12.
21. The Complex Ores Act 1909. Tasmanian Acts of Parliament 1909, p.xix
22. Gillies, op. cit., p.25.
23. J.H. Butters. The Great Lake Hydro-Electric Scheme of the Tasmanian Government. A paper read before the Electrical Association of Australia in 1916. Austral Printing Co. Melbourne (Copy in H.E.C. Archives).

24. Prospectus of Hydro-Electric Power and Metallurgical Company Limited. H.E.C. Archives.

25. Ibid., p.3.

26. Ibid, p.11.

27. Ibid, p.14.

28. Gillies, op. cit., pp 20-24.

29. H.E.P.M. Co. Prospectus, op. cit., p.3.

30. The Mercury, March 16, 1910.

31. Rowland, J. Progress in Power. (The contribution of Charles Merz and his Associates to sixty years of electrical development 1899-1959). Newman Neame London, 1960, p.35.

32. H.E.P.M. Co. Prospectus, op. cit., p.17.

33. Butters, op. cit., p.4.

34. Green, Hydro-Electric Development, op. cit., p.7.

35. Complex Ores Act 1909, p. para. 40.

36. Gillies, op. cit., p.62.

37. Butters, op. cit., p.5.

38. Gillies, op. cit., p.56 and p.68.

39. Ibid, p.81.

40. Ibid, p.115.

41. H.E.C. Archives.

42. Gillies, op. cit., p.115.

43. E.Z. Review 1916-66, 50 years of Progress EZ 1966, p.8..

44. The Mercury, 16th March, 1910.

45. Gillies, op. cit., p.118.

46. Obituary, J.H. Butters.

47. H.E.P.M. Co. Prospectus, op. cit.

48. Gillies, op. cit., p.44.

49. Hydro-Electric Department Report 1916-17.

50. Green, F.C., Responsible Government, op. cit., p.221.

51. H.E.P.M. Co. Tasmanian Government Agreement 1914. H.E.C. Archives.

52. Ibid, p.2.

53. Hand-written note on H.E.C. Pro's File, "Annual Reports '15-'24".

54. Hydro-Electric Department Report 1915-16.

55. Ibid, p.3.

56. Butters, op. cit., p.50.

57. H.E.C. Report 1915-16, p.3.

58. Ibid, p.4.

59. Butters, op. cit., p.48.

60. Hobart Tramway Co., Amendment Act 1902.

61. Hand-written notes by A.P. Binns, First Manager, Retail Supply, H.E.C Archives.

62. H.E.P.M. Co. Hobart distribution sub-contract, H.E.C. Archives.

63. Hobart Gas Company Purchase, Parliamentary Paper 33 of 1915.

64. Ibid, p.3.

65. Butters, op. cit., p.48.

66. The Mining Act, 1893, 57 Vic.24, p.514.

67. Launceston Electric Light Act, 1887, Clause 56.

68. Ibid., p.23.

69. Kozakiewicz M. Duck Reach and the Electric Light. A. B.A. (Env. Res.) thesis T.C.A.E. 1982, p.48.

70. Launceston Electric Light Act, faceplate.

71. Town Boards Act 1891. Tas Acts of Parliament 1890-1, p.678.

72. Hobart Light Act 1896, p.257.

THE DEPARTMENT REACHES OUT; 1918-1928

In the years immediately after the Great War there were enormous forces for development and expansion in Australia. Assisted migration,[1] tariff protection for new industries,[2] irrigation and closer settlement,[3] a record marriage rate in Tasmania in 1920;[4] all fuelled by overseas borrowing[5] and higher wages for the working man.[6] The electricity supply industry was at the crest of this wave of expansion throughout Australia due to another influence; the development of domestic electric appliances.[7]

In Tasmania this expansion of the industry was accelerated even faster by an even larger factor, the establishment of electro-metallurgical industries.[8] This rapid expansion affected almost all electricity supply undertakings, but in different ways. It made the H.E.D., but many of the smaller schemes could not stand the pace and faltered. Butters seems to have had a good idea of what to expect. He had worked in England as recently as 1909, his ex collegues at Siemens probably kept him informed and all that chasing the materials ordered by H.E.P.M. Co. must have helped to keep in touch with developments. It is as well to remember that the Great War was largely a European war and the flow of newspapers and periodicals, especially from the United States, which did not enter the war until 1917, did not cease.

This development of the 'Dept.' took four forms; a survey of the water resources of the state, upgrading the Great Lake power generation scheme tenfold, trying to regulate the supply of electricity and its use and, possibly the most important organisationally, the supply of electricity in bulk, to municipal councils, wherever it could be done on a paying basis. All had long-term organisational effects. Other electricity supply undertakings in Tasmania did not do this, with the minor exception of Mt. Lyell. Had the Launceston Council in particular developed the potential of the South Esk in the 1920's, sold bulk electricity to adjacent

electricity to adjacent municipalities, as it had every right to do, the organisation of electricity supply in Tasmania might look very different today.

As early as 1916-17 the H.E.D. had started a survey of the states water power resources. Initially this was restricted to ascertaining what reasonable power station sites were available close to the Central Plateau. Some rainfall figures were available and these enabled an assessment to be made as which catchments and sites had attractive water power potential. Several potential power schemes were already obvious and "the work on the Franklin River involved a complete traverse of the scheme from Mt. Arrowsmith to its source and established certain definite data which make the project worthy of further investigation as the water supply available is a most valuable one."(9) By 1922, seventy stream gauging stations had been established, most of which were read daily(10) and by 1923 fourteen potential power station sites totalling 400,000 HP had been identified.(11)

This was however just a start. In 1924 Butters stated to an Engineering Conference in Hobart that "the difficulties encountered in new countries such as Tasmania, are very great. Large areas have not been explored, nor can they be explored easily, and the information available concerning larger areas still, in fact the bulk of the state, is that obtained from explorers sketch maps. The trigonometrical survey is incomplete and no extensive topographical survey has ever been undertaken."(12) The Hydro-Electric Dept. Organisation chart for 1920 shows a 'Hydraulic Designs Branch'(13) and there is a Hydrology Section in the H.E.C. to this day.

In August 1916 it became obvious that very much bigger things were coming. On 2nd August 1916 a contract between the Tasmanian Government and Amalgamated Zinc (now Electrolytic Zinc Co.) was tabled in Parliament. This allowed Amalgamated Zinc to set up a zinc refinery at

Risdon and provided for the company to receive 4000 HP of power with the right to acquire a second block of power up to 26,000 HP, plus a third block to 50,000 HP.[14] These were the Baillieu BHP interests and the Government was that of Walter Henry Lee.

This was a period of low industrial activity in Tasmania, and the multiplier effects were marked. Imports for essential industries were held up by the German submarine blockade and shortage of refrigerated shipping prevented apple and pear exports. Even the previously booming mining and timber industries were prevented from functioning at full capacity due to manpower difficulties.[15] Lee was responsible for the establishment of three industries in the state zinc refining, confectionery and the woollen industry in Launceston.[16]

EZ set up a pilot plant at Risdon and took their first power in February 1917. At first they only took a small amount of power, about 100 KW, but had spent £170,000, (perhaps $10,000,000 in 1985 dollars) had "made excellent progress towards the completion of the first stage ... its 10 ton plant"[17] and were clearly big future power users. H.E.P.M. Co. were also building. In April 1917 their factory building at North West Bay was complete and most of their machinery delivered.[18] They were now going to make carbide, but still wanted 10,000 HP. It was thus clear that the power available at the southern end of the Great Lake must be increased by tenfold.

This was done in three stages. Firstly, at the end of 1916 Parliament authorised the expenditure of £171,000 to nearly double the power available from Waddamana and put in the necessary translines and substations to supply EZ and H.E.P.M. Co.[19] Secondly, the excavation of a large canal with the capacity to carry 450 cubic feet per second was started on 1st January 1918. This was to divert the River Ouse into the Great Lake "to make the utmost use of the floodwaters of the available catchment area forming the sources of the

Rivers Ouse and Little Pine",[20] i.e. almost double the catchment area. Last, but certainly not least, a much larger higher dam was designed to raise the level of the Great Lake to thirty-five feet above its original level i.e. twenty-five feet higher than the original dam. This was designed in 1919 and was a state-of-the-art design.

Various types of dam were investigated and a "multiple arch" dam chosen as it had the smallest concrete content, as the transport problem was very difficult and it provided security on the foundation available, which was hard, but known to be fissured extensively.[21] This was a much larger structure than the original dam. The H.E.P.M. Co. dam has been described as a "substantially built weir of diabase masonary with under-structures in the body of the dam and escapes at both ends. The heights from sill to sluices to crest of escapes was eleven feet and its length, including escapes about 480'".[22] The Multiple Arch Dam was forty feet high and 1180 feet long. If the techniques of the first dam had been used, the second dam would have required twenty to thirty times as much material.

This was the first dam the H.E.D. built and it set quite a few precedents which in their own way shaped the civil engineering side of the organisation of electricity supply in Tasmania.

The dam was designed by Mr. C.C. Halkyard[23] one of the H.E.D.'s own engineers. It was not designed by consultants. There is reason to believe that it was designed as early as 1917 when Halkyard's entire salary except 10, was allocated to "C" the code for Loans Charge or in 1985 parlance capital work. That other 10 was allocated to "Miscel. Mins. for Lands investigation of water for power."[24] Cyril Halkyard at that time was an Assistant Engineer. He had been Resident Engineer at the Headworks in 1914-15, in charge of the whole works from the Power Station to the Lake.[25] He had worked for H.E.P.M. Co. since 1912, rising from Junior Assistant Engineer.[26] By 1923 Halkyard was Deputy Assistant Chief Engineer, [27] i.e. Butters deputy,

the first of the civil engineers to become important, but not the last.

Halkyard desined a state-of-the-art dam, probably the most innovative in Australia at that time, but to realise just how appropriate it was one must realise that there were three constraints in 1920 that are no longer present today.

Most moving of earth and rock was done by men and horses. In 1919-20 "picks and shovels did the greater part of our digging, the spoil being carted and barrowed out at first; then, when the trucks came along we used them instead, either running them out by hand through side cuts or hauling them out with a steam winch. The hand-trucking method is popular with contractors." "The horse scoops worked satisfactorily..." "The steam-shovel was very disappointing..."[29] Note: the steam shovel; there was only one; "hand-trucks"; horse-scoops, steam-winch. It is clear that a rock fill dam, which is what the H.E.C. built at Miena in the 1950's when Poatina was built was quite out of the question in 1920 due to the lack of mechanised earth moving equipment.

Cement was very difficult to obtain. There appears to have been no Australian cement manufacturers at that time. In June 1920, "no cement whatever is available"[29] and so a start could not be made. Work was started "with a small parcel of Union (?) cement, then came a shipment of Japanese, then lots of Swedish, Danish and Java cement and finally some thousands of barrels of English."[30] One can see why a design was chosen that was "exceedingly economical of material."[31]

Transport was a problem. It was forty miles from the rail-head at Apsley to Miena. After Bothwell the road to the Lake was "merely a fair-weather road, without foundation, which under the heavy traffic ... went rapidly to pieces."[32] It was necessary to keep a permanent H.E.D. maintenance gang on the Great Lake Road[33] and to install a second-hand steam driven sawmill near Deloraine[34] and also supply the construction works via another road to the

north end of Great Lake "practicable only in the summer,"[35] and two motor launches.[36] Rackham[37] quotes John Butters most vivid recollection of that time as seeing "a nest of our 4ft diameter steel pipes completely submerged in mud, truck and all, with just the tip of the pipes visible and the last of the team of horses being dug and pulled out of the mud." 20,000 tons was transported over these two routes during the building of the dam. An alternative design such as the conventional concrete dam built at Cluny in the 1960's could easily have doubled the amount of cement necessary making the task of transporting it that much more ardous.

Originally tenders were called to build the dam. Two were received, both from Hobart, and both were rejected as being considerably over-estimate. The H.E.D. then set about building the dam itself with its own day labour force.[38] That set a precedent that has held with only one or two exceptions to the present day and caused the setting up of that part of the organisation necessary to recruit, pay and supply a large workforce. This caused a major expansion in the Head Office Staff. In mid 1919 the H.E.D. had sixty-five staff in Hobart,[39] by mid 1922 this had almost doubled to 119.[40] The maximum work force at the Lake at any one time was 1800,[41] at times the weather was terrible, with the Great Lake frozen over thick enough to play football on its surface[42] and the gales severe enough to wrench loose the formwork for the arches.[43] The dam was complete by Christmas 1922 and filled to 31.9ft in 1924.[44] The power station had been upgraded to 66,000 HP by the addition of seven 7050 KVA generators, each driven by a 8,000 HP turbine[45] and the transline upgraded to four circuits between Waddamana and Risdon.

In terms of the organisation of electricity supply in Tasmania, however, another aspect of the H.E.D.'s activities was far more important. This was the supply of

bulk power to Municipalities. Many of the more progressive towns had installed Town Electric Light schemes, before the Great War. These schemes were of the order of 100 HP, quite sufficient to power 1500 lights. The generators, often DC units, were easily driven by a single cylinder suction gas engine as at Burnie,[46] diesel as at Cygnet[47] or hydro as at Franklin.[48] However in the early 1920's almost all of these schemes started to become inadequate.

Devonport is probably a typical example. The original plant was installed in 1903 and was a steam driven DC system. Its capacity was 154 KW and by overloading by as much as was prudent it could produce 170 KW. By June 1920 the maximum demand had reached 175 KW and by 1923 it was 185 KW. There were applications for power that could not be connected. Worse still half the load was being carried by one engine that was twenty-five years old and liable to complete breakdown at any time.[49]

There were two main reasons. Increasing population and the increasing proportion wanting electricity was one. More important however was the availability of domestic appliances. By 1923 stoves, radiators, grillers, vacuum cleaners, urns, electric jugs, hot water systems, irons, kettles, toasters and even "electric bed-warmers" were readily available in Tasmania.[50] Now all these things have in common that they take a great deal more power than an electric light. A small radiator uses 1000 watts, as much as twenty-five 40 watt lamps. 40 watts = 32 candle power, considered quite an adequate domestic light at that time. The "Town Lighting" undertakings could not cope and either had to upgrade their plant or restrict supply. Initially most upgraded their plant and the year books of Tasmania's parliament in the 1920's are full of Lighting Acts allowing Municipalities to borrow several thousand pounds to buy new engines or extend distribution networks or buy meters as they changed over from 'fixed fee, horse power connected per annum' contracts to

'pennies per unit used' tariffs. However once the 1916 Hobart price reductions[51] and the fact that the H.E.D. apparently had plenty of power available became generally known, many Municipalities began to look to the H.E.D. for electricity supplies.

Initially the Department responded by providing bulk power, but only where it could sell it profitably. There were three good reasons for this policy. Firstly, in the twelve years to 1927 the H.E.D. only once made a profit, in 1922.[52] Thus Butters must have been reluctant to expend money where he did not see a return. Secondly, the "Town Lighting" schemes already had established distribution systems. The Municipal Councils were keen to retain the revenue from these if they could. At this time there was no take-over legislation and the H.E.D. would have had to buy these distribution systems. Furthermore many of the town undertakings were D.C. or worked at a different AC voltage and frequency than the H.E.D. In most cases the Council were willing to pay for the cost of changeover.[53] Thirdly, the H.E.D. did not have the staff or the organisation to carry out the maintenance, metering and administration of town lighting schemes. This was sixty-five years ago remember, transport was still usually by horse once away from the railway stations, telephones were few and exchanges hand operated.

It is most instructive to look at the older files and note that urgent communication between senior H.E.D./ H.E.C. people and senior Launceston City Council people was always by telegram, right up until the middle 1930's. Only after that do records of telephone calls start to be mentioned. Now these were two important entities in the two major cities and would represent the best available communications.

It therefore made good sense to sell the power in bulk to the Municipality and keep out of the time consuming, expensive and cumbersome local distribution of electricity where possible.

The first extension was to Launceston. Duck Reach had been extended in 1904 and a steam engine installed in Launceston in 1913. In 1918-19 however the Launceston Council was pressing for bulk power to be supplied.(54) A 88 KV single circuit transline was run north from Waddamana and electricity first transmitted over it in September 1921. The Launceston Council took power at 6.6 KV and continued to do so for twenty-three years. However it was never a very harmonious arrangement as will be explored later.

In 1921-22 the Department deliberately, set about "the creation of the (country and provincial) demand on a commercial basis and then the meeting of it."(55) They were leading the way in Australia in rural electrical service and had to tread carefully. In the early 1920's the H.E.D. was certainly the biggest and most extensive electricity supply system in Australia. Hobart was the only capital city that had an integrated electricity supply system, Waddamana was by far the biggest power station in Australia and the H.E.D. operated far larger a length of high-voltage transline than any other power supply authority. The other large Australian electricity supply authorities were big city based, often several to a capital. They were hard pressed to satisfy local demand in the suburbs. It seems that outside the capitals and large country towns there were only "town lighting schemes" and few wanted to create demand there.(56)

This creation took four directions.

By mid 1923 a 1000 KVA 88KV/11KV 3 phase outdoor substation had been built at Bridgewater, where the 88KV transline crossed the Derwent. An 11KV wood pole line was erected from Bridgewater to New Norfolk. Until 1923 a DC supply was available to residents of New Norfolk from a steam-driven plant located at the Mental Diseases Hospital and 86 customers were connected. Within nine months of the H.E.D. supply becoming available 220 customers were connected and a large

number of motors, kettles, irons and toasters installed. These results were considerably more than the Department had expected and an immediate extension was made to Plenty, 7 miles beyond New Norfolk.(57)

A similar 11KV feeder had been extended from the Electrona substation to Cygnet, which made the change from a diesel powered DC system in February 1924.(58) The Cygnet scheme was only eight years old,(59) but was not in good order. Over the next four years supply was extended to most of the towns in the Huon Valley. The Department supplied in bulk to the municipalities. The Councils then distributed, administered and kept any profit.

In 1922-23 a different kind of initiative was taken, but to the same end. Mt. Lyell's Lake Margaret Power Station had excess capacity in 1921-22 and there was a market for it with the new EZ smelter at Rosebery and also with the Zeehan Council. The Zeehan Council had the exclusive right to sell electricity in that Municipality under the Zeehan Electric Light and Power Act 1898. They had a steam driven power station, were actively selling electricity, but did not have the capacity to supply EZ.(60) The Department rapidly negotiated with Mt. Lyell, EZ and the Zeehan Council, obtained an appropriation from Parliament for £ 31,000,(61) cleared and surveyed the twenty-nine mile transline route, designed the transline and let a contract for its construction. The 44KV transline was completed to Zeehan in February 1925 and extended to Williamsford and Rosebery in March 1927.

The transline to the north west coast had mixed beginnings. As late as November 1922 it was "prohibited by the high cost it would entail" as John Butters replied to a depulation of MLC's, MHA's and Councillors from several NW Municipalities that requested an early start.(62) Perhaps Butters was bargaining; he certainly knew that the Devonport Council, in particular, were desperate. He had to know; the Manager of the Hobart District Branch of the H.E.D. had

been recruited from Devonport only a few years before. George Lofts had been Town Electrical Engineer of Devonport until September 1916.(63) It was also public knowledge that power was rationed in Devonport. A timetable had been supplied to power users specifying that power could not be supplied on Wednesdays or Friday evenings. On Wednesdays there were two picture shows and on Friday nights the shops were open. These activities took all available power. It had been found necessary to prohibit picture shows on Friday nights.(64)

However, by that time Butters had some diversity in the Department's generation and transmission arrangements. No longer did Hobart depend upon two generators and a vulnerable sixty-two mile long single circuit transline. By 1923 there were 9 generators and two double circuit translines. 1922-23 showed a reliability index of 99.963%, with only two power station/transline outages of more than a few minutes.(65)

By 1923-24 Butters could lead his Report with the proud boast that the transmission system had shown "almost complete freedom from interruption ... sufficiently complete to be unnoticeable by consumers."(66) Thus the standby steam plant in Hobart, so valuable in 1916, was no longer necessary and could be used elsewhere. The North West request was therefore a golden opportunity to create demand along the coast and Butters was quick to sieze it. By May 1923 the Department had signed an agreement(67) with the Devonport Council whereby the Department agreed to install an 800 KW steam plant in Devonport and to supply electric power to the Council for "cost plus five per cent." Those ex Gas Company and ex Tramways steam plants came in handy.

The Council would provide a freehold site and agreed that it would "use its best endeavours by all means in its power to further the sale of electricity within its boundaries." Furthermore the Minister, with the consent of

the General Manager of the H.E.D. could sell electricity to other municipalities. The Devonport Council retained the distribution and administration rights, but had to borrow £17,000 to change over from DC to AC and upgrade its installation.(68)

Although the Councillors spoke glibly about the new AC equipment being necessary "when the hydro-electric line comes to the coast"(69) and Butters in his 1923-24 Report spoke of "certain new consumers could be counted upon which would have involved very considerable new load" and involvement in hardwood paper making south of Burnie, nothing came of these. He wrote of 4000 HP supplied via a transline through Cressy and a power scheme on the Arther River,(70) but these didn't eventuate, either. Thus the Waddamana - Railton 88 KV transline, and the 5000 KVA Railton substation, first mentioned in the 1924-25 H.E.D. Report,(71) come right out of the blue. It has all the markings of a high-level exercise. The Department used contract surveyors, shared the cost with the Lands Department, and promised completion in eleven months. In fact it took eighteen, but even that indicates a fair degree of urgency. It was a sixty mile transline, built across the roadless western share of the Great Lake. Perhaps the explanation lies in the brief sentence "Transmission lines from the substation to Railton, Sheffield, Tasmanian Cement Co., Shale Oil Works and the line linking up the towns of Devonport, Ulverstone and Penguin were also completed and placed into service."(72) Northern political pressure is nothing new. That was in January 1927.

In November 1924 John Butters left the Department to become chairman of the Federal Capital Commission which developed Canberra. His work had been done and done well. From a shaky start in October 1914 he had built a system that by 1928 extended from Wynyard in the north west to Geeveston in the south, taking in seventeen municipalities along the way. There was also the Department-coordinated west coast

system.[73] By 1927 the Department was making a profit and by 1930 it had wiped out its accumulated losses.[74]

He did however have one big failure. The Department had no regulatory power. They could neither license Electricians nor Electrical Contractors nor could they standardise apparatus throughout the state.

As early as 1916-17 Butters had proposed an "Electric Light Act" but it seems not to have been proceeded with.[75] In 1921 an "Electricity Bill" - "to regulate and control the installation of light and power and licensing of persons connected with its installation" reached a first reading in November 1921, was negatived in its 2nd reading on 1/12/1921 and not mentioned again.[76] Possibly Butters was a little premature. In 1921, most of the "Town Lighting Undertakings" were coping and even making profits. The Launceston City Council considered that "the Bill would give the manager of the Hydro-Electric Department very wide powers and it was considered possible that these might be exercised to the detriment of the municipality."[77] Such existing regulatory powers as there were, were the responsibility of municipalities before 1929 and no doubt others felt the same as the Launceston Council. Most northern municipalities had town lighting schemes and Hobart was far away. Better to control things yourself than let public servants in Hobart dictate what should be done.

It was during this period that time and technology passed Launceston by. It is also difficult to avoid the conclusion that they were helped by that far sighted man of action, John Henry Butters. In 1915 Launceston had the best electricity supply system in Tasmania. It was probably one of the best in Australia. Its electricity undertaking was twenty years old, had 3171 customers, with 444 motors, 586 electric irons and 377 radiators connected.[78]

Launceston had electric trams, a multi-generator

hydro power station at Duck Reach, a steam standby plant, three phase power and metered installations. The Launceston Council ran it all. They, alone in Tasmania had effective regulatory power. As far back as 1895 they had issued their "Rules and Regulations for the guidance of Certificated Electric Wiring Contractors" a seven page booklet that begins "Only persons approved by the Council will be allowed to undertake the wiring of houses for Electric Lighting" and continues "the City Electrician will require from applicants for certificates evidence of both the possession of technical knowledge and of the skill in Workmanship."(79) The Launceston "Electrical Undertaking", as it was called was twice as big as Hobart.

Both the Electrical Undertaking and the Trams were run by an engineer who was an Associate Member of the Institute of Electrical Engineers and a Member of the Institution of Engineers (Australia).(80) As early as 1906 the City Electrical Engineers Department had a staff of six.(81) These were "staff", i.e. there were clerks and wage employees as well.

In 1903 Duck Reach was expanded by 1.2MW. Four turbines each coupled to a generator were added and the whole town supply, except the public arc lights, changed to three phase at a frequency of 50 cycles.(82) A flume was built, weirs and dams built at Woods, Arthurs and Toombs Lakes and a new 800 KW generator installed in 1921.(83) In 1924 the voltage was changed to 240 volts AC from 110 AC "to conform with other undertakings in Australia and New Zealand."(84) It was a knowledgeable and progressive undertaking, using steel distribution poles, tungsten filiament lamps and underground cables, hiring motors and stoves, fixing its own meters, providing advice to customers and repairing appliances, all as far back as 1913-14.(85) By 1920 their generation capacity was strained.(86) Load had been growing for some years and

it was clear that something must be done.

There were two choices; obtain power from the H.E.D. via a transline from Waddamana or build the "High-Level Scheme" which took water from the South Esk at the third basin and brought it to a power station at sea-level. A similar scheme had been suggested by the first "City Electrician", Mr. Corin, in 1906.(87) The Launceston Concil opted for H.E.D. power and this is another of the decisions that shaped the organisation of electricity supply in Tasmania. This "High-Level" Scheme did eventually get built; it is called the Trevallyn Power Development and was opened by the Premier, the Honorable Robert Cosgrove in December 1956.

In the early 1920's the Launceston City Council could have borrowed the £350,000 necessary to build it. They could have supplied the whole north coast of Tasmania if they had moved quickly. The H.E.D. could not have stopped them. The Launceston Council had the water rights at the third basin(88) and the Hydro-Electric Commission Act 1929 was in the future.

It didn't happen. The lure of H.E.D. power at an annual cost of £5/9/- per HP was too easy. On 18th December 1922 "the Government bulk supply was officially switched on to the City. I (the Mayor) had the honor of performing this note worthy function at the Sub-Station on the Cataract hill. " " we have now partially dispensed with the running of our own Hydraulic Station, and wholly with the Steam Auxiliary which we are endeavouring to dispose of favourably."(89)

The H.E.D. had built a transline with the capacity to supply Launceston for the forseeable future. That was good engineering but it was also very shrewd long term planning and John Butters thought in the long term. He had even then proposed a state-wide coordinating body. Coincidence; I doubt it. It would be twenty-two more years before the H.E.C. took over the Launceston Councils Electrical

Undertaking, years of argument, legislation and, eventually arbitration. But the die was cast about 1920.

For some places state "hydro-electric power" seemed remote.

Latrobe continued to be supplied by the Latrobe Hydro-Electric Company. Once the H.E.D. decided to install its steam plant in Devonport in 1923, it approached the Latrobe Council, but they already had a contract with the Latrobe Company.(90) In 1924 the power station was flooded but Harold Lord, the Engineer and Manager reacted by installing a bigger new steam standby plant well above flood level.(91)

In May 1927 the Latrobe Hydro-Electric Company made enquiries as to whether the H.E.D. could make bulk power available to his company for retailing, but this did not come about. This sort of transaction was certainly not envisaged by the Complex Ores Act,(92) under which the Department was still operating, but it is doubtful if it would have been Government policy anyway as by this time the Lyons Government had already presented its 1925 version of the Hydro-Electric Commission Act.

In 1928 the Latrobe Hydro-electric Company seems to have had sufficient generating capacity to "supply the town with light and power for many years to come", though putting in extra plant to carry "the shale and cement works was rather too risky ... as they carried very big loads and should he (Harold Lord) put in a plant to cope with them and should they cease to function, he would be in queer street."(93) Domestic and small industrial load was encouraged by giving a bonus to any licensed wiring contractor who introduced new business be it a lighting customer, or an electric iron. Where a customer installed a new appliance such as a "Frigidaire", hot water systems, or even vacuum cleaners the first quarters electricity for that appliance was supplied free.(94) The Latrobe Hydro-Electric Company

supplied DC and AC power in the late 1920's and had about 300 customers.

Longford converted from a suction gas engine to a small hydro plant in 1920,[95] Scottsdale Municipality set up a similar scheme in 1922. Both changes were supervised by Harold Lord.[96] Gormanston and Queenstown were supplied by Mt. Lyell with electricity generated by Lake Margaret Power Station and supplied in bulk to the municipal council.[97] Waratah was supplied by Mt. Bischoff. As late as 1927 though, towns were still setting up their own undertakings. Stanley put in three phase AC power at 240 and 415 volts in that year.[98]

Of course in many areas of the state things were much as they always had been. Although most towns had electricity supply by the 1920's, large areas of Tasmania did not. Apart from Scottsdale the whole of the east coast was without electricity, as was the Fingal Valley. The Tasman peninsula, Bruny Island, Strahan and Smithton were also without electricity. Most "Town Lighting Undertakings" had just a few hundred customers and this implies that once out of the town area, there was no electric light. The farms etc. were still using wood stoves and kerosene lamps.

The 1920's are one of the definitive periods in the organisation of electricity supply in Tasmania. The "Town Electric Light Undertakings" failed to expand themselves and many took bulk supply from the H.E.D. instead. This was in contrast to much of the interstate experience where in general the capital city electricity suppliers expanded, sometimes several to a capital as in Sydney.[99] Suppliers in isolated country centres grew slowly, but survived. The main reason seems to be that almost all interstate suppliers were operating thermal stations which could be built close to the market. There were economies of scale to be gained in the mainland capitals but not enough incentive to build long high voltage translines.

The H.E.D. however could reach out and it did. It had the transmission technology and the incremental cost of hydro-electric power in the quantities required by Devonport or Launceston was negligible, once the second Miena Dam was built. There are four factors worth considering; that familiarity with technology promotes its use, that the H.E.C. had access to money via the government, that state-of-the-art technology attracts top thinkers and planners and that John Butters was a very good leader. Most of these will be explored in chapter eight, however it appears that capital was readily available in the early 1920's[100] and this factor was minor.

The effects on the organisation are apparent in the differences between figures 2 and 3, 4 and 5 and 7.

By 1929 (fig. 7) four groups have consolidated. Hobart District has become a distribution branch. It's 1920 Accounts Department had been amalgamated with the main Accounts Branch in 1928 in what seems like a rationalisation preparatory to the country districts era to come. The Secretarial Branch has emerged as the H.E.D.'s administrative arm with the amalgamation of the Secretarial staff, Accounts "Branch" and "Clerical Sections" in 1927-8 plus the acquisition of stores and garage. The Chief Operator has acquired regional subordinates at Waddamana, Hobart Sub-stations, Launceston Substation, Electrona Substation and presumably Devonport Power station. He also has a Trans-mission Lines Engineer. The modern Power Branch is starting to take shape with its decentralised administration where each area is administered by a Power Station Superintendent. Its technical maintenance as exemplified by translines maintenance, however is done on a centralised basis. Country Districts Branch had been formed in 1923 but had remained in an embryo state during the 1920's. This will be explored in the next chapter. The organisation chart does show a Divisional Mains Foreman (New Norfolk) and several Junior Engineers. This Branch is poised for massive expansion

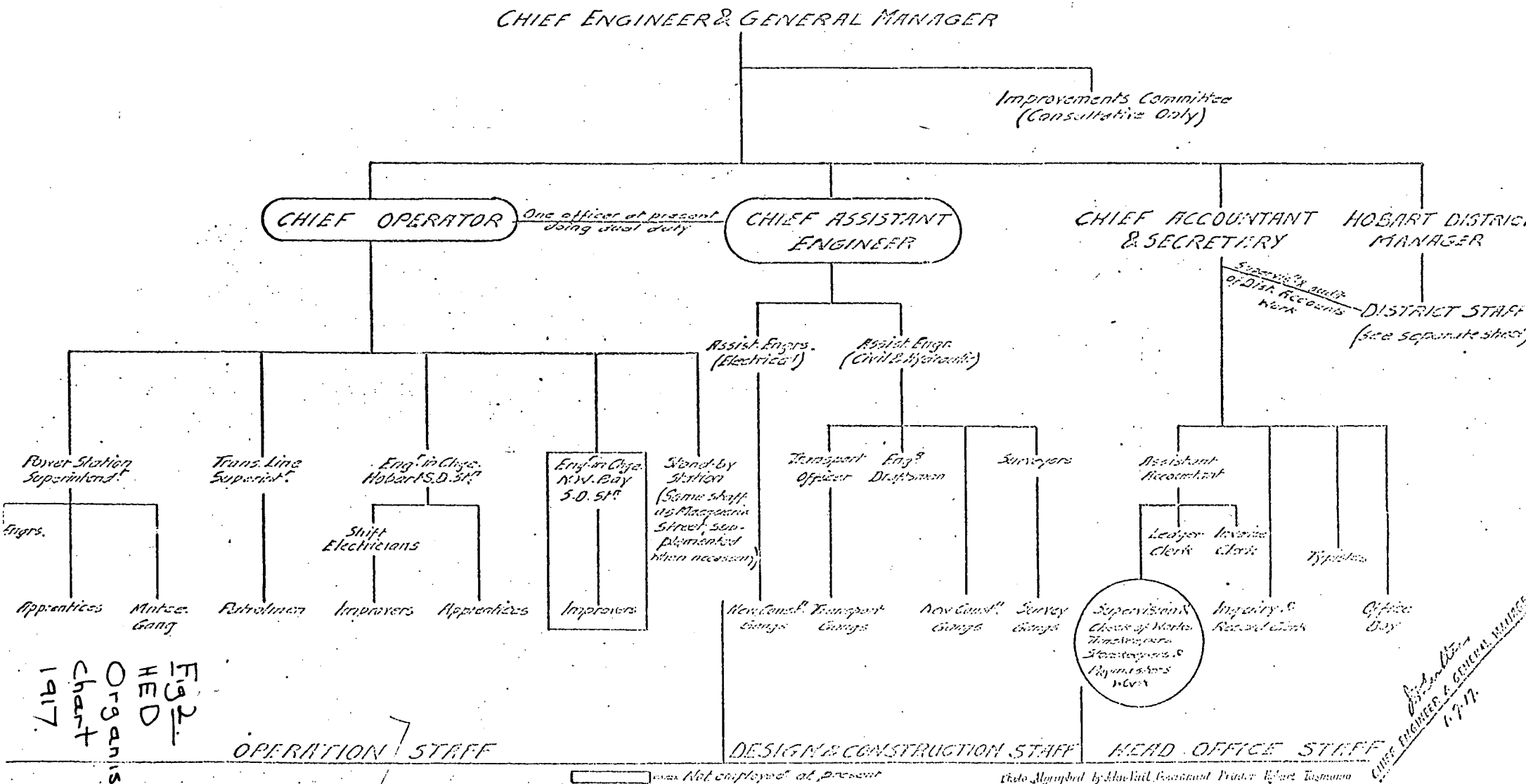


Fig 2 HED Organisation chart 1917

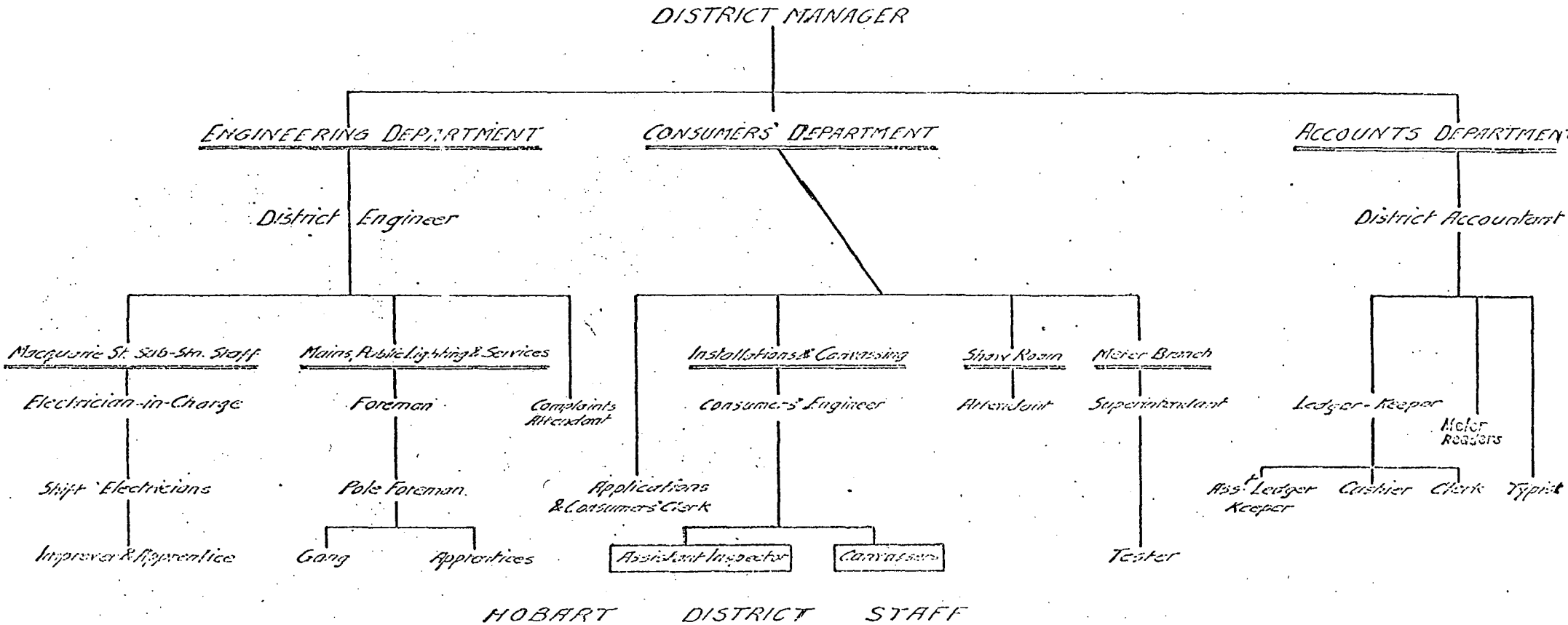


Fig. 3. Hobart District Organisation chart 1917.

Photo Lithographed by Alan Reid Government Printer Hobart Tasmania

CHIEF ENGINEER & GENERAL MANAGER
1.7.17

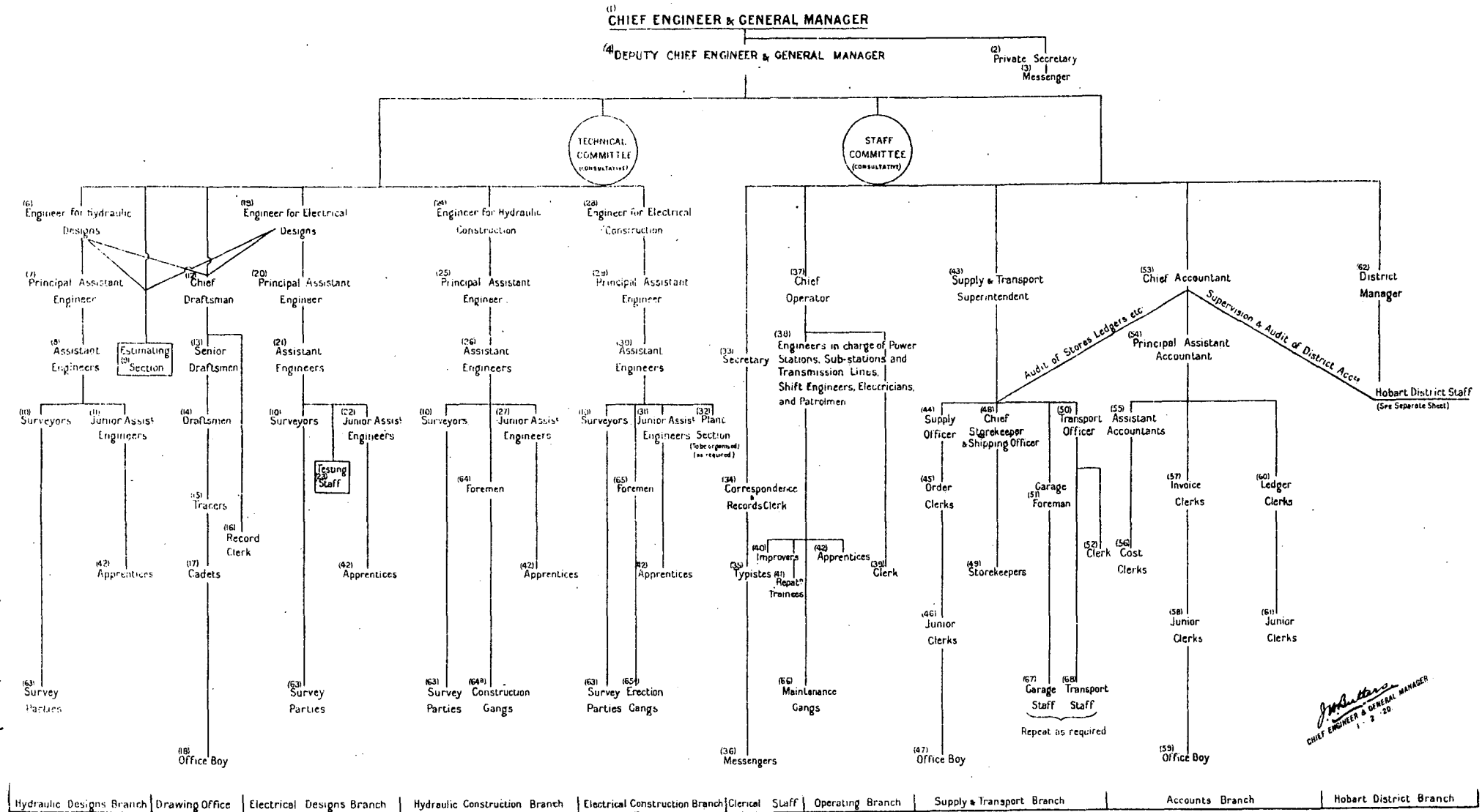


Photo Appropriated by John Vail Government Printer Hobart Tasmania

Fig 4. HED Organisation chart 1920.

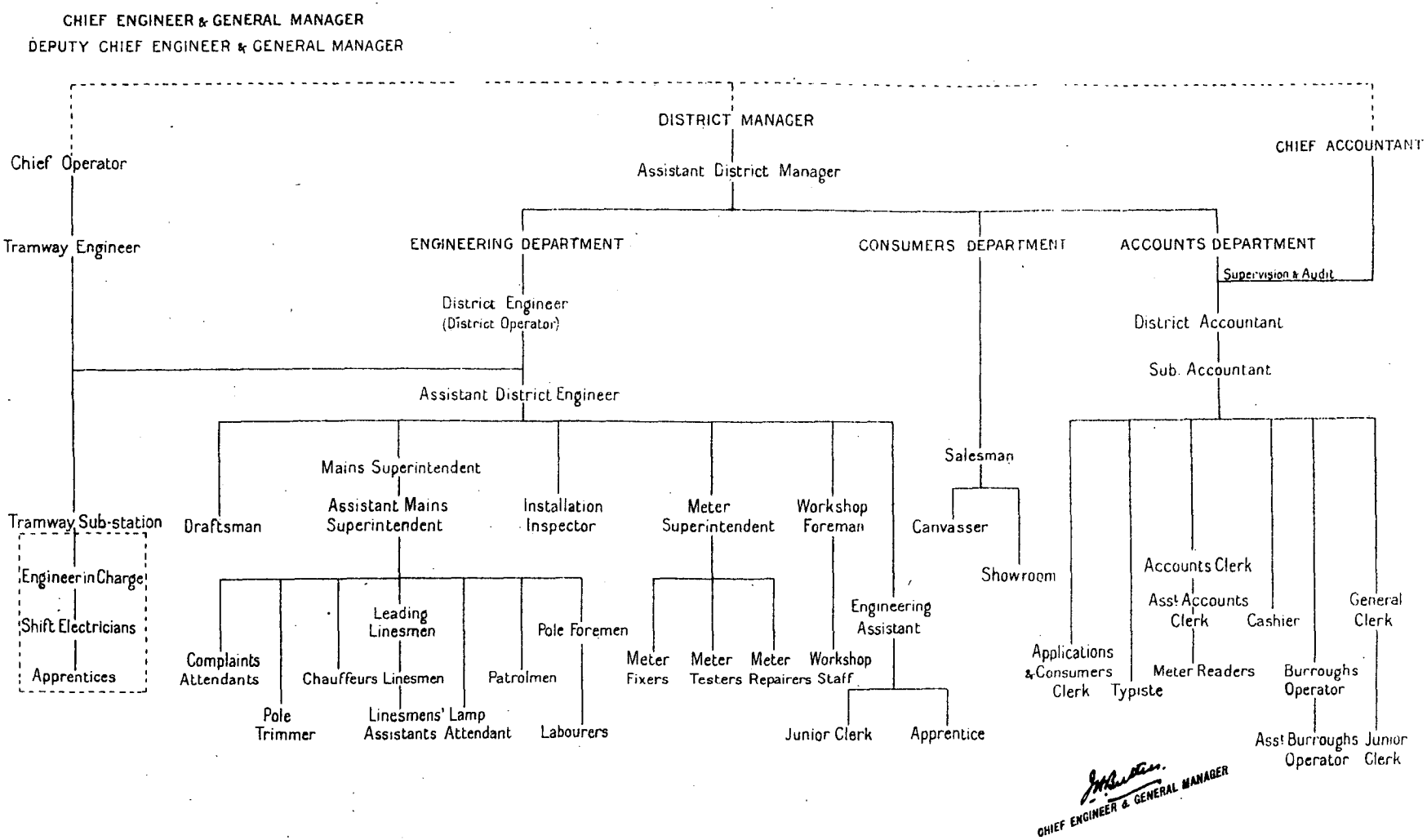


Fig 5 Hobart District Organisation Chart 1920.

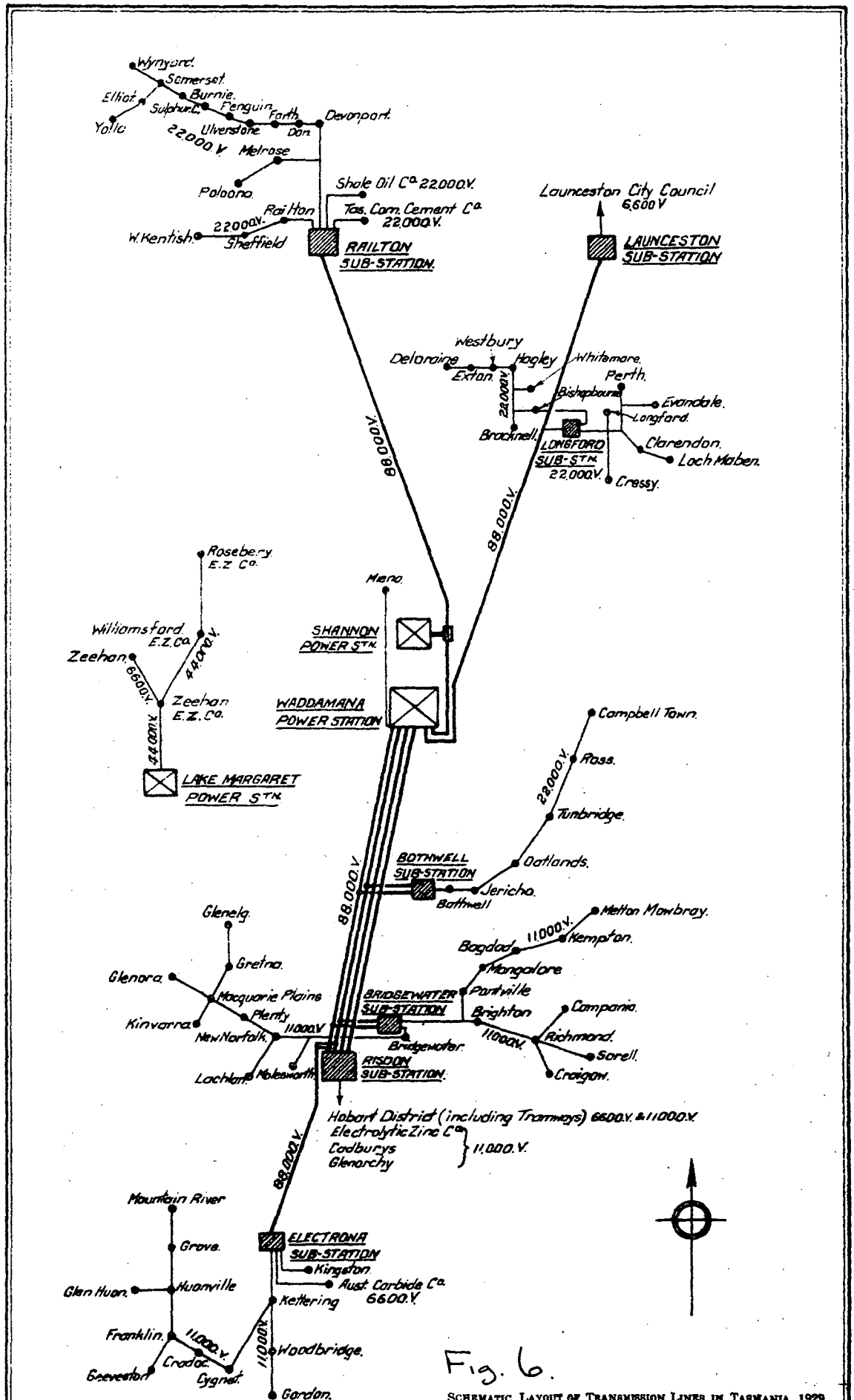
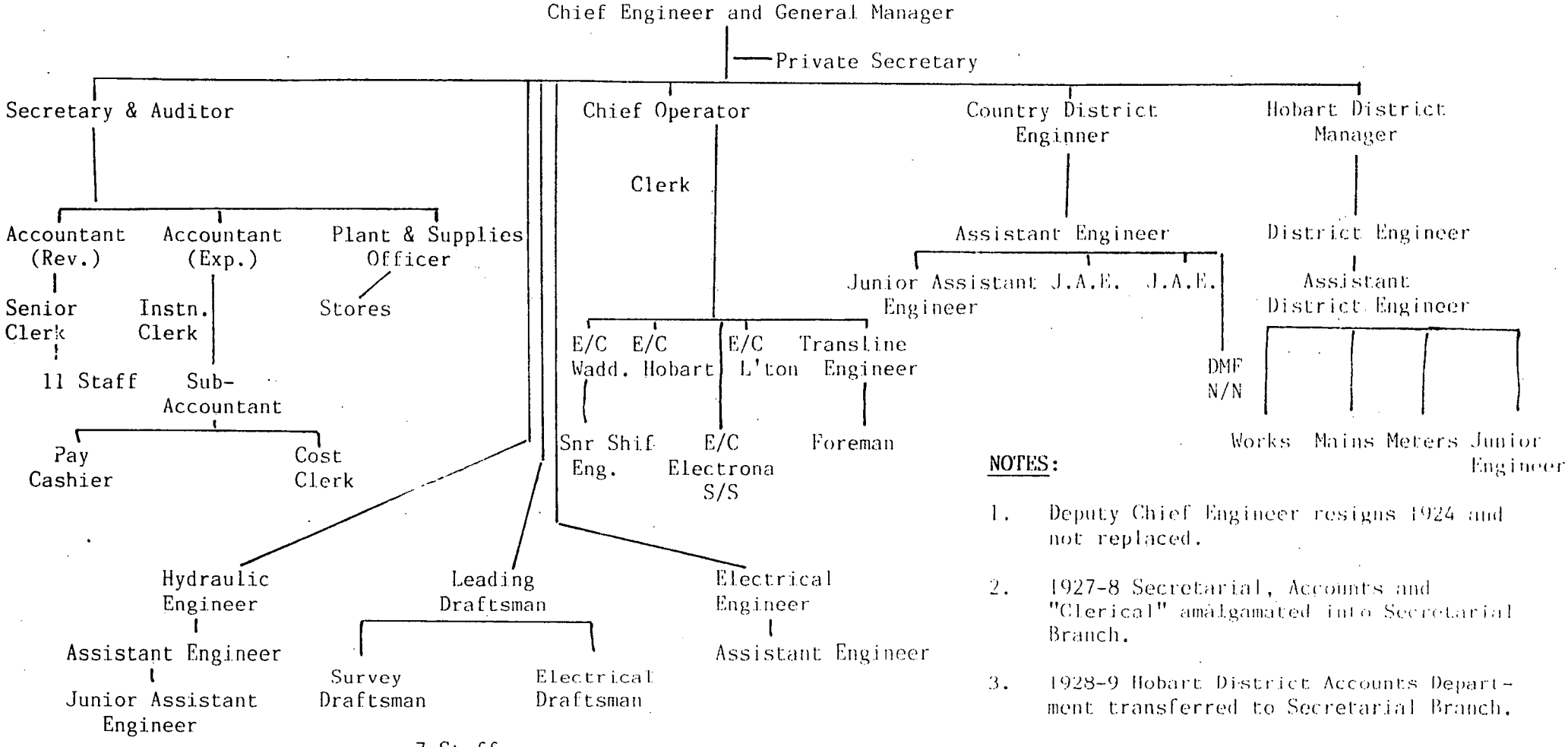


Fig. 6.

SCHEMATIC LAYOUT OF TRANSMISSION LINES IN TASMANIA, 1929.
(Not to scale.)

Fig 7. HEO Organisation Chart 1928-9. Constructed from 1928-9 Staff List.



NOTES:

1. Deputy Chief Engineer resigns 1924 and not replaced.
2. 1927-8 Secretarial, Accounts and "Clerical" amalgamated into Secretarial Branch.
3. 1928-9 Hobart District Accounts Department transferred to Secretarial Branch.
4. Hobart Distribt Manager is highest paid at £720. Secretary, Hobart District Engineer, Chief Operator 625. Electrical Engineer 600.

during the following fifteen years.

Launceston's Electrical Undertaking did not expand. In 1922-3 "the question of a Greater Launceston and the supply of City Utilities to suburban districts (had) been before the Council for practically the whole year and some progress had been made"[101] said the Mayor's Valedictory address and it is clear that there were influential people who wanted to make sure that any benefits remained in Launceston. Launceston's Electricity Undertaking continued to attract more customers within a limited area and to keep its standards up to date, but it only hesitantly expanded outside the City boundaries.

It had every right to supply electricity to adjacent municipalities, acquired water rights far up the tributaries of the South Esk and could probably have modified its Electric Light Act prior to 1915 to supply Longford, but did not. Its organisation froze after about 1912.

1. Younger, op. cit., p.506.

2. Ibid, p.500.

3. Ibid, p.508.

4. Tasmanian Year Book 1973, p.167.

5. Younger, op. cit., p.520.

6. Ibid, p.499.

7. H.E.D. Annual Report 1923-4, p.5.

8. H.E.D. Annual Report 1917-18, p.11.

9. H.E.D. Annual Report 1916-17, p.23

10. H.E.D. Annual Report 1921-2, p.46.

11. H.E.D. Annual Report 1922-3, Attachment.

12. Butters, J.H., Notes on the Development of the Power Resources of Tasmania, 1924. (Read at 1926 Engineering Conference Hobart), p.15.

13. H.E.D. Annual Report 1920-1, Appendix J., p.41.

14. Gillies, op. cit., p.141.

15. Green, op. cit., p.223.

16. Ibid, p.225.

17. H.E.D. Report 1916-17, p.8.

18. Gillies, op. cit., p.143.

19. H.E.D. Report 1916-17, p.1.

20. H.E.D. Report 1918-19, p.1.

21. H.E.D. The Hydro-Electric Power of Tasmania, Tait, Melbourne 1925, p.11.

22. Bastow, A.H. Construction of a multiple arch dam at Miena. A paper presented at the Engineering Conference, Hobart, p.65.

23. Ibid, p.91.

24. H.E.D. Report 1916-17, p.39.

25. H.E.D. Report 1914-15, p.7.

26. H.E.D. Report 1923-4, p.9.

27. Ibid, p.9.

28. H.E.D. Report 1919-20, p.10.

29. Ibid, p.5.

30. Bastow, op. cit., p.69.

31. Ibid, p.68.

32. Ibid, p.68.

33. H.E.D. Report 1920-1, p.23.

34. H.E.D. Report 1919-20, p.13.

35. Bastow, op. cit., p.69.

36. H.E.D. Report 1920-1, p.23.

37. Rackham S., Hydro Construction Villages, Vol. 1, H.E.C. 1982, p.14.

38. Bastow, op. cit., p.70.

39. H.E.D. Report 1918-19, p.27.

40. H.E.D. Report 1921-2, p.34.

41. H.E.D. Report 1920-21, p.1.

42. Bastow, op. cit., p.68.

43. Ibid, p.92.

44. Ibid, p.92.

45. H.E.D. Hydro-Electric Power of Tasmania, op. cit., p.33.

46. Advocate, 15/4/1924.

47. Mercury, 7/11/1916.

48. Daily Post, 26/12/1915.

49. Advocate, 4/12/1923.

50. H.E.D. Report 1923-4, p.5.

51. H.E.D. Report 1915-16, p.5.

52. H.E.C. Report 1929-30, p.9.

53. Advocate, 4/12/1923.

54. H.E.D. Report 1918-19, p.12.

55. H.E.D. Report 1921-2, p.7.

56. Allbut, G., "A brief history of some of the features of Public Electricity Supply in Australia", E.S.A.A. Melbourne, 1958.

57. Curtis, H.A., The extension of the Hydro-Electric Service to Tasmanian Country Towns and Rural Areas. Distribution June 1929 p.160.

58. Huon and Derwent Times, Huon Centenary Settlement Issue, December, 1936

59. Mercury, 7/11/1916.

60. Advocate, 15/11/1923.

61. Mercury 15/11/1923.

62. Mercury, 30/11/1922.

63. H.E.D. Report 1916-17, p.11.

64. Daily Telegraph, 10/4/1923.

65. H.E.D. Report 1922-3, p.16.

66. H.E.D. Report 1923-4, p.3.

67. Parliamentary Paper No. 3 of 1923.

68. Advocate, 4/12/1923.

69. Ibid.

70. H.E.D. Report 1923-4, p.8.

71. H.E.D. Report 1924-5, pp 4, 12 and 13.

72. H.E.D. Report 1926-7, p.4.

73. H.E.C. Submission to Royal Commission on Municipal Government, 5/12/1938, H.E.C. Archives.

74. H.E.C. Report 1929-30, p.9.

75. H.E.D. Report 1916-17, p.25.

76. Mercury, 3/12/1921.

77. Mercury, 14/11/1922.

78. City Electrical Engineers Report (in Mayor of Launceston's Valedictory (i.e. Annual) Address 1913-14.

79. Rules and Regulations for the guidance of Certified Electrical Wiring Contractors, 1895, Launceston Council, (Copy held by Queen Victoria Museum).

80. Kozakiewicz, op. cit., p.58.

81. Examiner, 30/10/1906.

82. Kozakiewicz, op. cit., p.107.

83. Ibid, p.108.

84. Valedictory address, 1922-23.

86. Launceston City Engineers Report 1919-20.

87. Kozakiewicz, op. cit., p.58.

88. Report on Power Development. R.J. Strike and G.D. Basille, Launceston Council, 1928, Q.V.M. Archives.

89. Launceston Valedictory Address, 1922-23.

90. H.E.C. File, District 70, H.E.C. Archives.

91. Cyclopedia of Tasmania 1931, op. cit., p.376.

92. Complex Ores Act 1908, op. cit., Clause 42(1).

93. Advocate, 8 August, 1928.

94. Cyclopedia of Tasmania 1931, op. cit., p.376.

95. Daily Telegraph, 31/8/1920.

96. Advocate, 2 March 1948.

97. Mercury, 22/4/1921.

98. Advocate, 7/1/1927.

99. Allbut, op. cit., p.31.

100. Ward, R., A Nation for a Continent: the history of Australia 1901-1975, Heineman Australia 1977, p.156.

101. Valedictory 1922-3, op. cit.

THE COMMISSION GAINS CUSTOMERS: THE 1930'S AND 1940's

The Hydro-Electric Department never really seems to have functioned as a true government department at all. At least, not as we understand it today. From the very start in practice, it managed the money it borrowed, earnt and spent; hired, paid and fired its own men, bought its own stores, provided its own transport, arranged its own accommodation, organised itself and made its own rules. This almost certainly stemmed from its antecedants and the personality and background of John Butters.

Most of its early staff came from private enterprise. The H.E.D. took over two existing enterprises; the hydro-electric part of H.E.P.M. Co. and the Hobart Gas Company's Electrical Undertaking. Most of the staff of those two enterprises were dismissed and promptly engaged by the H.E.D. Binns and Spencer, for example, came from the Gas Co. and Halkyard from H.E.P.M. Co. The H.E.D. continued to operate out of H.E.P.M. Co.'s old offices in the old A.M.P. Building and leased the electrical portion of the Gas Company's works for some years. H.E.D. never seems to have operated under the Public Service Act. In 1916-17 "the Department is working under The Complex Ores Act, and one or two amending acts based on this one, The Hydro-Electric Purchase Act, and the Hobart Gas Company's Electric Undertaking Purchase Act, and it is needless to say that this multiplicity of Acts is at times very inconvenient" said John Butters in his 1916-17 Report.(1) No doubt there were also times when it was very convenient.

In early 1916 Butters had suggested that the hydro-electric undertaking be placed under a Commission and his recommendations of that year make it clear that he was thinking of a "Commission" in the presently understood sense, i.e. a semi-autonomous public authority that manages the enterprise in the long-term and is answerable only to

Parliament.

His recommendations were;

(1) "That as soon as Parliament goes into recess, a Bill be drafted to provide for the establishment of an authority to control the hydro-electric undertakings of the State, and to consolidate and amend our existing legislation.

(2) That the whole of the powers at present vested in the Minister be vested in the new authority, or be vested in the Governor acting on the advice of the new authority.

(3) That a Commission or a Board of Management be appointed by the Governor in Council, to consist of three gentlemen selected solely for their business acumen, experience, and ability, to have no connection whatever with politics, and to act exactly as a board of directors would act were the undertaking a private one. The Commission or Board to meet at least once per month, and so much more frequently as the General Manager of the Department may desire for the proper conduct of the business. That they should be paid a fee for each meeting attended.

(4) That the members of this Commission or Board be appointed for a term of seven years, in order to avoid the continual necessity of educating them into a sufficient understanding of a hydro-electric undertaking to enable them to intelligently apply their business knowledge: the first appointments being for periods of three, five, and seven years respectively, so as to ensure that only one member retires at a time.

(5) That the Commission or Board be responsible directly to a Minister of the Crown, who would act as the mouthpiece of the Commission in Parliament.

(6) That the Treasury Regulations and "Audit Act" be so amended as to allow of the business of the

Department being carried on exactly as a private enterprise would do it, subject to legislation to be developed, and to Government audit.

(7) That the executive management of the Department be in the hands of the Chief Engineer and General Manager, who shall be responsible to the Commission or Board or Management; it being laid down, however, that in the event of a recommendation of the General Manager not receiving the concurrence of the Commission or Board, he shall have the right to refer the decision to the Minister, with the reasons for his recommendation and the reasons of the Commission or Board for not concurring therein."

There was also another recommendation and this was quite probably one of the reasons why the bill was not quickly passed. In fact it took thirteen years. This eighth recommendation concerned a Water Conservation Commission, which brought together hydro-electric, water supply, irrigation, forestry and mining interests.(2)

The only thing that seems to have eventuated was a three-man Consultative Board that met on eight occasions between March and June 1918.(3) In 1921 Butters tried again. This time he had visited many overseas electricity undertakings, especially in England and the U.S.A. in the course of an eight months long overseas trip. However he recommended much the same system as he had in 1917.(4)

This was not really surprising as at that time the electricity supply industry in England was being reorganised in much the same way. During the Great War a body called the Coal Conservation Committee had thoroughly investigated the industry, noted its lack of co-ordination, heard expert views and made its report. In 1919 the Electricity (Supply) Bill was introduced into the U.K. Parliament. This proposed to set up a body to be known as the Electricity Commissioners and to endow them with wide powers, including the compulsory creation of joint elecricity authorities throughout Great

Britain. These were to be semi-public, non-profit making bodies and would control and operate electricity supply over very wide areas. This Bill was passed by the House of Commons but drastically amended by the Lords. The Electricity Commissioners came into being, but as a more advisory body. However, the idea had taken root and voluntary joint authorities did eventuate.(5)

Similarly the "Electricity Commissioners" were appointed in Victoria in 1919 to "erect and operate electrical undertakings; to supply electricity to any person outside an area in which there was an existing undertaking; to carry on any business associated with an electrical undertaking; to make regulations as to precautions to be adopted in the use of electricity and arrange for the licensing of wiremen."(6)

The Hydro-Electric Commission Bill was introduced in September 1925.(7) It aimed at consolidating the existing legislation, investing the water-power of the state in the Commission and providing for the setting up of recognised standards for the installation of electrical apparatus and the wiring of private installations throughout the state.(8) This Bill passed both readings in the House of Assembly, indeed it was supported by the Opposition.(9) Unfortunately, at this time the House of Assembly was in the middle of a constitutional conflict with the Legislative Council. This conflict "was by far the most acute and had the most lasting consequences. It marked the first serious challenge of a Labor Government which represented new democratic forces in the electorate."(10) After passing the second reading in the Legislative Council the Bill was killed at the committee stage.(11)

In 1928 the Department tried another tack. Although most municipalities were by then supplied with bulk power, "the reticulation and distribution of power by the various municipalities has not in every case been successful."(12)

It proceeded to initiate the Rural Districts Electrical Undertakings Act 1928.[13] This facilitated the takeover of the distribution networks of the municipalities of Deloraine, Westbury, Longford and Evandale.[14] This was a shrewd move for two reasons. Both Deloraine and Longford had inaugurated small Town lighting schemes nearly twenty years beforehand. The penetration of household appliances noted in Hobart, Launceston and Devonport in the early 1920's in the previous chapter was probably, by the late 1920's, appearing in the small country towns. This would expose the inadequacies of their distribution system. The four municipalities concerned were close to Launceston. Some of the opposition to the 1925 Bill had come from Launceston.[15]

Apart from the developing inadequacies of their distribution networks there was probably another good reason for the municipalities and thus, indirectly, the Legislative Council, to welcome such takeovers in 1928: the Depression was looming. It was in 1927 that the level of unemployment (in Australia) began to rise from a low point of 6% to its peak of 30% in the terrible winter of 1932. Wool and wheat prices fell from a peak in 1928.[16] Britain was buying less, as that government initiated sharply deflationary policies in 1925, by 1926-7 other export products were suffering too.[17] This meant general belt-tightening. In farming country it meant watching cash outflows. By 1928 some electricity customers would be finding it difficult to pay their bills. With a local electricity undertaking this would be very awkward for the Councillors; far better the H.E.D. in Hobart demanding payment than the local council.

By December 1927 proposals had been made to all municipalities taking a bulk supply from the H.E.D. to absorb their undertakings, the Department becoming responsible for their capital liability; making reductions in charges to

customers and offering the municipality an agreement for street lighting.[18]

At this time there were about 32,000 customers of the various electricity undertakings in Tasmania. The Department supplied 23,000 directly and indirectly, 14,000 of which were in Hobart,[19] Launceston's Council supplied 8,000,[20], the Latrobe Hydro-Electric Company supplied 270, Mt. Lyell's Lake Margaret supplied 3-400 in Queenstown and Gormanston and Mt. Bischoff supplied about 100-150 in Waratah. Scottsdale Council supplied perhaps 150. Say 18% of these were non-residential customers. (The percentage of H.E.C. customers classed as residential stayed consistently at 82% from the 1970's back to 1948, the first time statistics are available), i.e. 30,500. In 1933 there were 54,905 dwellings in Tasmania.[21] Thus about 60% of dwellings in Tasmania had electricity connected in 1930.

On 21st November 1929, the Treasurer J.C. McPhee introduced a Bill to provide for a Commission to manage and control the state hydro-electric works, to vest certain waters of the State in the said Commission under certain conditions and to provide for the regulation and control of electrical installations.[22] There were three main constraints on the Commission. Firstly, the Public Works Committee Act 1914 was not to apply; but before any new work was constructed, a report had to be furnished to the Minister setting out as far as was possible; the nature of the works; their estimated cost; how much money was requested; the annual costs of repaying the loan, working and maintaining the works; the estimated revenue together with the reasons for proceeding with the recommendations. Second, no new hydro-electric works were to be constructed by the Commission unless and until the moneys therefore had been voted by Parliament. Existing water rights were retained. Third, the Commission could not sell electricity to any person for use at any places within

six miles of the City of Launceston except with the consent of the Launceston Council. The Hydro-Electric Department continued to exist and constituted the machinery for carrying out, under the Commission, the provisions of the Act.[23] This time the Bill passed both houses.

One of the first actions was the making of regulations for the licensing of Wiremen and Electrical Contractors. These came into force on 1st October 1930. By 31 July 1931, 133 licences had been issued to Contractors, seventeen to "A" Grade Wiremen, 237 to "A" Grade Provisional Wiremen, four to "B" Grade Wiremen and seventy-one to "B" Grade Provisional Wiremen.[24] The fact that only twenty-two had presented themselves for examination, with seven failing, implies that some kind of "provisional" system must have previously been in force and licenses granted to established wiremen etc. without examination. This assertation is reinforced by the statement in the H.E.C. 1931-2 Report that "the Electrical Wiring Rules have been revised and re-issued under the Commission Act for the State of Tasmania. This has done much to clarify the position in this regard."[25] It reads as if there was a generally recognised but unenforcible set of rules that had been drawn up and circulated by the H.E.D., without any real authority.

Throughout the 1930's the Commission worked hard to gain customers in three ways. Firstly, offers were made to the remaining municipalities still taking electricity in bulk and retailing it and gradually their electrical undertakings were acquired. The offer to take over the debt, operate and upgrade the distribution network, generally take on any existing employees and pay the Council 2 1/2% commission for receiving accounts must have been very attractive to a Council seeking to economise in the Depression.

First was Cygnet on 1st April 1934,[26] and Bothwell Oatlands and Campbelltown in 1935.[27] Cygnet brought in

492 customers in 1936,[30] Zeehan 187 in 1938[31] and Burnie about 2,000 in 1940.[32] By 1940 the only municipalities buying electricity in bulk from the H.E.C. and retailing it were Ross and Launceston.

Secondly, the H.E.C. extended its transline network significantly, in the process taking over two previously independent electrical undertakings and supplying electricity to several previously unreticulated municipalities. The Latrobe Hydro-Electricity Company was bought out and taken over on 1st April 1933, bringing 268 customers with it[31] and the Scottsdale Council's Electrical Undertaking in 1940, bringing about 170.[34]

The H.E.C. also built many miles of relatively cheap 22 KV transmission lines, forty-nine miles from Smithton and Stanley to Wynyard in 1930-31,[35] seventy-seven miles from near Longford Substation to St. Marys in 1931[36] and thirty miles from the Launceston Substation to Beauty Point in 1931-2.[37]

As a result of the above, plus the gradual extension of the distribution network the H.E.C. supplied 37,013 customers directly as of 30/6/1940 an increase of 23,000 in the twelve years since 1928. Most of this increase had come outside Hobart, where direct customers had increased from 492 in 1928 to 19,523 in 1940.[38]

Thirdly, the H.E.C. standardised and reduced prices. In 1929-30 tariffs in Hobart were 5d per unit for the first 1000 units used for lighting and 3d per unit thereafter; 1d per unit for heating and cooking; ½d a unit for hot water services and 2½d per unit for the first 120 units used for motive power and ½d per unit thereafter. Outside Hobart the H.E.C. sold power at varying prices, all, with the exception of continuous hot water, at least 40% more expensive than in the capital. The most expensive lighting was in Richmond, Penguin, Sorell and Kentish Municipalities, where it cost 9d per unit. Heating and cooking were 2d for the first fifty units and 1½d for the next fifty; motive power 2½d for the

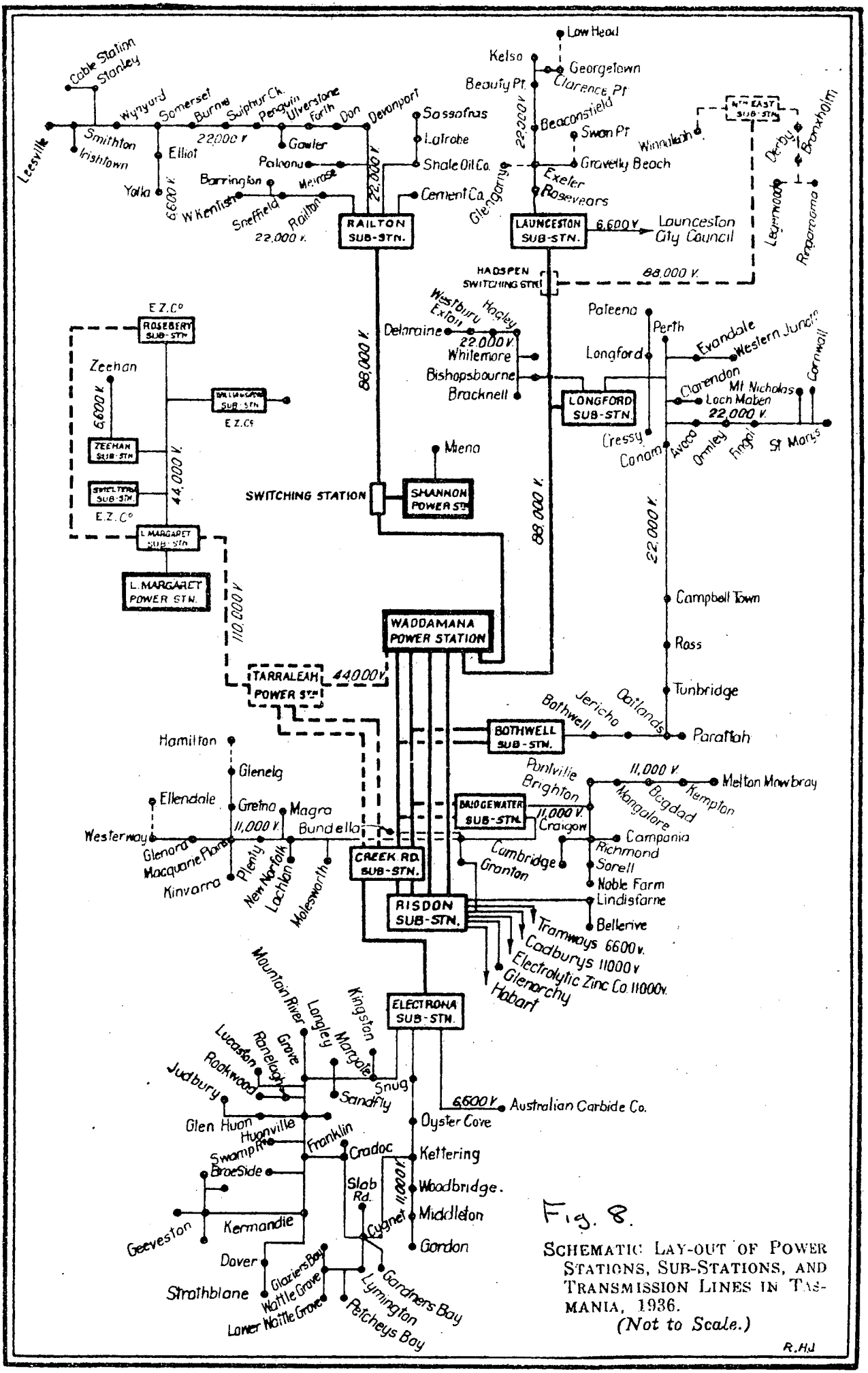


Fig. 8.

SCHEMATIC LAY-OUT OF POWER STATIONS, SUB-STATIONS, AND TRANSMISSION LINES IN TASMANIA, 1936.

(Not to Scale.)

R.H.J

first 120 units, 1d for the second and ½d thereafter.

Where the power was retailed by municipalities it was always more expensive than in Hobart, and usually more expensive than in H.E.C. retailed areas. The most expensive were the midlands municipalities of Ross, Oatlands and Campbelltown where the first eighty units for lighting cost 1/- each.(39) Launceston charged 6d per unit for lighting, falling after about 100 units per quarter to 3d, and 2d initially for power and heating,(40) i.e. it was more expensive than in Hobart.

The independent electrical undertakings varied enormously. Some were charged on a totally different basis, e.g. Gormanston charged 6d per month per 100 square feet of floor area plus ½d per unit consumed. Apart from Queenstown, which distributed power purchased from Mt. Lyell, they seem to have been more expensive than Hobart.(41)

To put these charges in perspective, in 1931 the basic wage, for a forty-four hour week, was £3/7/0.(42)

On 1st January 1934, the H.E.C. "Continuous Hot Water" rate was dropped 20% to .4d per unit.(43) Further reductions of up to 20% in motive power tariffs and up to 12½% on hot water and cooking tariffs were made on 1st June 1936,(44) and more on 1st March 1938.(45) In 1939 the lighting rate was standardised to 6½d per unit in all H.E.C. country areas except Burnie and Devonport, where it was 5½d unit. In December the Hobart lighting rate was reduced to 4½d per unit.(46) In 1941 tariffs were made uniform throughout these areas of the state supplied directly by the H.E.C.(47) Tariffs were reduced again in 1943.(49) Throughout most of Tasmania electricity cost half what it had cost fifteen years earlier.

By 1940 there were only five towns of any size that were not supplied directly by the H.E.C. Ross was retailing bulk H.E.C. power, Waratah was supplied by Mt.

Bischoff, Queenstown and Gormanston Councils were retailing power supplied by Mt. Lyell and Launceston Council was retailing electricity partially purchased in bulk from the H.E.C. and part generated by its Duck Reach Power Station.

The Ross electricity undertaking was transferred to the H.E.C. on 1st January 1942.(50) Waratah was still well away from any transline and seems to have been satisfied with its supply from Mt. Bischoff and largely ignored by the H.E.C. A 44 KV transline from Waddamana to Queenstown, via Tarraleah had been built by 1936,(51) but Queenstown and Gormanston residents were getting a better deal from their councils than the H.E.C. could offer, so neither side was inclined to upset it. Mt. Bischoff and Mt. Lyell were generating and supplying power under the Mining Act 1929. The Councils were buying and retailing power under the Local Government Act 1906, so it was all legal.

Launceston, however, was a different matter. It too had been affected by the surge in demand following the Great War and had reacted in two ways. The Duck Reach Power Station was optimised in 1921 by the addition of a new flume and 800 KW of generating capacity.(52) The Launceston Council also, in 1919, agreed to purchase bulk power from the H.E.D. and the Waddamana-Launceston transline was built.

This 1919 Agreement contains some revealing clauses that were the cause of dissension between the Launceston Council and the Department. Clause fourteen states that "The Corporation shall operate in such a way as not to cause dislocation of the Departments electrical system, shall maintain a phase balance to the satisfaction of the General Manager and shall cause obligations to rest upon such of its customers whose demand could have the effect of dislocating or unbalancing the said system." Clause fifteen required that "Except with the consent of the General Manager the

Corporation shall keep its existing hydro-electric plant in full service and shall continue to produce such electricity as the said hydro-electric plant is now capable of producing or after the date of these presents is made capable of producing ..."[53]

Now these clauses require that Duck Reach be operated as a "slave" station, synchronised to the transline and this was inevitable. But as late as 1925 the Launceston Council had installed no synchronising gear, nor was there any communication (i.e. telephone) between the H.E.D. sub station and Duck Reach Power Station. This surely reflects a significant lack of communication at the working level between the H.E.D. and the Launceston Council.

Clause four required that the supply "shall be 22 KV, 11 KV or 6.6 KV at the option of the Department ... and shall be available twenty-four hours a day every day of the contract period."[54] Now this was rather optimistic of the Department. They had built a fifty-eight mile single circuit transline across the snow country of the Central Plateau and should have known better.

During the 1920's the load built up in Launceston. Kelsall and Kemps Woollen Mills, Patons and Baldwins Spinning Mill, the Railway Workshops and Rapsons Tyre Company, together with 7029 lighting customers, 1182 electric motors, 2989 electric irons, 2095 electric radiators, 192 electric cookers, 220 hot water systems and 519 "sundries" (totalling 443 KW) boosted the peak load to 3952 KW on 25th June 1928. It had increased 1710 KW in the previous three years.[55] This was well beyond the capacity of Duck Reach and no doubt set the City Electrical Engineer thinking about Corin's 1906 third basin scheme.

On 20th September 1928 the City Electrical Engineer, R.J. Strike and the City Engineer submitted and recommended to the Launceston Council their "No. Seven" scheme. This came to be called the High Level Scheme. It consisted of

the following items:-

(1) "Dam at Third Basin to pond sixteen million cub. ft. Height fourteen feet above summer level. Crest length 426 feet. Abutment and slab type. To be designed for future raising to twenty feet, if found desirable for regulation purposes.

(2) Tunnel from Third Basin towards North-East. Length 7,350 feet. Designed to pass 600 cusec under dam head. To be concrete lined.

(3) Surge tank at tunnel exit. To take care of full load rejection without spill water.

(4) Two seventy-five inch Wood Stave Pipe Lines, one to be installed in first instance. Length, 3,600 feet. Staves of treated West Australian karri.

(5) Two surge tanks on hill about 2,000 feet from power house, one to be installed in first instance. To take care of full load rejection without spill water.

(6) Four fifty-four inch welded steel pipe lines, two to be installed in first instance. These lines pass under a private road and West Tamar Road and Tamar through concrete culverts.

(7) Power House between West Tamar Road and Tamar River. Length 150 feet, width sixty feet, height thirty-four feet.

(8) Tail race to Tamar River. Length 750 feet. To be designed to pass 750 cusec at high water.

(9) Power House equipment to consist of four units each of 4,500 E.H.P., switchgear and auxiliaries. Two complete units to be installed as first development. Subsequent additions as demand warrants.

(10) Transmission by two circuits to -

(11) Sub-Station at Cataract Quarry directly opposite Paterson Street."(56)

Preliminary designs had been worked out and estimates framed. They were:

"First Development 9,000 E.H.P.

Hydraulic works, including dam, tunnel, surge tanks, pipe lines, power house and rail race	199,000	
Electrical equipment, transmission and sub-station	56,000	
Interest during construction	23,000	
Engineering and supervision	10,000	£ 268,000
Second Development 18,000 E.H.P. (Future)		
Hydraulic Works	56,000	
Electrical equipment	49,000	
Interest during construction	5,000	
Engineering and supervision	3,000	£ 113,000
	Total	£ 401,000

This High Level Scheme was originally proposed as a "nine hour", i.e. working hours, scheme "but could be converted into a twenty-four hour load development by the provision of more storage at Arthurs and Woods Lakes."(58) In 1928 this was all quite feasible. Under the Launceston Water and Lighting Act 1894 the Corporation was empowered to take water at a point not exceeding five miles above the Cataract Bridge. This included the third Basin.

In 1929 the idea of Launceston undertaking a 300,000 high level scheme to develop first 9,000 HP and ultimately 18,000 HP from the South Esk had the strenuous opposition of the then Management of the Hydro-Electric Department and so hostile a reception in the House of Assembly that it had to be withdrawn.(59) Moreover the Council had some bad luck which possibly delayed any progress re the High Level Scheme for some years. The Rapson Tyre Company, which had looked like a big customer, stopped production, and the Duck Reach Power Station was wrecked by an unprecedented flood.

"The Government supply failed at 9.00 p.m. on Friday 5th April 1929 and was not resumed until 9.50 p.m. on Sunday

7th April, a total of nearly forty-nine hours, the period of total cessation being 46 hours 27 minutes, the Station at Duck Reach taking the load on 5th April from 9.00 p.m. to 11.23 p.m. when the flood waters swamped the building and the operating staff were compelled to evacuate the Power House.

On the subsidence of the flood, work on clearing up commenced. Fortunatley the turbines and generators although totally submerged, had not suffered material damage and reconditioning of No. one machine was commenced on 16th April; a temporary building was erected and switchboard erected and by 31st May this set was in commission. At the time of writing (21/1/1930) the other four sets have been reconditioned and a new switchboard in course of erection...

Tenders are being called for the erection of a new Power House in reinforced concrete... the work of reconditioning transformers motors and ... in the flooded areas of Inveresk and Invermay entailed considerable work ... and by 9th April it was possible to switch on the High Tension current in portion of the flooded area, then in gradual stages reconnect consumers and by the first week in May most of the industries affected were in normal operation."(60)

Although the Rapson Tyre Company continued production in fits and starts, by 1930 the Depression was in full swing. The Council, which had made handsome profits on its electricity undertaking in the years immediately before the flood, only made meagre profits in 1930-1935. The Depression would also have made it difficult for the Council to borrow the necessary £300,000 and in any case the Council had renegotiated its Agreement with the H.E.C. and was obtaining power at £5 per HP in a ten year Agreement that did not expire until 1940.(61)

The High Level Scheme was raised again in 1934, this time with a flood-diversion aspect included. By February 1935 the Launceston Council were "awaiting a favourable opportunity for the introduction into Parliament of a measure seeking authority to borrow £300,000 for the purchase of plant with which the Council could generate 9,000 horse power at

its own station."[62] The Launceston Council, the Launceston Chamber of Commerce and "The Examiner were very much in favour of the scheme, partially due to the estimate of the City Engineers that it would save about £25,000 when complete,[63] partially because it provides much-needed employment,[64] partially due to alleged unreliability of supply[65] and partially due for a desire for independence. The Duck Reach station could no longer supply Launcestons 8,938 customers when Waddamana power was not available. There also seemed to be considerable uneasiness in Launceston that the Councils Agreement with the H.E.C. for the supply of electricity expired on April 30th 1940 with no right of renewal.[66]

However, the H.E.C. Act 1929, was now in force and the then H.E.C. Commissioner was of the very emphatic opinion that all electric suppliers should be state undertakings and under one central authority.[67] As the Mercury editorial of 7th October 1935 put it, "In the ordinary course, such a proposal, provided that careful investigation showed that it was financially sound, would be authorised (by Parliament) without much question. But in this case a question of public policy is involved." It was a stand-off which eventually was resolved, for the moment, when the Bill that was to have authorised the borrowing was discreetly allowed to remain in abeyance, the H.E.C. agreed to duplicate the transline from Waddamana and both parties agreed to renegotiate the Agreement after 1940.[68]

This was renegotiated in 1938 and provided for a ten year contract for 8,000 HP at £5/5/- per HP per year. If the Council did not use the power, it still paid £42,000. The H.E.C. agreed to supply up to 10,000 HP if necessary at that price.[69] This implied that the Launceston Council was obliged to promote the sale of electricity.

However the matter would not die. There were probably three reasons.

The Government's policy was for uniform tariffs, the profits made from city electricity consumers going to subsidise country consumers. This was embodied in the Amendment to the H.E.C. Act passed in 1940.[70] Funnily enough, it is fairly clear from the tone of two quite separate paragraphs in the H.E.C.'s 1941-2 Report, that they did not favour uniform tariffs.[71] The Launceston Council's practice was to make a profit on electricity sales, particularly those to customers in adjacent municipalities and to use these profits to subsidise its trams and to keep the general rates low.[72] Thus the Government policy and the Council's practice were opposed to each other.

Second was the attractions of the South Esk High Level Scheme. For Launceston it meant profit, employment and independence. The H.E.C. by this time must have been thinking in statewide terms. They had not yet reached the situation when the whole generation and transmission system must be operated as a controlled network, but it would have been clear to any well read electrical engineer that it was inevitable.

Thirdly, a large prize had appeared; the aluminium industry. In 1938 the then H.E.C. Commissioner W. McLean had visited Aluminium refineries in Canada and Scotland,[73] and Sir Colin Fraser, the Chairman of E.Z. announced that the British Aluminium Company (33 1/3%), the Aluminium Co. of Canada (33 1/3%) and E.Z. (20%) had put together a 1M consortium to "undertake the production of ingot aluminium and the rolling and extruding of aluminium and its strong alloys."[74] This was to be in Sydney, but everybody knew that much electric power would be necessary and that Tasmania could provide this cheaply. In early 1939 the Federal Minister for Development, R.G. Casey had instructed the C.S.I.R.O. to develop electrolytic techniques, using West Coast ore to produce Aluminium and Magnesium for defense purposes.[75]

Although negotiations between the H.E.C. and the Launceston Council went on between 1938-1941 nothing much

came of them and in November 1942 the Government stepped in with The Local Authorities Lighting Bill 1942. This amended the Local Authorities Lighting Act 1930 and required the compulsory acquisition of the Launceston Council's electrical undertaking, set a mandatory timetable and provided that Arbitrators be appointed to determine a "fair and reasonable" price to be paid to the Council",(76) if necessary. This passed in the House of Assembly but there was spirited opposition in committee in the Legislative Council. An amendment "that the undertaking be not acquired until the electrical contract expired" (1950), being defeated only on the casting vote of the chairman.(77) In the end arbitration was necessary, as the Council's and the Commission's valuations differed by over ≠ 400,000 and were based on different assumptions.(78)

On 1st July 1944 the Commission acquired the electrical undertaking of the Launceston City Council(79) and, as part of the agreement, employed those working in the City Electrical Engineers Department. That shaped the organisation for the next thirty years.

By 1946 Mt. Lyell's electricity needs were beyond the capacity of their Lake Margaret Power Station and they obtained extra power from the H.E.C.(80) Probably as a result of this the Queenstown Council requested the H.E.C. to take over its electrical undertaking and this was effected on 1st January 1948.(81) Gormanston was taken over at the same time.

Oddly enough the last Municipality to be independently supplied with electricity was Waratah, where the first private house and the first public building in Tasmania had been lit by electricity in 1883. Throughout World War Two the production of tin at Mt. Bischoff had continued under the control of the Commonwealth Department of Supply for defense purposes. In 1951 they passed control of the Town's Distribution to the H.E.C. and the Commission bought the old Mine Managers house, the first house to be

lit by electricity in Tasmania, for temporary use as a depot and store.(82)

The organisation of public electricity supply in Tasmania was now integrated into one entity, the Hydro-Electric Commission. In 1930 it had directly served 23,000 customers, by 1952 it served 87,519.(83)

1. H.E.D. Report 1916-17, p.28.
2. Ibid, p.29-30.
3. H.E.D. Report 1917-18, p.1.
4. H.E.D. Report 1920-1, p.11.
5. Rowland, op. cit., p.72.
6. Allbut, op. cit., p.42.
7. Examiner, 23/9/1925.
8. H.E.D. Report 1924-5, p.7.
9. Mercury, 30/9/1925.
10. Green, op. cit., p.45.
11. Mercury, 26/11/1925.
12. H.E.D. Report 1927-8, p.1.
13. Local Authorities Lighting Act 1928.
14. H.E.D. Report 1927-8, p.1.
15. Examiner, 26/9/1925.
16. Ward R., op. cit., p.163.
17. Younger, op. cit., p.525.
18. H.E.D. Report 1928-9, p.1.
19. H.E.C. Report 1929-30, p.19.
20. Mayors Valedictory Address (City Electrical Engineers Report) 1929-30.
21. Tasmanian Year Book 1984, p.542.
22. Mercury, 21/11/1929.
23. The Hydro-Electric Commission Act 1929. Tasmanian Acts of Parliament 1929-30, p.919.
24. H.E.C. Report 1930-1, p.17.
25. H.E.C. Report 1931-2, p.17.
26. H.E.C. Report 1932-3, pp 10 and 13.
27. H.E.C. Report 1934-5, p.15.
28. H.E.C. Report 1933-4, p.15.

29. H.E.C. Report 1934-5.

30. H.E.C. Report 1936-7, p.12.

31. H.E.C. Report 1937-8, p.9.

32. H.E.C. Report 1939-40, p.7.

33. H.E.C. Report 1933-4, p.12.

34. H.E.C. Report 1939-40, p.7.

35. H.E.C. Report 1930-1, p.15.

36. H.E.C. Report 1931-2, p.8.

37. Ibid, p.9.

38. H.E.D. Report 1927-8 and H.E.C. Report 1939-40.

39. H.E.C. Report 1929-30, pp 32-3.

40. Letter Launceston Council to Siemens 6/4/1927, QVM Archives.

41. H.E.C. Report 1929-30, p.33.

42. Ward, op. cit., p.188.

43. H.E.C. Report 1933-4, p.27.

44. H.E.C. Report 1935-6, p.16.

45. H.E.C. Report 1937-8, p.4.

46. H.E.C. Report 1939-40, pp 3-4.

47. H.E.C. Report 1941-2, p.7.

48. Ibid, p.8.

49. H.E.C. Report 1942-3, p.4.

50. H.E.C. Report 1941-2, p.7.

51. H.E.C. Report 1935-6, p.12.

52. Kozakiewicz, Duck Reach, op. cit., p.108.

53. Agreement between the Tasmanian Government, Hydro-Electric Department and the Mayor, Aldermen and Citizens of the City of Launceston for a supply of electrical energy, 1918.

54. Ibid.

55. Launceston City Electrical Engineers Report 1927-8.

56. Strike & Basille Report on 1928, op. cit., QVM Archives, pp 8-9.

57. Ibid, p.10.

58. Ibid, p.11.

59. Examiner 18 April 1934.

60. Launceston Electrical Engineers Report 1928-9, in Mayors Valedictory Address, p.56.

61. Examiner 28/5/1935.

62 Examiner 24/1/1935.

63. Examiner 19/9/1935.

64. Examiner 19/5/1935.

65. Mercury 7/10/1935.

66. Examiner 19/9/1935.

67. Mercury 7/10/1935.

68. Examiner 28/2/1936.

69. Examiner 19/5/1938.

70. H.E.C. Act 1940 (5 Geo VI No. 8).

71. H.E.C. Report 1941-2, pp 1 and 7.

72. Mayors Valedictory Address 1943-4, Electricity Supply Comparative Report.

73. Mercury 16/5/1938.

74. Mercury 28/10/1938.

75. Examiner 9/2/1939.

76. Parliamentary Paper No. 37 of 1943. Report of Joint Committee.

77. Advocate 16/4/1943.

78. Examiner 15/2/1944.

79. H.E.C. Report 1944-5, p.5.

80. Lake Margaret op. cit., p.16.

81. H.E.C. Report 1947-8, p.9.

82. Advocate 10/12/1951.

83. H.E.C. Report 1952-3, p.7.

POWER DEVELOPMENT: 1945-1975

The policy of using cheap hydro-electric power as a vehicle for state development was spelt out as early as 1916 by that clear sighted man of vision, John Henry Butters. In his second report he wrote: "It has frequently been stated that the advent of hydro-electric power would be the means of inducing the influx of manufacturing industries to the State, and it has been suggested that power could be sold with greater benefit to small industries than to large metallurgical industries. The position, however, is quite contrary. The industries which will be likely to establish themselves in Tasmania are ones whose electric power costs represent a large proportion of their total annual costs, and which require a very large amount of electrical energy, which makes the power costs the most important factor of their operations. The only industries of such a nature are electro-chemical and electro-metallurgical industries, all of which require very large blocks of power. This may be emphasised when it is noted that the whole of the requirements of the City of Hobart and its suburbs at the present moment amounts to less than 2000 horsepower, whilst one contract alone for an electro-metallurgical industry will require 30,000 horse-power. These electro-chemical and metallurgical industries (that is, primary industries) will be the first fruits of the hydro-electric investment, and they, in their turn, will induce a large growth in existing secondary industries, and also the establishment of additional secondary industries, and so on. These secondary industries, however will neither require nor expect electric energy at prices very much below what can be obtained on the mainland; in fact, it may be stated that there are very few such secondary industries whose principal market is outside Tasmania which would come here even if power were supplied free, as the extra shipping and marketing charges would more than outweigh this concession. The prosperity of the State, therefore, cleary depends upon our being able to induce large primary industries to establish themselves here, and this being achieved consequent results will follow."(1)

Within ten years the state had two such industries, E.Z. and H.E.P.M. Co. (now Electrona Carbide) which together bought more than 90% of the power sold[2] in 1925.

The 1930's were bad years for establishing industry of any kind, but some new industries did start in Tasmania. They came for climatalogical reasons like Cadburys and the Woollen Mills in Launceston or because the natural resources were here, like Australian Newsprint Mills at Geeveston or Goliath Cement at Railton.

Similarly the power station construction program was fairly low key. Shannon was built in two stages, the civil engineering aspects by contract in the middle 1920's and the electrical aspects by the H.E.C. in the early 1930's. Tarraleah was partially a job-creation scheme that came about when Ogilvie's Labour government won the 1934 State election. An additional hydro-scheme was one of the main election issues and was approved by parliament in a record time of seven weeks. This was the last of the older type schemes with little mechanical plant, most of the work being done with pick and shovel. Although at times in 1935 there were more than 1000 men employed in the Tarraleah area, there were only eight cars and twenty-seven trucks.[3]

As World War Two approached however, Australia began to realise just how vulnerable it was and started to think about what it would need and how it would manufacture what might no longer be available from Europe. One industry fitted Butters definition; aluminium refining. The Cosgrove government lobbied hard in Canberra. Tasmania had the electric power and there was 2,000,000 tons of bauxite deposits at Ouse.[4] In September 1943 the Prime Minister John Curtin announced that the Commonwealth would set up an Aluminium industry in Australia and that the choice to locate the smelter in Tasmania was influenced by the availability of cheap power.[5]

On 18th April 1944 the Acting Minister for Supply and Shipping Dr. Evatt, on behalf of the Commonwealth and the Tasmanian Premier Mr. Cosgrove signed an agreement for the establishment of an aluminium ingot industry in Tasmania. A press statement was issued, stating, "It is intended that Tasmania shall contribute £ for £ with the Commonwealth towards the capital cost of establishing the industry. Provision will be made by the Commonwealth to the extent of the £1,500,000 and by Tasmania to the extent of £1,500,000. This presupposes that the estimated capital cost of establishing the industry will be £3,000,000.

"There has been a limited amount of Australian production of aluminium articles from imported aluminium ingot. Private enterprise erected one factory for rolling sheets, but the Government greatly expanded the capacity and created a forging plant. Unfortunately, however, there has been no production of the vital metal, and the agreement is the first step to remedy that deficiency.

"The production of aluminium calls for the use of much electric power and a sufficient supply of the necessary raw materials, of which the most important is alumina, which in its turn, is obtained from alumina-bearing materials, the chief of which in general use today is bauxite. The cost of production depends in the main on the cost of power and the cost of these raw materials. The great commercial plants of the world are naturally located where power is cheapest. The great national plants had to be created at existing hydro-electric power works or extensions of them, and, as in the case of North America, new power centres were established to meet the demands of the Governments.

"Roughly, it takes 40,000 hp to handle all the requirements of a 10,000 ton aluminium metal plant. This means that cheap power is essential, and the cheapest power is usually the result of hydro-electric schemes. The world's output of the metal today is using about 12,000,000 hp.

"In cases of extreme urgency power from coal has been utilised to produce the metal, notably in Britain, but

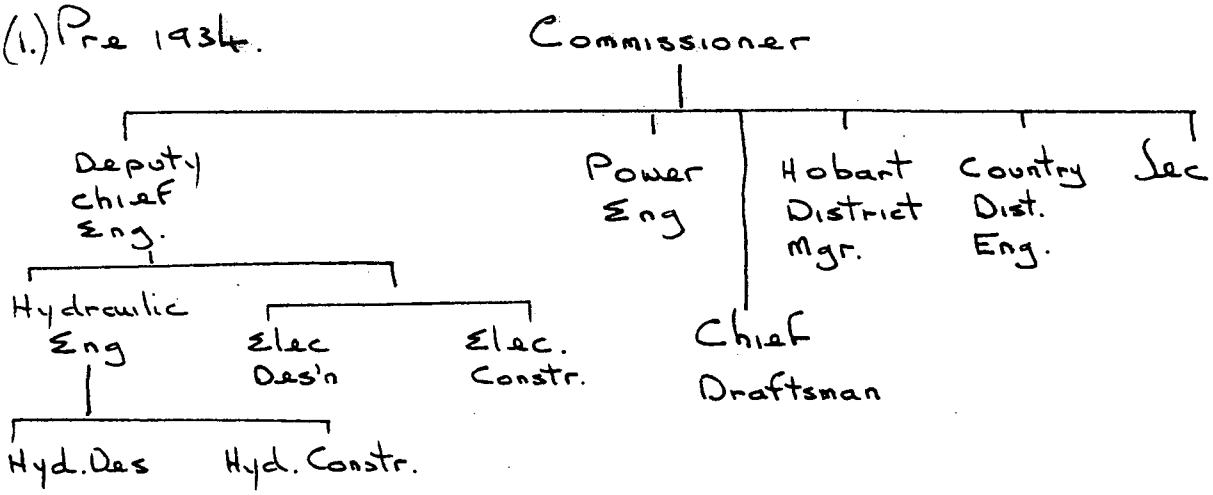
most of the coal power plants have been closed, as coal today probably is the scarcest of all minerals.

"Australia's hydro-electric power developments, have, so far, been only small compared with those of some other countries. Our resources in this direction are not vast, but we hope to see more than 1,000,000 hp developed in Australia from this source. The Commonwealth Government has had advice from officers of the great enterprises. That advice has been to establish the first aluminium smelting works in Tasmania, where an excellent start already has been made by the establishment of important metallurgical industries. Fortunately for our scheme the existing enterprise of the Tasmanian Government will enable the necessary hydro-electric power to be supplied. This provides an excellent foundation for Australia's first plant."(6)

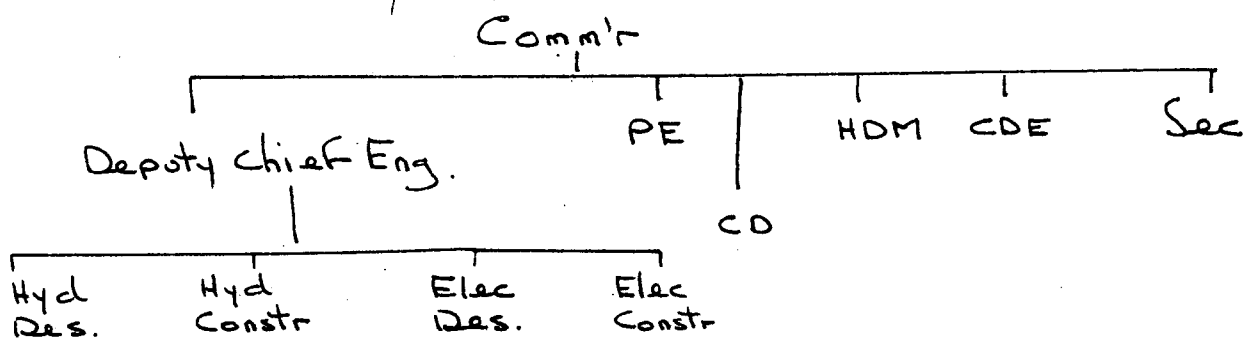
World War Two affected Australia much more than the Great War in many ways. In the 1940's Australia was still a sparsely populated continent largely without industry and vulnerable for those two reasons. These unpleasant facts were brought home to most Australians by things like the "Brisbane Line", petrol rationing, and the virtual cessation of any projects not connected with the war effort due to lack of manpower.

By late 1942 however, events like the re-taking of Kokoda, the relief of El Alamien and the Russian victory at Stalingrad had shown that, however long and hard the road, the war could only end in victory for the Allies.(7) It was also clear that many sophisticated commodities, previously imported, could be made successfully in Australia. The basic steel and chemical industries had been established before the war, but during World War Two secondary industry reached the "take-off" point, ship-building, munitions, including anti-aircraft and anti-tank guns, armoured cars and torpedoes, even motor vehicle and aircraft engines were made, and made successfully in Australia. Before World War Two only three companies in Australia produced machine tools. In 1943

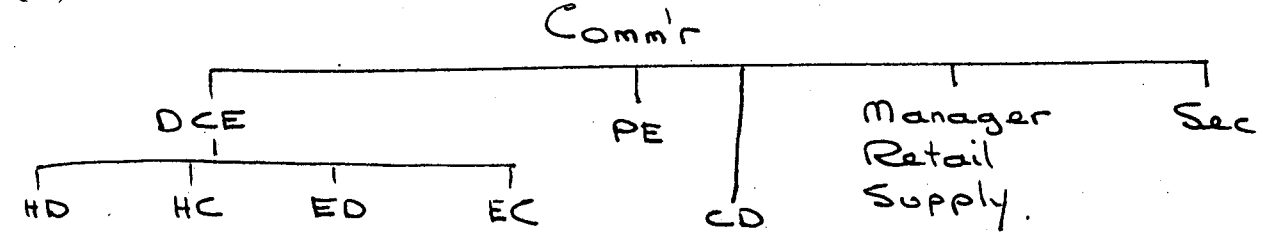
(1.) Pre 1934.



(2) After Oct 1934 / May 1935.



(3) 1940.



(4) 1942.

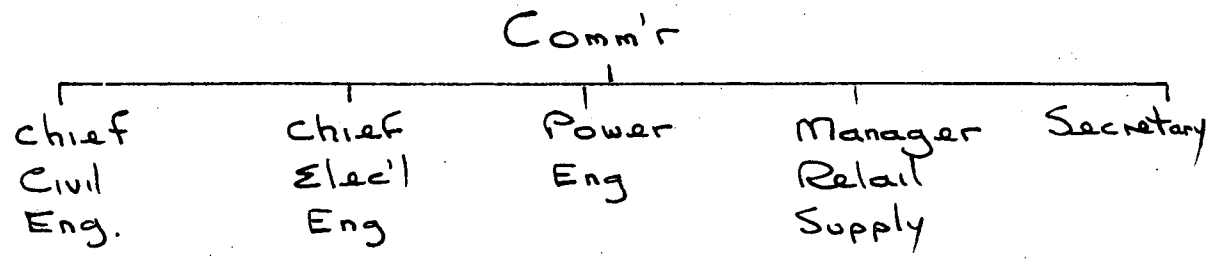


Fig 9. The evolution of the HEC five branch Structure 1934-42.

there were more than a hundred producing all kinds of lathes, drills, precision grinders and presses. Radio and telegraphic instruments were made in Australia, often for the first time.(8) In Tasmania precise optics were successfully manufactured.

It was clear that after the war many new industries could and should be started. Fortunately for Australia and Tasmania, both had governments that believed in planning national and state development rather than just leaving it to private enterprise. Since 1943 Chifley had been responsible for the Department of Post-War Reconstruction and in 1945 this was amalgamated with the Department of War Organisation of Industry and Redman, another of the Curtin governments ablest ministers, took it over. Tasmania was governed by the Cosgrove Labour government. Cosgrove's prime objective particularly in his early years of office, was to consolidate the initiatives started by Ogilvie. These included making the H.E.C. and the Public Works Department major vehicles of state development.(9)

Although little could be done during the war years themselves due to lack of labour and materials, the foundations could be laid for a massive post-war program of power development to provide for the aluminium and other industries that were seen to be necessary; and these foundations had to be laid. In the late 1930's there was considerable dissension within the Commission itself and amongst senior engineers on the civil and electrical engineering staff. Disagreements with the State Audit Department, allegations of conflicts of interest, personality clashes, administrative irregularities and engineering incompetence all led to the Government setting up a Board of Inquiry on the Hydro-Electric Commission in late 1940.(10)

Following its Report, which was presented in March 1941, one Associate Commissioner resigned,(11) a very senior engineer and another senior engineer were dismissed,(12) and the civil and electrical engineering design and construction

staff reorganised. Electrical Design, Electrical Construction and Drafting "Branches" were amalgamated to form Electrical Engineering Branch and Hydraulic Design and Hydraulic Construction combined to form Civil Engineering Branch.

In 1943 the H.E.C. ceased reporting to the Minister for Lands and Works and began a long period of reporting to the Premier in his role as 'Minister administering the H.E.C. Act.' The first such was Cosgrove himself. This continued for over 30 years. On 14th December 1944 Parliament enacted the H.E.C. Act 1944. This was substantially the same as the 1929 Act but did not contain the water rights clauses. It did however change wayleave easement compensation, the financing of distribution system extensions and the control by the H.E.C. of the establishment and extension of hydro-electric power stations.(13)

It was becoming clear that there was a great deal of work ahead, work that would continue over many years and would need an especially able man to do it well. There was such a man in Tasmania; Allan Knight. He had been born in Launceston in 1910, and was a product of the state school system, being educated at various primary and secondary schools to matriculation level. He initially worked as a school teacher and gained a Diploma of Applied Science at Hobart Technical College. He then attended the University of Tasmania, gaining the B.Sc, B.Comm. and M.Eng.

From 1932 to 1946 he worked for the Public Works Department, while there he invented the composite beam system of bridge construction now in use world-wide. He designed and supervised the construction of the Ulverstone, Scamander and Bridgewater bridges and in 1937 designed the floating arch bridge that first spanned the Derwent. In 1934 he was awarded the Institution of Engineers prestigious Warren Memorial Prize and in 1936 became Chief Engineer at the P.W.D.

This was one of Ogilvies main vehicles of state infrastructure development in 1934 and this was a big job. He was twenty-six.

Not only was he an outstanding engineer, he was a good sportsman as well. Allan Knight represented the University at rowing and Tasmania at tennis, being state tennis champion 1930-33.(14)

In 1946 William McLean was sixty-one and had served thirteen years as Commissioner, most of it with a much smaller H.E.C. that had a different emphasis. Allan Knight was thirty-six, Tasmanian, an engineer of world class with a commerce background as well.

He became Commissioner and lasted for thirty-one years. It is almost as if Cosgrove had a corporate plan for the H.E.C. after 1940. The construction branches were re-organised, top engineers recruited, the instructions were updated, the H.E.C. Act changed and the organisation taken directly under his own oversight. Then, when the opportunity came, a proven vigorous Chief Executive was appointed who was young enough to stay in the job for thirty years and had the local roots that would incline him to stay.

It worked. As Doug Lowe says in his Price of Power "By 1955 the H.E.C. was working with a sense of purpose that was the envy of most government departments. The mastery of Allan Knight at the helm as Commissioner was obvious and the Commissions general administrative and fiscal practices, following the Select Committee Report of 1951, were constantly being scrutinized to give greater efficiency and purpose."(15)

Over the next thirty years nine "Power Developments" were constructed, Tarraleah, Tungatinah, Liapootah, Wayatinah and Cataguyna in the Upper Derwent area; Lower Derwent consisting of three dams and associated power stations; Great Lake; Trevallyn; Mersey-Forth, consisting of seven dams and associated power stations and the Gordon River Power Development. The construction workforce, which had been about

500 in 1946, rose to 1500 at the end of 1948 and over 3000 in 1954. It seldom dropped below 2000 for the next twenty years. Twenty-two power stations were augmented or commissioned with a total installed capacity of 1400 MW. Units sold increased about ten-fold.

The organisational effects of such a large and prolonged construction program would always be large but they were enhanced by several factors that were not present before World War Two. Pre-war power developments had usually consisted of a low dam, a fairly level canal, then a woodstove or steel penstock down a steep hillside to a power station at the bottom of a valley. Post-war power developments were generally a lot bigger, involved much higher dams, much tunnelling and shaft sinking; the power stations often underground or at the foot of the dam.

Contrast the first post-war power development at Butlers Gorge with the biggest of the pre-war developments; the Multiple Arch Dam at Miena. Clark Dam was 200 ft high, Miena forty ft high. Clark Dam consumed over 200,000[16] cubic yards of concrete, Miena perhaps 15,000. Trevallyn involved a 3.2 km tunnell, Poatina a shaft, an underground power station and a head twice as high as anything pre-war.

Bigger dams, tunnels and shafts and higher heads all tended to require greater expertise to measure the preconditions and design the structures and components: this meant specialists. It meant specialist surveyors, drillers and geologists to find out if the dam or tunnel or underground chamber was feasible, or to find the data that enabled the most economical design to be used. It meant other specialists to design the component pieces for each power development. Dams, penstocks, gates and valves, structures; all posed difficult problems and the problems went on and on due to the flow of power developments.

The difficulties demanded specialists and the continuity made it worthwhile to employ, train and develop them rather than engage consultants.

Bass Strait was probably a factor. There were few, if any, Tasmanian companies able or willing to contract in the ten years after the war. Few mainland firms seemed willing to come to Tasmania either. The H.E.C. developed, or was perhaps forced to develop, self reliance. Twice contractors were used. Once was the use of a specialist French tunnelling company C.I.T.R.A. for the Trevallyn tunnel and here the H.E.C. people watched, learnt and tunnelled themselves thereafter. The other was the use of Pearson Bridge to sink the intake shaft of Strathgordon. In this case the H.E.C. was flat out elsewhere and contracted the job to gain the resources.

Pre-war developments were largely pick and shovel jobs, partially because Tarraleah was initiated as an unemployment relief scheme, but also because there wasn't much earth moving equipment available. The war changed all that. After the war labor was scarce and construction plant had been developed, largely in the U.S.A. In 1946-7 some war disposals construction equipment, mainly earth moving plant was bought "from the Commonwealth Disposals Commission at very favourable prices."(17) Air compressors, excavators, scoops, rollers, crushers, tractors and motor trucks in "substantial quantity" were purchased the following year, but "lack of adequate supplies of spare parts to maintain tractors ... caused delay and unnecessary expense."(18) In 1949-50 "twenty-one tractors, seventeen excavators, eight heavy diesel engined trucks, nine dumpers and seven rock buggies" were received and put into service. It had been necessary to obtain a special allocation of $US to the value of £212,000 to purchase heavy tractors in America.(19)

This plant required maintenance. Spare parts were very difficult to come by but it could be repaired and reconditioned. This required a quite massive expansion in workshop facilities. Civil Engineering Branch were the main

users and a Plant maintenance and operation group emerged in their Construction Division. Specialists construction plant workshops were set up in Hobart initially at Moonah. Soon however the space demands of two expanding workshops outgrew the site and the Plant Workshops moved to Glenorchy.

Another result of the scarcity of labor was the emergence of a specialist Personnel function. There were other reasons as well. There had been considerable industrial trouble over "aliens" in 1943,(20) the Allied Works Council, a bi-partisan Federal manpower allocation body, had managed Butlers Gorge in 1944, offering rather better rates of pay and standards than the H.E.C. had felt obliged to offer.(21)

Labor was scarce and appeared to have a preference for work near the towns and cities.(22) Probably also most remembered the tents, the snow, the "dry" camps and the almost total lack of facilities at Tarraleah pre-war. There no married quarters were provided officially, although a small number of selected key men were provided with 100 palings and a blind eye turned on the building of dwellings in the No. Two camp area, commonly known as Tickleberry Flats. There, ten families shared a communal wash house with a wood fired copper and the drinking and washing water, though pure enough, was brown.(23) Not memories to tempt workers back or stories to encourage people to work for the H.E.C. immediately after the war. The Commission let a contract for 100 demountable houses in 1947,(24) started to upgrade its amenities, upgraded the school, inaugurated a "wet" canteen(25) recruited over 2000 British and Polish migrants and started to go its own way regarding salaries and wages.(26)

This all fostered the growth of a specialist Personnel function. Initially subordinate to the Legal Officer in 1942,(27) the Industrial Officer was a Section head in March 1949, the "Staff and Industrial Officer" by April 1949 and the Personnel Superintendent in 1953. No doubt this expansion of the Personnel function was not hindered by the appointment of W.H. Nicol, a prominent A.W.U. official

as an Associate Commissioner, from 1st July, 1947.[28]

There were similar effects in other service departments. Power Branch had maintained a small workshop from very early days. There had always been maintenance to be done on generation machinery, transline towers and transformers. In the post-war years it was very difficult to get materials, but it apparently was easier to get materials and make and repair components yourself than it was to get others to build them for you. Besides at that time the H.E.C. was the only authority operating hydro power stations so there was no-one else in Australia with any expertise in that line anyway. Nor was there much really heavy engineering repair capacity in Tasmania.

In 1948-9 the Workshops Superintendent visited N.Z. to look at the manufacturing of transline towers,[29] and in 1949-50 orders were placed in England for steel framed buildings for a big workshop at Moonah.[30] By 1953-4 these workshops were fabricating over 1000 tons of steel a year, mainly galvanised transline towers but also including very large and complicated fabrications such as sections of thirteen feet six inches diameter, one inch thick high pressure steel pipe, radial gates and power station gantry cranes.[31] A considerable amount of machining work and transformer repair was also carried out. Despite doing most of its work for Civil Engineering Branch, the workshops remained in Power Branch where they had originated.

A similar story can be told regarding Motor Transport Section. Prior to World War Two the H.E.C. did have motor vehicles, but not many. There were "light trucks" in the Country Districts Depots, some lorries at Tarraleah and a few cars in Head Office. Motor vehicles were not common in Tasmania at all, there being only 5,235 commercial vehicles (vans, trucks and utilities) and 17,598 cars and station wagons in the whole state in 1940.[30] Most of the vehicles

the H.E.C. did possess although used in Country Districts, were operated in and around townships over fair roads. There was a garage in Head Office but it seems to have been only a small operation.

The war and the massive continuing construction program changed all that. The small garage expanded, moved, initially to Elwick Racecourse and then to Derwent Park. It too maintained and repaired vehicles and built special bodies. Although Motor Transport Section, as it came to be known, eventually took over the purchase and maintenance of the H.E.C.'s whole road-vehicle fleet except heavy construction vehicles it remained in its organisational niche, in Secretarial Branch.

There were also organisational effects of the power development program in the generation and transmission organisation; Power Branch. In the middle 1950's the generation and transmission system changed from essentially a central power station with discrete translines radiating from it, each carrying a load, to a network. Each link of this network requires adjusting so that the voltage and phase angle at each node is balanced. The network is not stable and self-balancing. As early as 1946-7 it had become necessary to give greater attention to the method of system protection.(31) Ten years later the H.E.C. reports are mentioning the power network(32) and two years later "a wide variety of investigations ... of transmission line networks" were being carried out.(33) These led to the establishment to a System Contral Centre being established in Power Branch to manage the system as a whole.

1971 was perhaps the crest of the power development program. Three large power developments were being constructed simultaneously; Mersey-Forth, Gordon Stage 1 and Pieman River. Staff numbers were at their peak in both Civil and Electrical Branches. Wages employees had reached their peak a little earlier, in 1968. There had been slightly higher numbers in 1952 but the level of mechanisation was less then.

A study of the formal organisations at 1942 and 1972 is revealing. The complexity is nearly representative of staff numbers; 186 on "salary" in 1942, 2028 "staff" in 1972. The five branch Commission structure has not changed, nor has the simplistic split of responsibilities. What has changed is the depth of specialisation, the intensity of work and its technical complexity.

One type of work seems to have gone the other way in status terms; drafting. Right through the 1920's the Drafting "Section" is not attached to any Branch. The Leading Draftsmen is highly paid, not quite as much as senior engineers, but comparable. In the 1930's there is reference to a Chief Draftsman. In 1942 the Drafting "Branch" was amalgamated with Electrical Designs and Electrical Construction to form Electrical Engineering Branch. By 1972 there are separate drawing offices attached to three sections in Civil Design, another in Design and Construction Division in Electrical Branch and another small one in Power Branch Workshops. The drafting function has fragmented and lost its status.

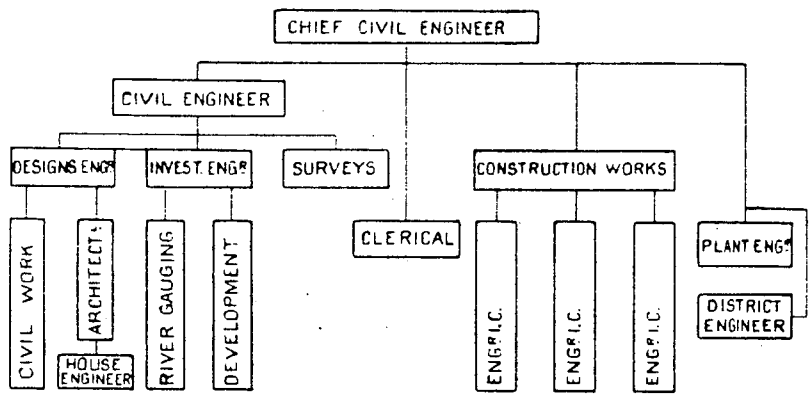


Fig 10. Civil Engineering Branch Organisation Chart 1942.

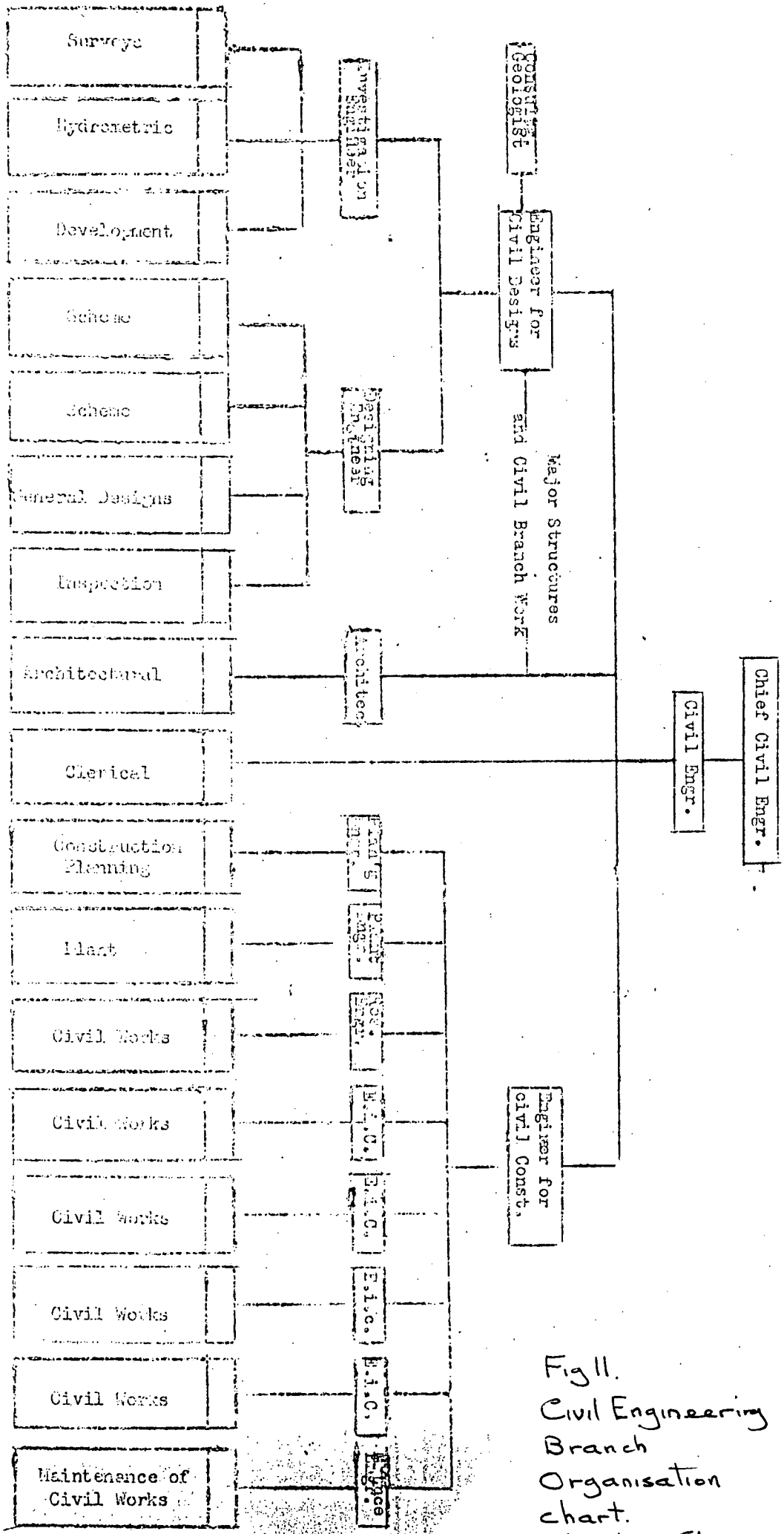
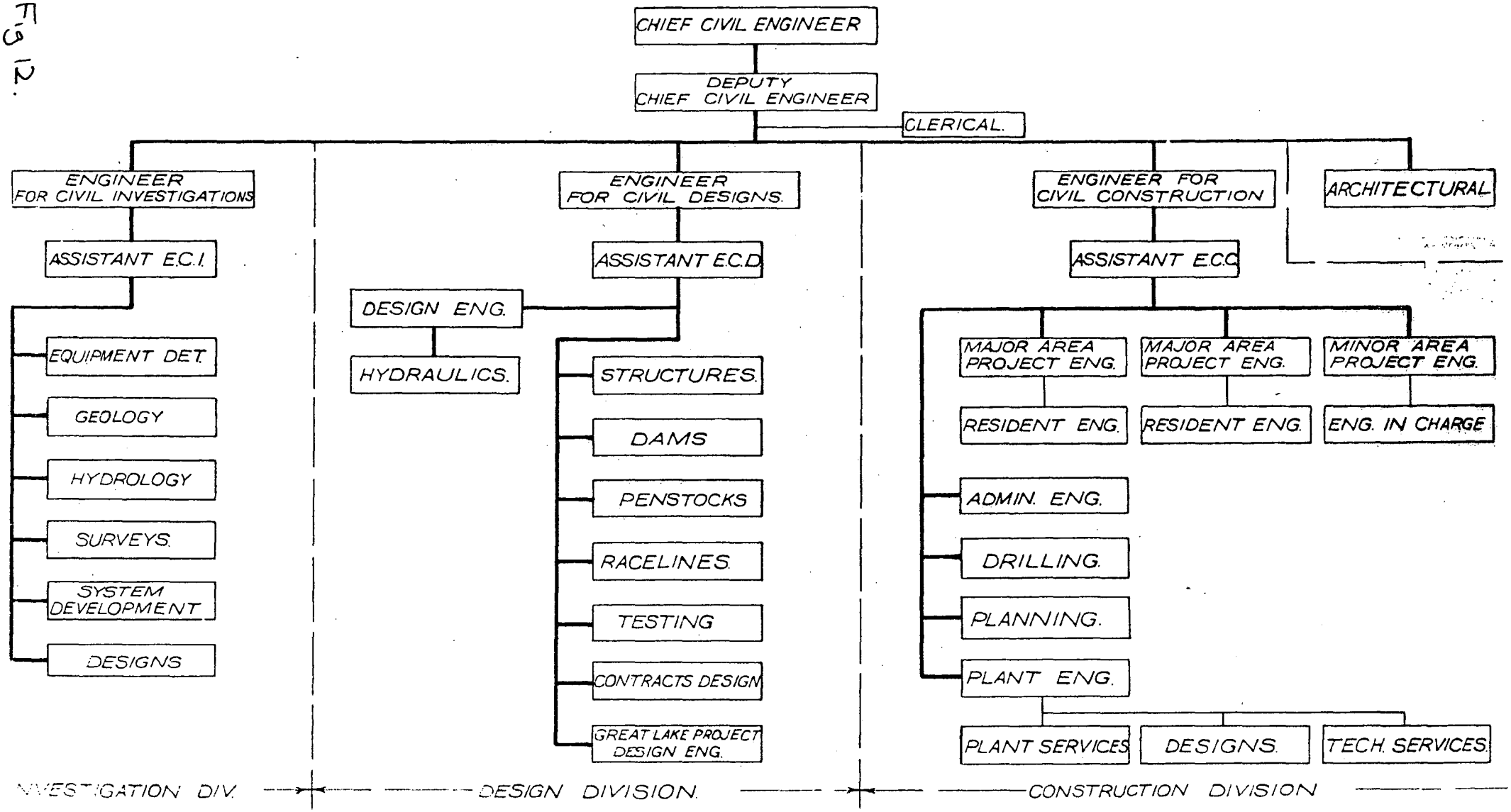


Fig 11.
Civil Engineering Branch Organisation chart.
About 1951.

Fig 12.
Civil Engineering Branch Organisation Chart 1967.



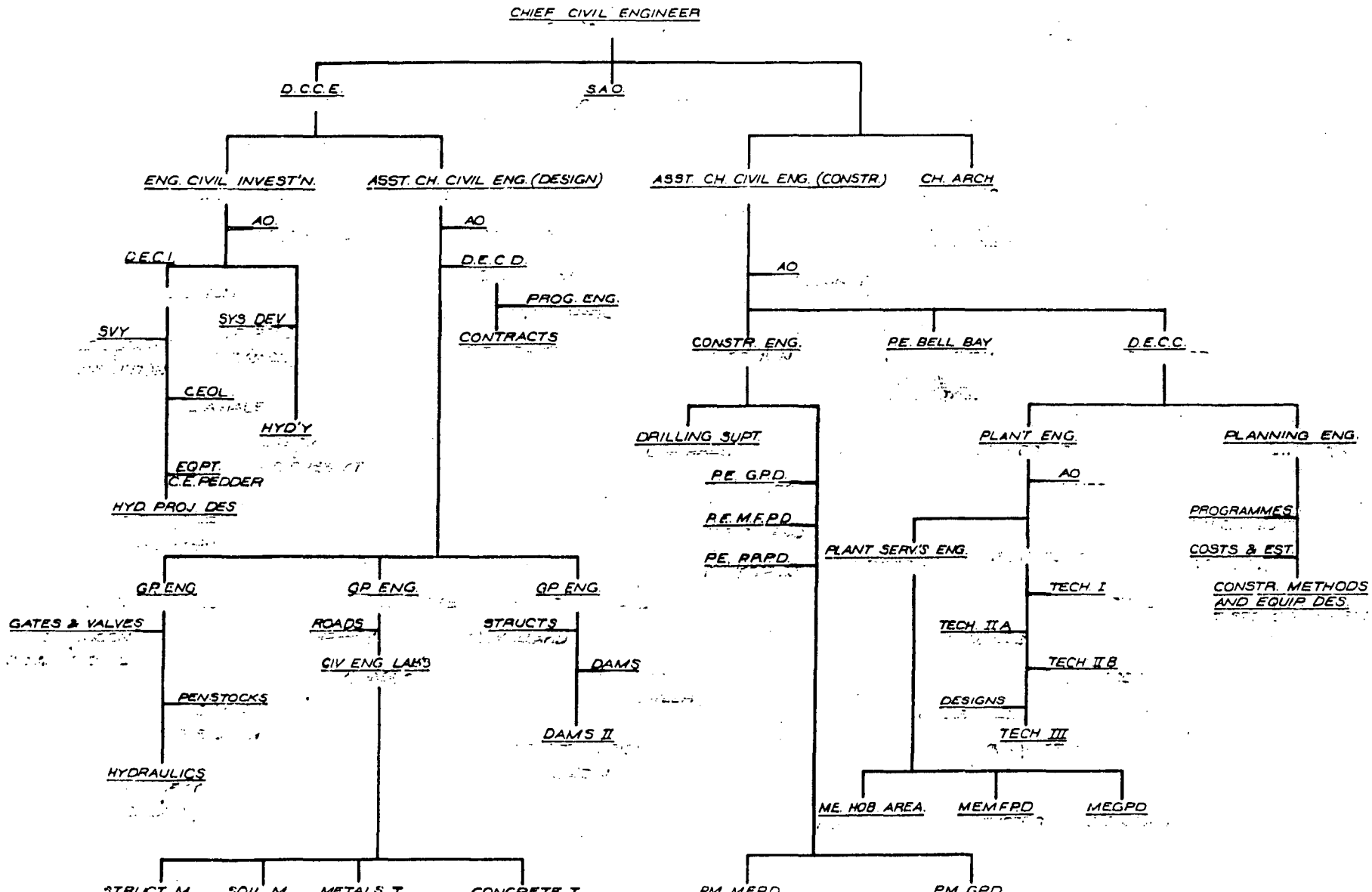


Fig 13. Civil Engineering Branch Organisation chart 1972.

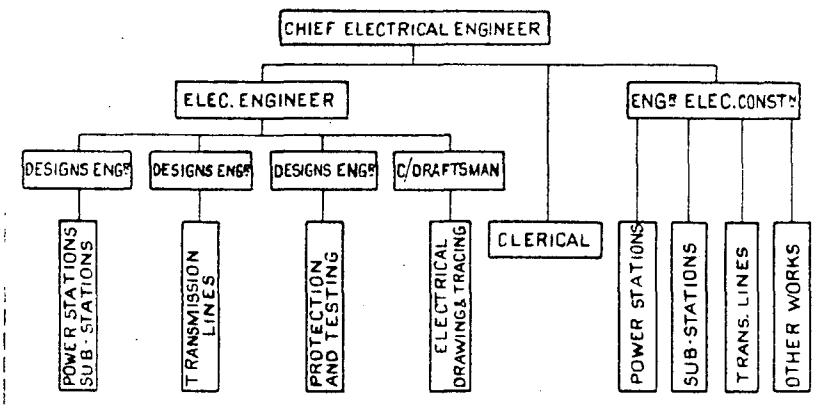


Fig. 14. Electrical Engineering Branch Organisation Chart. 1942.

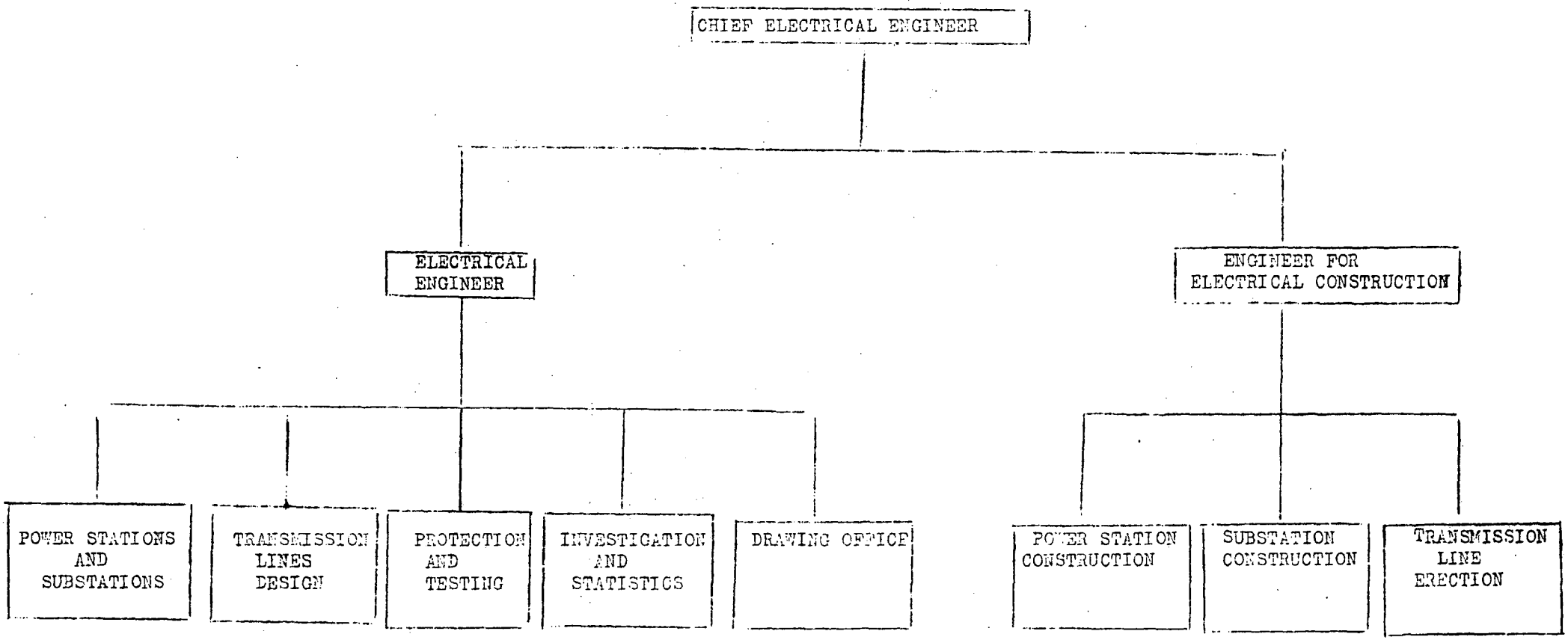


Fig 15.
Electrical
Engineering
Branch
About 1951.

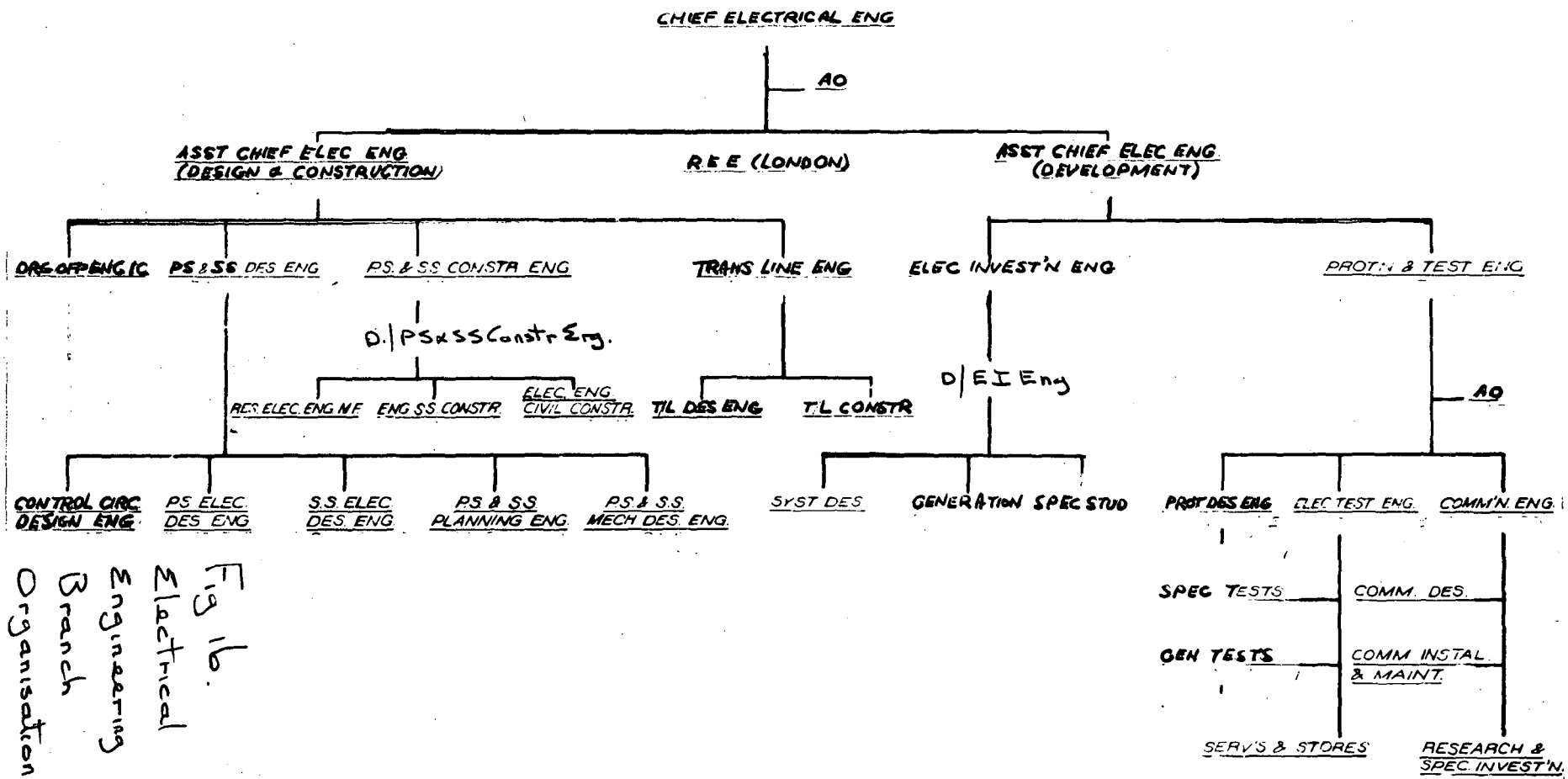


Fig 16.
Electrical
Engineering
Branch
Organisation
Chart. 1972.

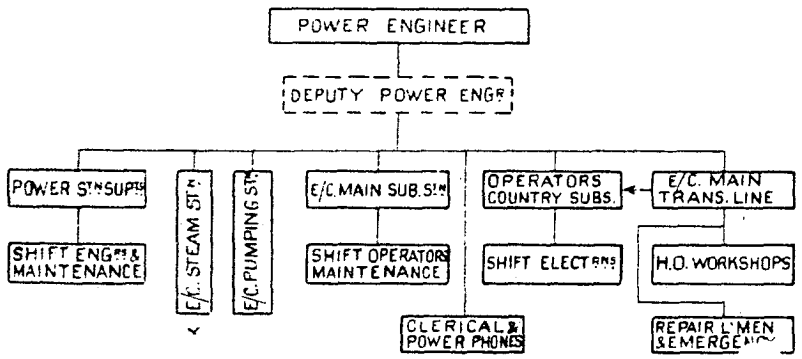


Fig. 17. Power Branch Organisation chart 1942.

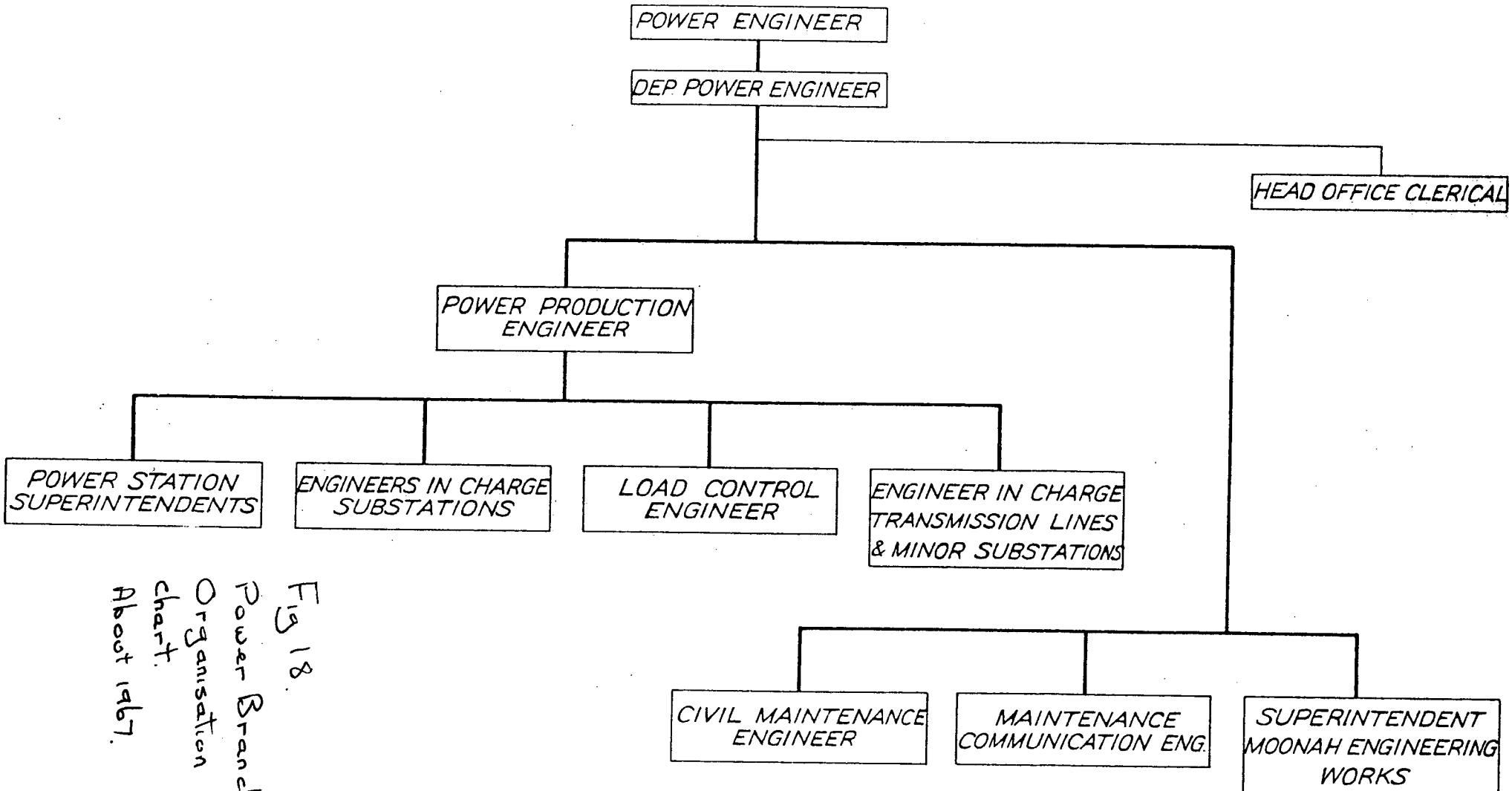


Fig 18.
Power Branch
Organisation
chart.
About 1967.

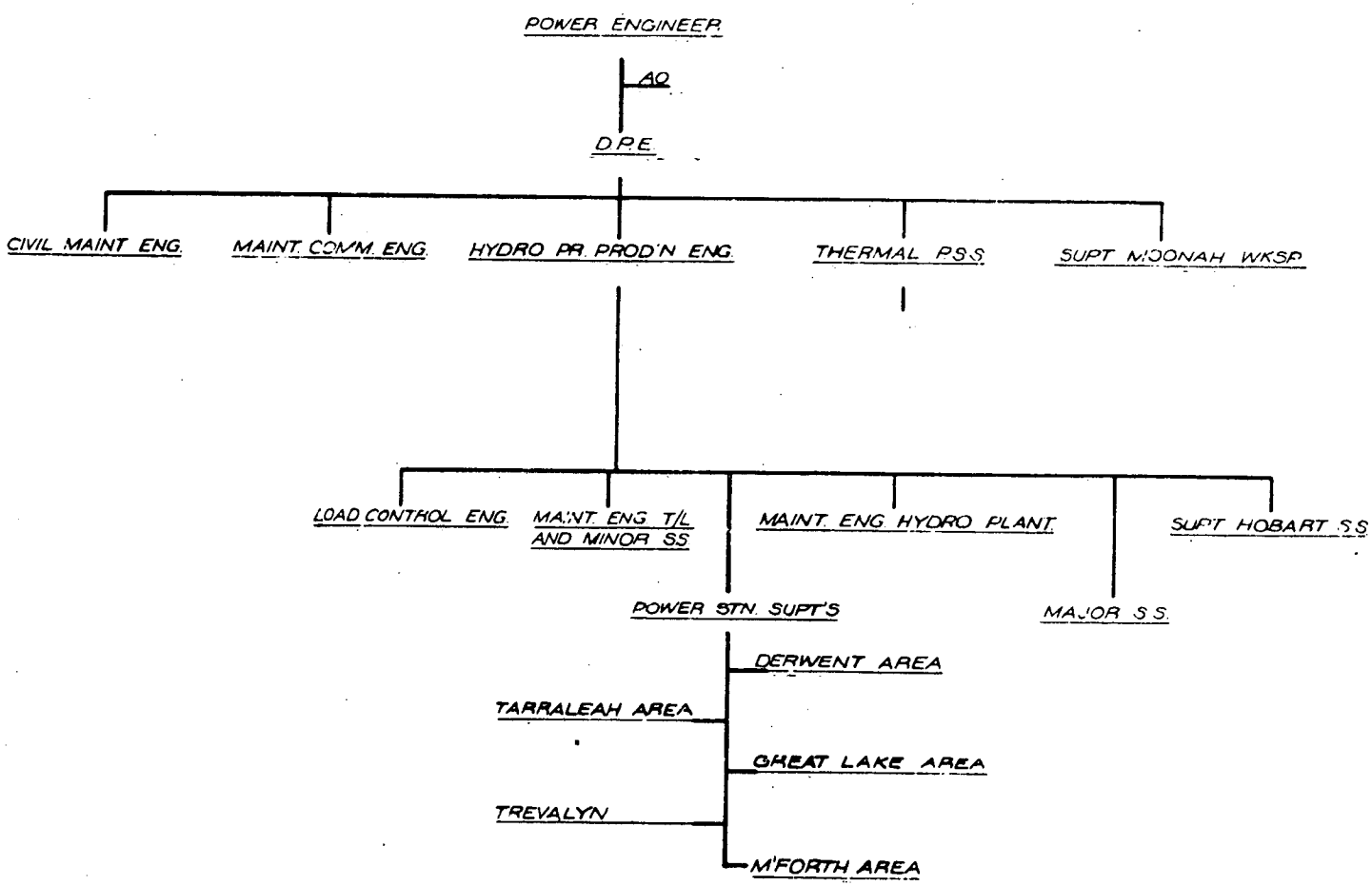


Fig 19. Power Branch Organisation chart 1972.

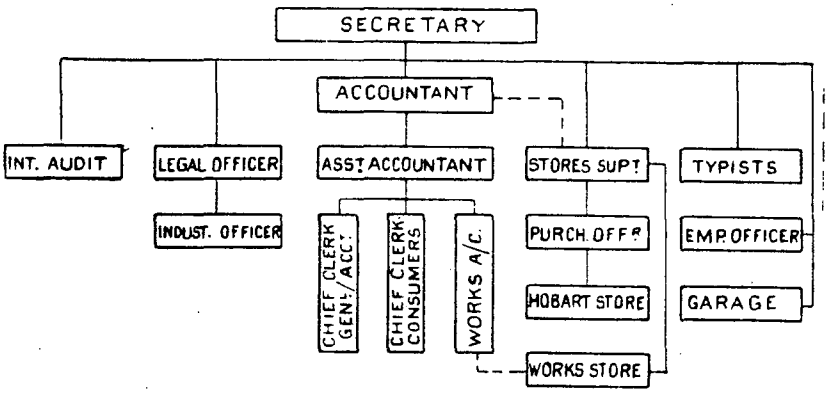


Fig. 20. Secretarial Branch Organisation chart 1942.

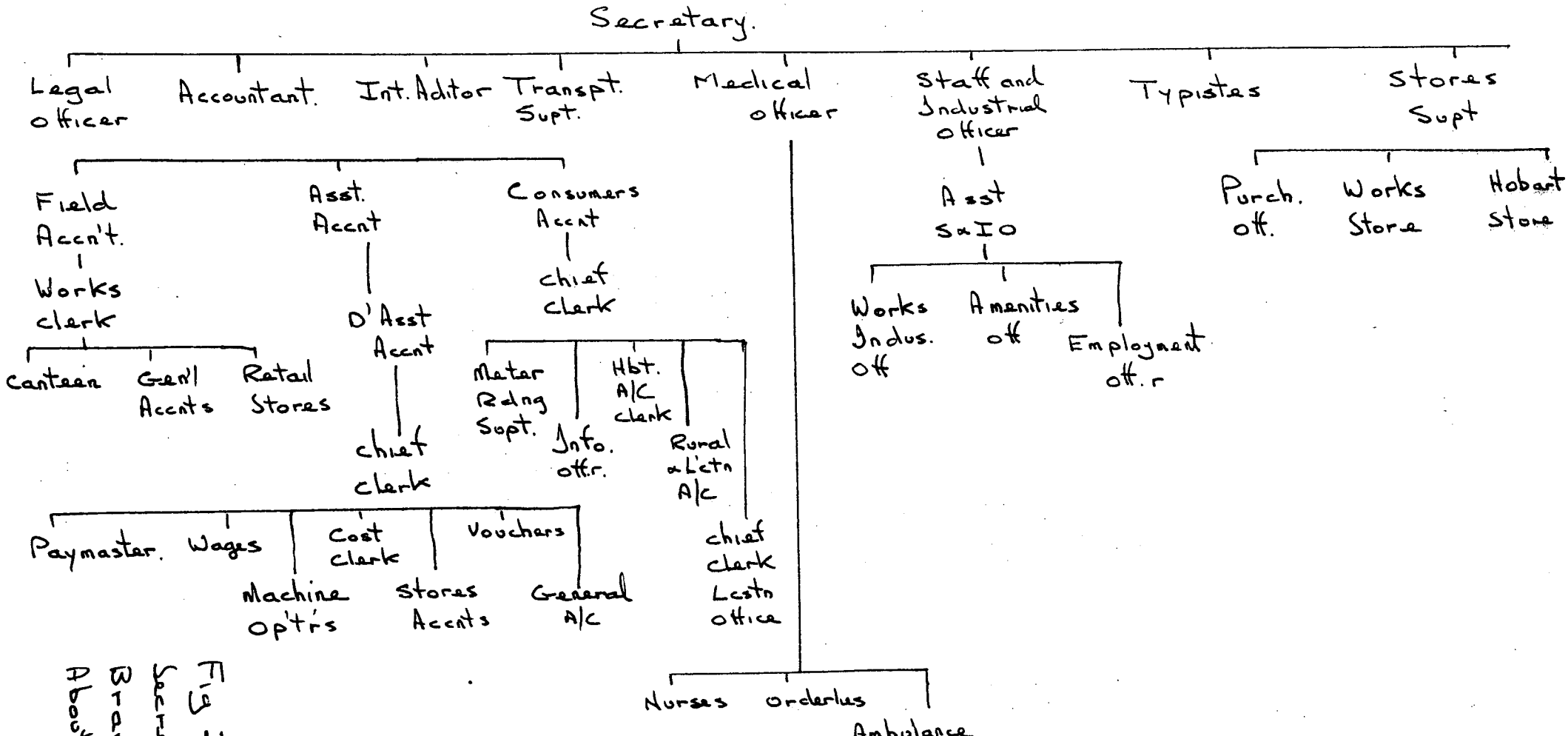


Fig 21.
Secretarial Branch.
About 1951.

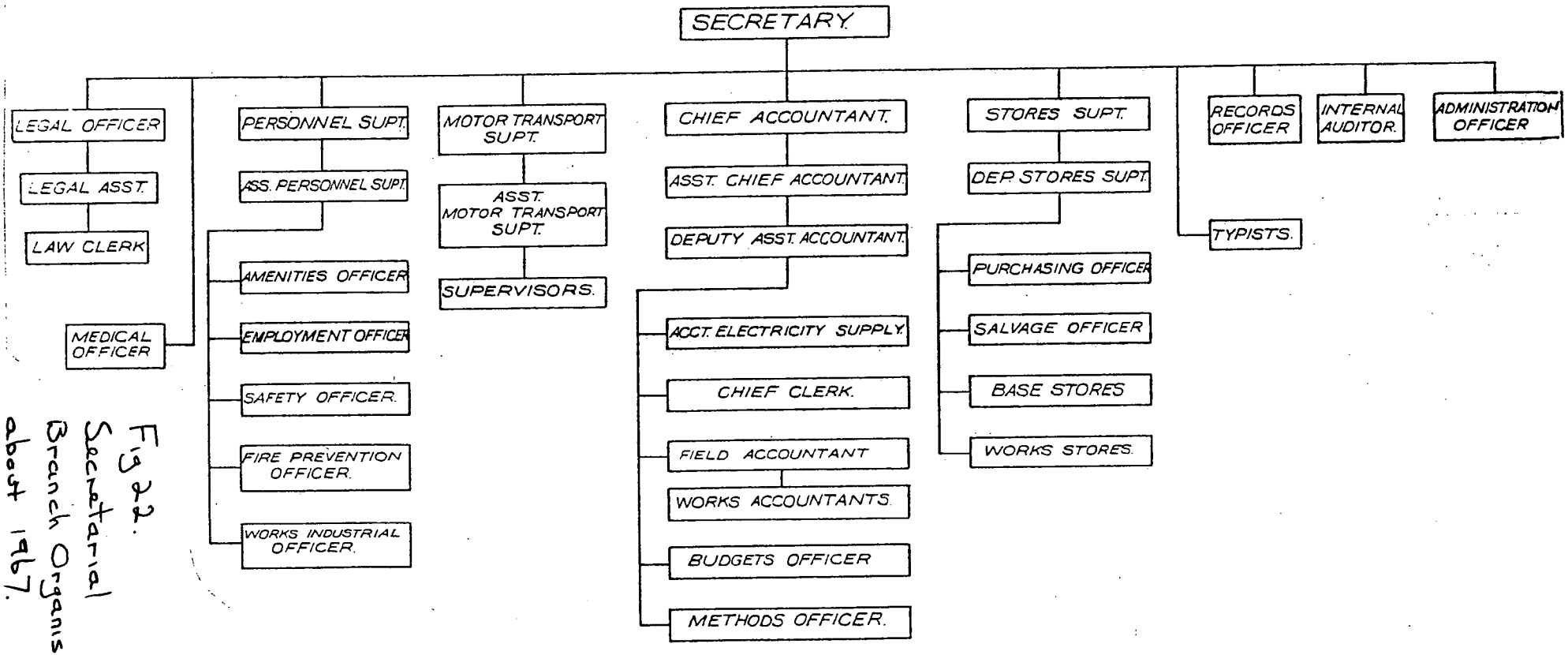


Fig 22.
Secretarial Branch Organisation about 1967.

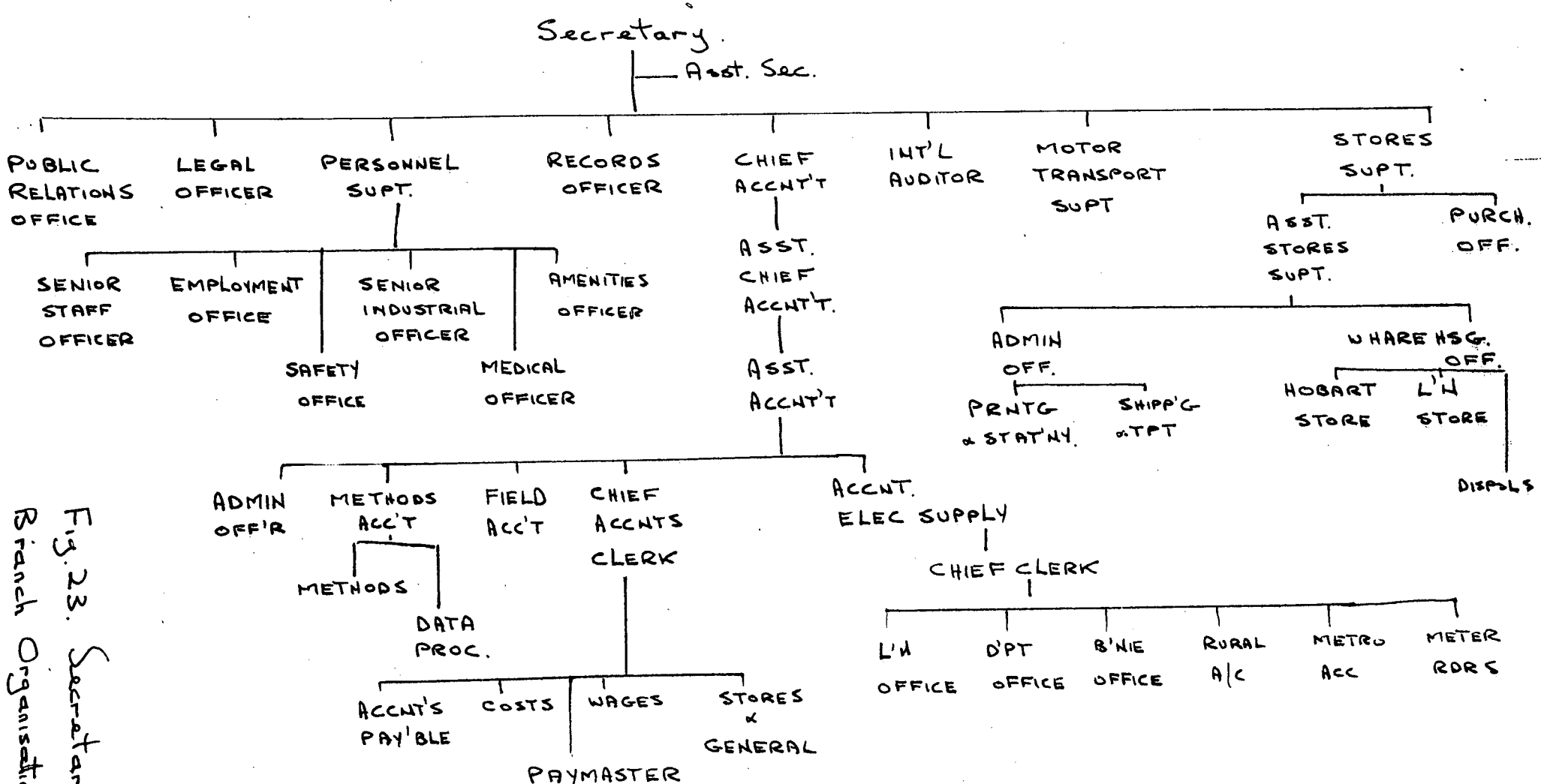


Fig. 23. Secretarial Branch Organisation 1972.

1. H.E.D. Report 1915-16, pp 7-8.

2. H.E.D. Report 1927-8, p.23.

3. Rackham, S., Villages 1, op. cit., p.57.

4. Advocate 10/10/1941.

5. Examiner 29/9/1943.

6. Mercury 19/4/1944.

7. Ward, op. cit., p.252.

8. Ibid, p.254.

9. Lowe D., The Price of Power, MacMillan, Australia, 1984, pp 4-5.

10. Report of the Board of Inquiry on the Hydro-Electric Commission, 1941. Government Printer, Hobart.

11. Examiner 28/5/1941.

12. Advocate 18/8/1941.

13. H.E.C. Report 1944-5, p.4.

14. Cross Currents December 1976, p.3.

15. Lowe, D., op. cit., p.13.

16. H.E.C. Report 1944-5.

17. H.E.C. Report 1946-7, p.9.

18. H.E.C. Report 1947-8, p.11.

19. H.E.C. Report 1949-50, p.4 and 9.

20. Rackham, S., Villages 2, op. cit., p.12.

21. Ibid, p.14.

22. H.E.C. Report 1945-6, p.3.

23. Rackham, S., op. cit., Villages 1, p.52.

24. Rackham, S., op. cit., Villages 2, p.18.

25. Ibid, p.17.

26. H.E.C. Report 1948-9, p.4.

27. H.E.C. Report 1941-2, p.14.

28. H.E.C. Report 1946-7, p.10.

29. H.E.C. Report 1948-9, p.4.

30. Tasmanian Year Book 1973, p.388.

31. H.E.C. Report 1946-7, p.10.

32. H.E.C. Report 1957-8, p.12.

33. H.E.C. Report 1958-9, p.14.

AN ESSENTIAL SERVICE

In 1940 some 39,000[1] Tasmanian homes had electricity, about 65% of dwellings. Of these 39,000, about 5,500 had electric stoves and about 5,000 electric hot water services. Some 20,000 dwellings still used kerosene lamps and 55,000, used wood stoves for cooking, chip heaters or just kettles to heat water and wood fuelled coppers for washing. From these figures it is clear that although most of the better off, and remember Australia still had 10.2% unemployed in the last quarter of 1939,[2] had electric light, electric stoves and hot water services were luxuries only enjoyed in one home in ten.

The H.E.C. had been thoroughly business-like in its connection policy, demanding that revenue exceed the annual cost of connection. Where significant extension of the distribution network was involved in connecting a customer or group of customers, those people essentially paid for that extension. This policy, and there is no information that any Municipal Council was any different, meant that most electricity supply customers were in or close to Hobart, Launceston and the country towns.

In 1940 about two hundred employees operated and maintained the distribution system with forty-four of these in Hobart and about thirty-five in Launceston. The remaining twenty or so country depots employed 112 people. It is probable that the smaller places such as Oatlands, were maintained by a small gang of say four men using a light truck.

Ten years later there had been significant changes in the proportion of dwellings connected to the electricity supply and to the percentage of those dwellings using electric stoves and electric hot water services.

In 1949 88% of dwellings used electricity, 37% of them used electric stoves and 30% electric hot water services.[3]

There were two reasons for this change.

In 1944 the H.E.C. Act had been changed allowing for uneconomic extensions to be subsidised. Assistance was given by the State Government and the H.E.C. such that extensions were carried out without customer contracts where the capital cost per customer did not exceed 50. It also considerably reduced the annual contract required in cases where the capital cost per customer did exceed 50.[4] By 1945-6 the Government was contributing 75%, the H.E.C. 25%,[5] i.e. it would appear that such extensions were almost wholly subsidised. This change in the Act resulted in significant numbers of customers being connected on the fringes of the previously reticulated areas. In addition it facilitated high voltage distributors being built to the smaller townships. By 1949-50 20% of new customers were coming from this source, 1092 were so connected in those twelve months.[6]

The other reason was increasing expectations and affluence. Over a million Australians went overseas in World War Two. To many a young man it must have been the first time he went far away from his home township. Hobart, Melbourne, Sydney and, for many, London and Europe must have opened many soldiers eyes. The immediate post-war years were a time of prosperity unparalleled in Australia's past. Australia was still mainly a primary producing country and when in 1947 the world market price for wheat rose to six times what it had been in 1939 it certainly lifted incomes all round. Then in 1950 wool did much the same thing.[7] Refrigerators, washing machines and a host of consumer goods were being made in Australia for the first time and many a newly prosperous farmer must have bought one. So too did the shopkeepers and tradesmen who shared the wealth. Almost all these consumer goods needed electricity and it is not surprising there was a great demand for new connections.

Prosperity and full employment lasted for the next twenty years, with a minor hiccup in 1961. By 1966 110,000 dwellings were connected to the mains, almost every dwelling

in Tasmania. 78% of them had an electric stove and an electric hot water service. Many also possessed radios, television sets, refrigerators, washing machines, irons, toasters, electric heaters, fans and vacuum cleaners, floor polishers and other appliances that the previous generation had never thought of. Electricity was no longer a luxury, it was a necessity. Almost every house was connected from the city centres to farms right out in the bush and holiday shacks. This was implicitely recognised in 1957 when a £2 per annum concession on their electricity accounts was provided for aged and invalid pensioners living alone or with people in similar financial circumstances. 1910 pensioners had taken advantage of this by the end of the first year.(8) A generation had grown up depending on electricity, who didn't own as much as a candle in alternative lighting, but who did have a telephone (which does not rely on a local electricity supply) to demand that their electricity be reconnected if for any reason the supply failed.

This transition from near luxury to necessity changed the organisation of electricity supply in Tasmania. In 1940 the Country Districts Branch and the Hobart Districts Branch were amalgamated into Retail Supply Branch. There was probably no single reason. Country Districts had been growing throughout the 1930's, was engaged in very similar activities. With the veteran Hobart District Manager George Lofts on the verge of retiring slightly early due to poor health, it must have seemed a sensible move.

In 1944, Launceston was taken over. The old Launceston City Council Electricity Undertaking seems to have been split into three pieces, each piece joining the relevant branch of the H.E.C. Duck Reach was taken over by Power Branch who operated it until 1955. Accounts, including meter readers were attached to Customer Accounts, and the remainder to Retail Supply Branch. The Launceston District was set up and the entire staff of the Launceston Council's electricity undertaking joined the H.E.C. Their City Electrical

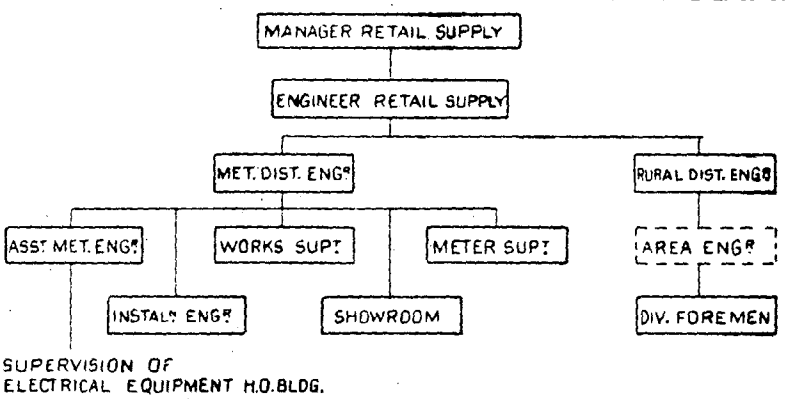


Fig 24. Retail Supply
(now Distribution Branch)
1942.

Engineer became the Launceston District Engineer, and the practices and procedures stayed much the same for the next twenty years.

For twenty five years the basic three division Hobart: Launceston: Rural split up continued, each evolving as dictated by its own requirements, but in similar ways.

Fig. 24 shows the 1942 organisation. At this time there were eighty full-time and seventeen "temporary" employees in Rural Division, spread over about twenty districts. Each district has a Divisional Mains Foreman or D.M.F. The dotted oblong foreshadows the creation of Area Engineers, each supervising several districts. Even at that early stage the existence of larger distribution systems at Burnie and Devonport must have necessitated more qualified men to supervise them. Both these areas had set up Electric Light Undertakings early on and had retained their own distribution systems until 1940 and 1937 respectively. As at 1942 each would have had an "Engineer" and it is probable that during the 1940's the "foremen" in each district gradually came to look to these closer "engineers" rather than distant Hobart for advice, etc.

By 1950 there were 350 employees in these districts. The increasing number of employees and vehicles necessitated a central depot in each District. Many district work gangs had previously apparently worked out of whatever had been taken over from the Municipal Electrical Undertaking in the 1930's.

By the middle 1960's there were five such "Areas". The north-west, consisting of Smithton, Wynyard and Burnie was based upon Burnie. The northern, consisting of Ulverstone, Deloraine and Devonport, was based on Devonport. The north-east, consisting of Exeter, Georgetown, Scottsdale, Longford, St. Mary's and Derby, was based on Launceston but did not report to the Launceston Distribution Engineer. In the south there were two "Areas". New Norfolk, Sorell, Campbelltown and the Tasman peninsula comprised the South East Area. This is apparently based on the 22 KV distribution

system emanating from the Bridgewater Substation and may have been a de-facto grouping much earlier. Kingston and Huonville constituted the south-west area. These also were based on the distribution system from Electrona sub-station and may have been an earlier de-facto grouping. When Queenstown joined the H.E.C. in 1948 it was attached to the south-west area. At the time Queenstown's electricity supply came from Tarraleah. Both of the southern Area Engineers were based in Hobart, but did not report to the Metropolitan Distribution Engineer, as the Hobart District Manager was now called.

As will be seen from Fig. 25, which dates from about 1966 Rural Division also included a Planning and Design, Protection and Substation Sections. The philosophy was apparently that the bigger and more difficult distribution substations were designed and planned in Hobart and built by a specialist wandering construction workgroup.

Launceston was a mature distribution system when it was taken over. For many years the Launceston City Council's Electricity Undertaking had maintained its own meters and built and "operated" its own substations. The C.B.D. in Launceston was served by underground cable well before the H.E.C. took it over. In particular the Launceston Council had had an active inspection of installations policy as far back as 1895. This self-contained and effective organisation continued well into the 1960's as can be seen from the Launceston portion of Fig. 25. It was probably helped by the survival into the 1970's, as Launceston Distribution Engineer, of one of the engineers the H.E.C. took over in 1944. The Launceston Council had existed as an independent electricity authority for fifty years and the Launceston Division continued this attitude of sturdy independence.

In the middle 1950's the H.E.C. decided to replace the overhead distribution systems in closely built up areas of cities with underground cables. In the 1955-6 summer they installed 10,000 yards of such cable in the Hobart Central

Business District.[10] This policy, together with the erection of "zone" substations about this time lead to the division of the Hobart District (by then called Metropolitan Distribution Division) into specialist substations and operations sections ("operation" in electricity supply parlance means the writing and executions of instructions that connect and disconnect high voltage distributors when repairs or modifications are necessary).

The number and complexity of distribution substations had by then made it necessary to create a planning section. This group of specialists liaised with architects, developers and municipal authorities largely in the Hobart and Glenorchy areas. Hobart too had retained its Meter Section. John Butters organisation chart of 1916 shows a "Meter Branch Superintendent" and it is reasonable to suppose this came from the Gas Company.

Between 1942 and the mid 1960's there had been a shift in those parts of the Distribution organisation concerned with customers directly, i.e., face to face rather than the supply of electricity current over wires. In 1942 (Fig. 24) the Showroom and the Installation Inspectors were still in Metropolitan (Hobart) Division. On 31st March 1958 Regulations were made to vest with the H.E.C. the authority to control the sale of electrical appliances for the protection of users. These regulations were the same as those already in force in other states and provided that any electrical appliance presented for sale must have been approved, either by the H.E.C. or another electricity supply authority in Australia.[11]

In 1961 the H.E.C. started to promote the use of electricity again. There had been sporadic periods of promotion as far back as the early 1920's but they had usually taken the form of exhibitions. The 1961 promotion was intended to continue, however. "A campaign to promote the more extensive use of electricity, particularly in the heating field, was launched in March and carried through to the

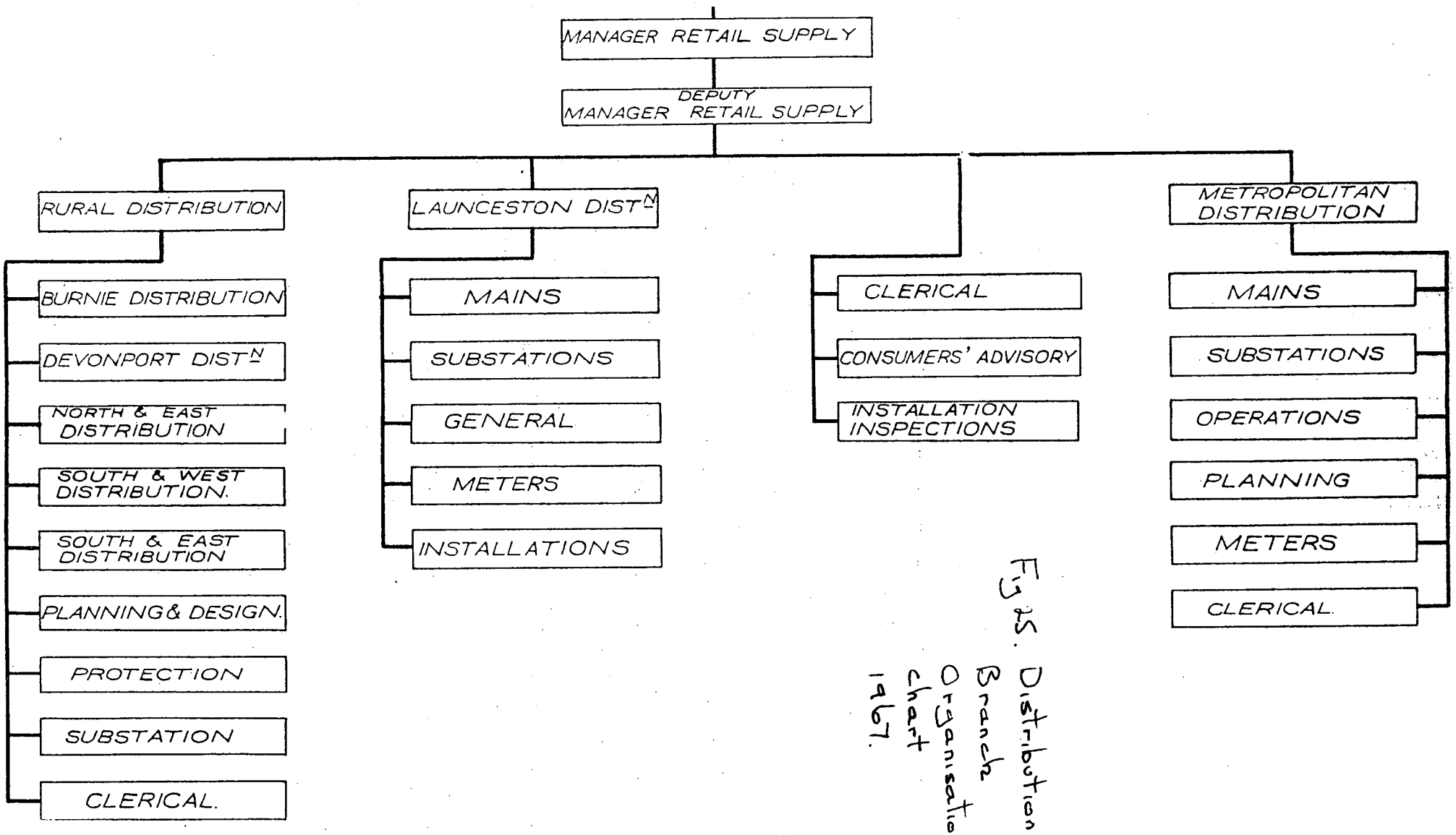


Fig 25. Distribution Branch Organisation chart 1967.

winter. Exhibitions of heating appliances and equipment were held in Hobart, Launceston and Burnie and were well attended and clearly much appreciated by visitors and the trade. The electrical trade participated actively in the exhibitions and in the campaign generally.

The object of sales promotion was not merely to increase total usage of electricity, but to improve the system load factor by encouraging a more even use of electricity. A feature of power supply systems is that greater use can be made of an existing distribution system by encouragement of off peak consumption at incremental energy cost, hence appreciably increased consumption can lead to a lowering of the average price per unit sold.

The campaign was directed to serve the interests of consumers as a whole and sales promotion and advisory services were expected to figure much more prominently in Commission activities in the future.(11)

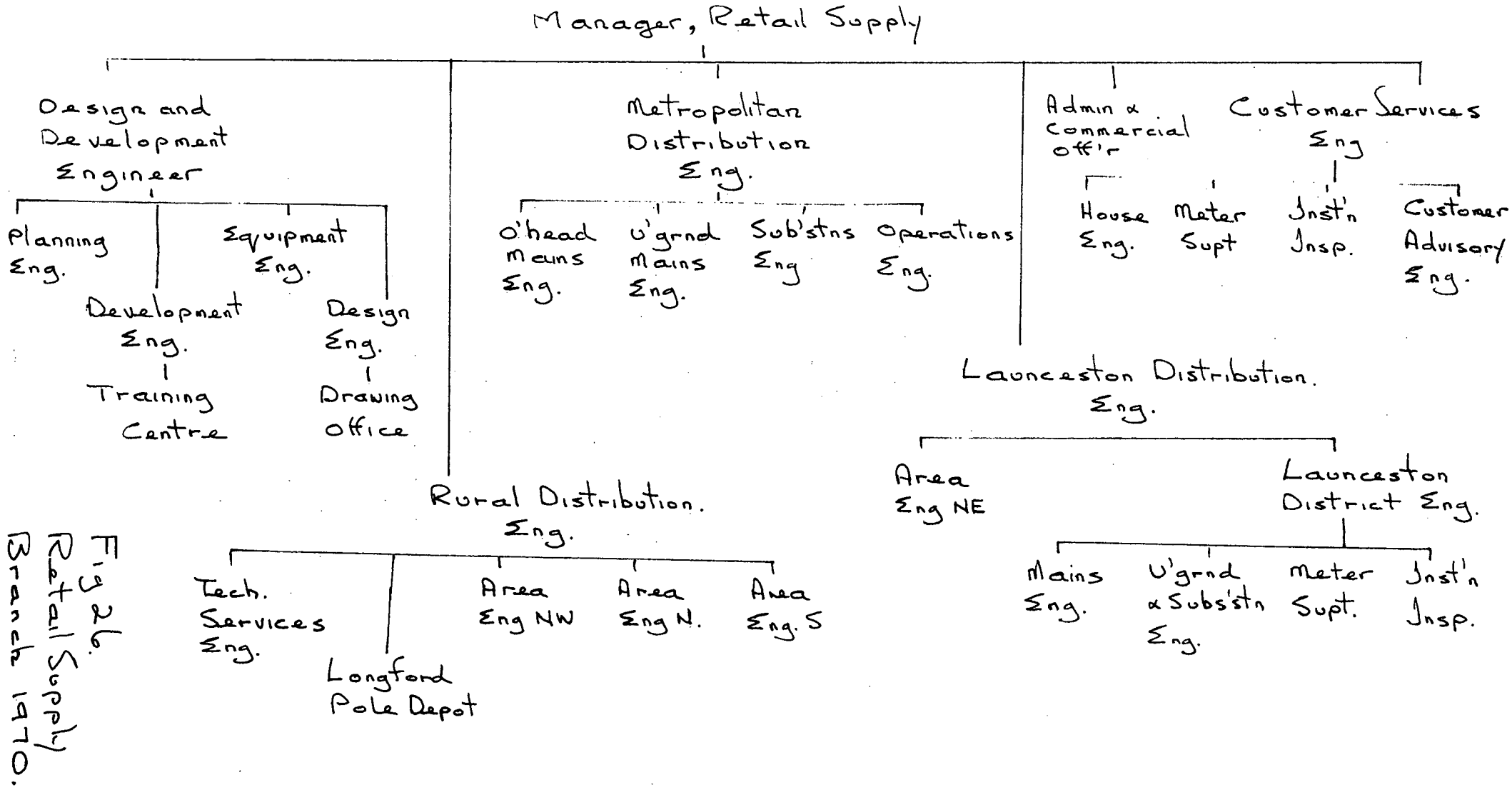
The Installation Inspection Section, which included the electrical approvals activities and the Customer Advisory Section (previously the Showroom) were taken out of Metropolitan (Hobart) and amalgamated into a loose group, not quite a division. This is shown in Fig. 25 which shows the organisation about 1966.

In the late 1960's other influences started to affect the shape of the Branch organisation. In 1964 the Commission engaged the services of P.A., Management Consultants Pty. Ltd. to advise on the setting up of a permanent Industrial Engineering Section and to train people selected for duty in that Section. It was intended that "the new Section will study methods and procedures used in any branch of the Commission at the direction of the Commissioner or at the request of any Head of Branch."(13) This Section carried ou much of its early work in Retail Supply Branch. In 1966 a Training Centre was established at Warrane and a series of introductory and refresher courses held intended to provide

instruction in safety procedures and standard techniques associated in overhead linework.[14] 1967 saw the appointment of an Engineer Retail Supply as a senior co-ordinator for sections involved in Branch-wide activity.[15]

Behind much of this activity lay the realisation that equipment and methods varied a great deal throughout the Branch. In the days when most districts obtained their poles and cross arms locally, worked with little more than a light truck and some ladders, and dug holes with pick and shovel this mattered little. The system had only been unified in 1944 (ignoring pockets like Queenstown, Gormanston and Waratah) and in the immediate post war period one was lucky to get any equipment to install let alone standardised equipment. By 1960 however the Retail Supply Branch employed 669 wages employees and 169 staff. It was the second largest branch in the Commission and impacted far more on the general public than any other. Its employees were scattered throughout the settled part of the state and were involved in such highly visible activities as building new lines, pruning trees under existing lines and disconnecting customers who did not pay their accounts. The advantages of standardised equipment, consistent procedures and optimised methods began to become more obvious. 1964 was probably the turning point. That year marks a peak in the number of wages employees. 704 men were employed as linesmen, labourers, meter readers etc. in that year. Despite a great increase in customers and power used per customer that number declined thereafter and was not equalled until 1980.

Productivity measures, training, standardised materials and procedures and the introduction of new equipment such as Elevating Platform Vehicles (E.P.V.'s)[16] and pole borer/erector units (Prolines)[17] all led to the need for a centralising of sections with statewide responsibilities.


Manager, Retail Supply
Design and Development Engineer
Planning Eng.
Equipment Eng.
Development Eng.
Training Centre
Design Eng.
Drawing office
Metropolitan Distribution Eng.
O'head Mains Eng.
U'grnd Mains Eng.
Sub'stns Eng
Operations Eng.
Admin & Commercial off'r
Customer Services Eng
House Eng.
Meter Supt
Inst'n Insp.
Customer Advisory Eng.
Launceston Distribution. Eng.
Area Eng NE
Launceston District Eng.
Mains Eng.
U'grnd & Subs'stn Eng.
Meter Supt.
Inst'n Insp.
Rural Distribution. Eng.
Tech. Services Eng.
Longford Pole Depot
Area Eng NW
Area Eng N.
Area Eng. S
Trainee 1970.
Retail Supply
Fig 2.

This happened to some extent in 1967 and was taken several steps further in 1970 when the organisation in Fig. 26 was set up. Two new divisions were set up. Design and Development and Customer Services. the former co-ordinated technical development of the whole distribution system, carrying out investigation and planning, preparing standard designs, procuring materials and equipment, developing new methods and training employees.

Customer Services brought together the co-ordination of those aspects of the branches work that impacted on customers on a personal basis i.e. advisory services, marketing, inspection of customers installations and metering. It had functional responsibility on a statewide basis, i.e. controlled what was done and how it was done. The local boss still controlled when and where it was done. The Metropolian, Launceston and Rural Divisions retained their line responsibilities. In addition Metropolitan Division which had established specialist underground mains and substation sections, was responsible for providing for the construction of these throughout the state. The Launceston Distribution Engineer was created the H.E.C.'s senior officer in the north of the state and made responsible for the North East Area.

The 1970's, particularly the 1974 oil shock, the rise in interest rates and the rise of environmental consciousness changed the rules for electricity supply authorities. The compromise organisation of 1970 was rationalised after Management Consultants, W.D. Scott, had undertaken a substantial study of the Branch organisation in 1978. There were three main changes. The statewide activities were placed in one division called Development Division. In the main they were longer term activities and thus were separated from the day-to-day construction, maintenance and "operations" activities. All these latter day-to-day activities were placed in one division, called Supply Division. This was divided on a rational geographic basis with all the north of the State controlled from

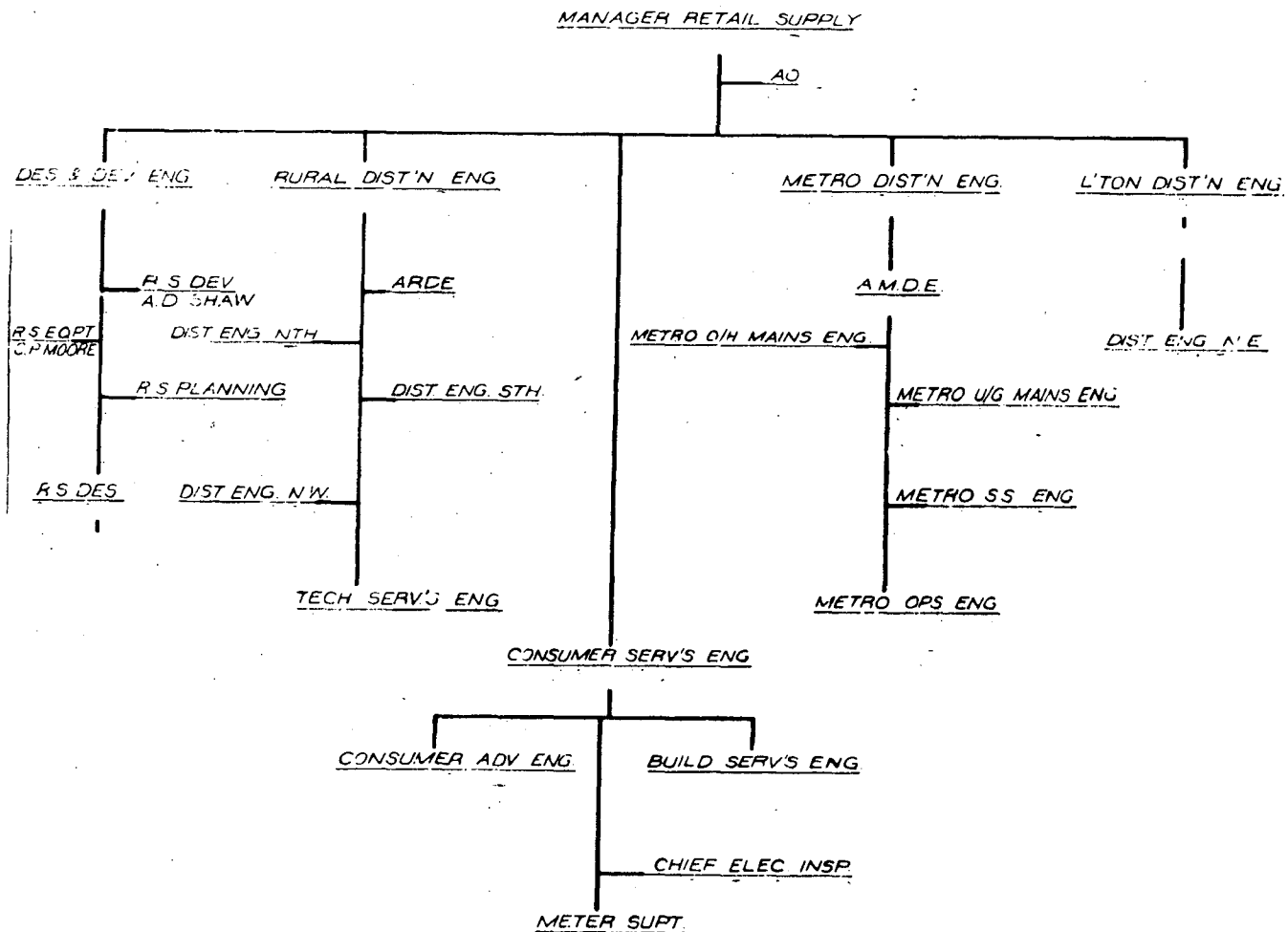
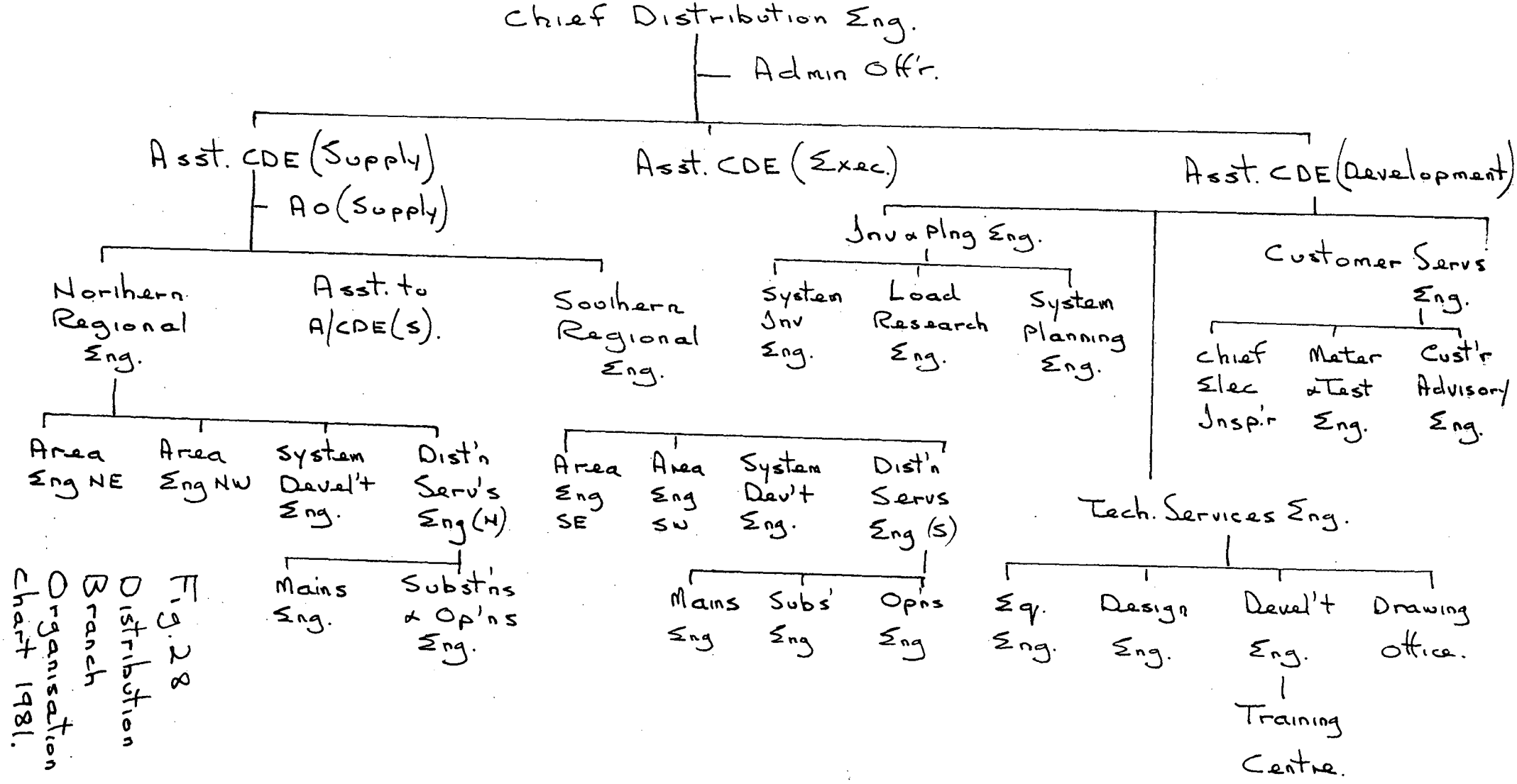


Fig 27. Distribution Branch Organisation chart. 1972


Chief Distribution Eng.
Admin Offr.
Asst. CDE (Supply)
AO (Supply)
Asst. CDE (Exec.)
Asst. CDE (Development)
Northern Regional Eng.
Asst. to A/CDE(s).
Southern Regional Eng.
Area Eng NE
Area Eng NW
System Devel't Eng.
Dist'n Serv's Eng (N)
Mains Eng.
Substn's & Op'ns Eng.
Inv & Plng Eng.
System Inv Eng.
Load Research Eng.
System Planning Eng.
Area Eng SE
Area Eng SW
System Dev't Eng.
Dist'n Servs Eng (S)
Mains Eng
Subs' Eng
Opns Eng
Customer Servs Eng.
Chief Elec Insp'r
Mater & Test Eng.
Cust'r Advisory Eng.
Tech. Services Eng.
Eq. Eng.
Design Eng.
Devel't Eng.
Training Centre.
Drawing office.
T.J.N.
Distribution Branch Organisation Chart 1981.

Launceston and all the south controlled from Hobart. A new Administrative Division was created, responsible for the placement and performance of all clerical and administrative people in the Branch and the provision of a clerical/-administrative service to the technical divisions. Fig. 27 refers.(18) The branch was now called Distribution Branch with its Supply Division organised to provide an essential service, the supply of electricity. The organisation had been optimised to provide this service on a routine day-to-day basis, allowing local input via the local District Supervisor; still a well known and approachable figure in any country town. The longer term planning and standard setting activities were centralised close to the other decision making centres of the H.E.C.

1. Estimate based on on 17,490 Hobart Customers, 19,523 Country Districts and 10,500 Launceston, 82% of which are residential customers.
2. Ward, Nation, p.237.
3. H.E.C. Report 1948-9.
4. H.E.C. Report 1944-5, p.6.
5. H.E.C. Report 1945-6, p.7.
6. H.E.C. Report 1949-50, p.6.
7. Ward, Nation, p.291.
8. H.E.C. Report 1957-8, p.9.
9. H.E.C. Report 1965-6, p.10.
10. H.E.C. Report 1954-5, p.14.
11. H.E.C. Report 1957-8, p.6.
12. H.E.C. Report 1960-1, p.11.
13. H.E.C. Report 1963-4, p.5.
14. H.E.C. Report 1966-7, p.11.
15. Ibid.
16. H.E.C. Report 1967-8, p.15.
17. H.E.C. Report 1969-70, p.10.
18. Cross Currents April 1979, pp 9-12.

CONCLUSION

One cannot escape the overriding influence of technology in the development of the organisation of electricity supply in Tasmania. It seems to influence the shape of the organisation in three ways.

The early "electric light undertakings" were DC or low voltage AC schemes with efficient transmission ranges of a few miles only. This limitation was unwittingly written into the early Acts of Parliament in that all of them conferred authority on local bodies. The Launceston Lighting Act of 1887 is specific, the Town Boards Act of 1891 and the Local Government Act of 1906 are general, but all place control under a local body.

The Telegraph Act of 1857, by contrast, envisaged a Statewide coverage from the start and it is relevant that telegraphy was long distance technology.

Secondly, electrometallurgy required large amounts of power. This meant large transmission losses if that power was to be transmitted at less than state-of-the-art transmission voltages. Thus it was the development of zinc refining technology about 1909 that necessitated an organisation able to transmit electricity sixty-two miles. The transmission voltage used seems to have long term effects.

With few exceptions one can correlate the transmission voltage used with the long term survival and expansion of that undertaking. The DC and low voltage AC "Town Electric Light Undertakings" were absorbed after twenty to twenty-five years. None seem to have expanded at all outside their parent townships.

The Hobart Gas Company's Electrical Undertaking which distributed at 2.2KV and the Launceston Council's Electricity Undertaking, which for ten years distributed at 1900 volts and then at 5200 volts, seem to have expanded a little, and that reluctantly. The Gas Company's distribution system cannot have reached much further than four or five

miles, and they sold out, apparently with some relief in 1916. Launceston's cables reached Relbia, 6.3 miles from the main substation in 1928.(1) Quite why they never put in say a 22KV transline to Longford in 1910 instead of that municipality building its own independent power station is cause for thought. Longford is only about ten miles from Duck Reach.

Mt. Lyell's Lake Margaret Power Station transmitted at 6.6KV. They did expand a little, selling power to Queenstown and Gormanston Municipalities, perhaps nine miles at the most from the power station. It was the H.E.D. however who built the twenty-nine mile 44KV transline to Rosebery. This could have been a simple commercial proposition. Mt. Lyell had spare power, E.Z. had a ready market, but it was the H.E.D. that bought power from Mt. Lyell, transmitted it twenty-nine miles and sold it to E.Z. John Butters organised it and he would have made a profit doing so.

The H.E.D. however, with their 88KV technology never seems to have hesitated to go long distances where it could be economically justified. The fifty-nine mile 88KV Launceston transline was adequate for twenty years and eventually was a big factor in the takeover of the Launceston Electricity Undertaking.

The establishment of a bigger steam station at Devonport effectively headed off what could have been other regional electricity authority. Both Burnie and Devonport were finding their power stations inadequate and there were also small stations at Latrobe and Ulverstone. Now just twelve miles from Latrobe, fifteen miles from Devonport and Ulverstone and thirty miles from Burnie is a good hydro-electric site. Devils Gate Dam and power station generate 60MW (40,000 HP). The potential for a more modest version of Devils Gate was there in the 1920's but no-one, except possibly John Butters, seems to have considered it. The emergence of another independent joint municipal electricity undertaking based on Devils Gate and supplying the north-west coast would probably have caused drastic modifications to the 1930 H.E.C. Act and stopped the compulsory acquisition of the Launceston Electricity Undertaking in 1944.

Not only did the H.E.D. survive the Legislative set backs of the 1920's, it emerged from the Depression as a vehicle for state development and expanded tenfold after World War Two.

Thirdly, state-of-the-art technology seems to attract people who think in the long term. There are three cases of state-of-the-art technology attracting long range planners. In 1895 Launceston attracted William Corin, in 1911 Complex Ores attracted John Butters and in 1946 the H.E.C. attracted Allan Knight.

Launceston's Electrical Undertaking was a state of the art development in 1895. When the Council advertised for a City Electrician they attracted applicants from all over Australia and as far away as England. The list of applicants contained twenty-seven men, almost all of whom had the qualifications and experience necessary.

William Corin was a professional engineer having been trained at University College London. He had worked as a Mechanical Engineer, then for five years with the Metropolitan Electric Supply Co. of London. This was one of the world's first power supply companies having two AC power stations, both powered by steam engines, with a total capacity of 5,000 HP. Together they supplied electricity for the largest number of lamps connected of any of the London electricity supply companies, i.e. the equivalent of 206,000 eight candle power lamps. Aged twenty-seven he was an Associate Member of the Institution of Civil Engineers, an Associate of the Institute of Electrical Engineers, an experienced electrical engineer and man manager and with some mechanical engineering experience.

William Corin had heard of the Launceston Development in London, had written to a friend of his in Launceston in anticipation of the job being advertised and asked the friend to pass it on to the Town Clerk. Corin had already booked his passage but asked his friend to telegraph him if he was required sooner.[2] Not surprisingly, was appointed City Electrician.

In 1900 he recommended that the system be drastically upgraded and be replaced with a three phase system. This recommendation was accepted and Corin prepared plans and specifications for the work. This consisted of four x 445bhp Francis turbines running at 500rpm each directly coupled to a 300KW generator. These supplied 50 cycle AC three phase current at 5200 volts. There was also another penstock and small dams at Woods, Arthurs and Toombs Lakes to regulate the flow of the South Esk in summer.

In 1906 Corin realised that the load was increasing so rapidly that the existing station would be fully loaded by 1912 and presented a confidental report outlining the "High Level" scheme. This took water from the Third Basin via a tunnel, flume and pipes generating three times the head used at Duck Reach. This was the origin of the South Esk High Level Scheme that was nearly built in the 1930's and was built, as the Trevallyn Power Development, by the H.E.C. in 1956.

The Launceston Council didn't take up the scheme and Corin resigned in 1907.(3) Had the Council constructed the High Level Scheme in 1910 it might have attracted Complex Ores or E.Z. and pre-empted the Waddamana development and the whole H.E.D./H.E.C. evolution.

John Butters was another ex patriate who graduated in England and worked there for Siemens before coming to Australia in 1909. Butters was associated with three sets of decisions that shaped the organisation of electricity supply in Tasmania. He also seems to have been the first to put in writing the concept of a "commission" and the philosophy of using cheap electricity as a method of developing the state.

The first set was H.E.P.M. Co.'s choice of 88KV transmission lines and the Earle governments decision to buy the remains of H.E.P.M. Co.'s hydro-electric undertaking in October 1914. Given the distance involved from the generation site to the market that order of transmission voltage was inevitable and it is probable that Merz and McLennan put it all together before Butters became involved in 1910.

His first really influential role was probably as facilitator in the Earle government purchase of H.E.P.M. Co.'s hydro-electric works. It is not documented, but Butters was ideally placed in that he knew just how near completion H.E.P.M. Co.'s hydro-electric works were, he must have known how H.E.P.M. Co. itself was situated and he almost certainly knew of the E.Z. interest.

In 1904 August de Bavey had developed a zinc extraction process and in 1905 Amalgamated Zinc (De Bavay's) was formed and purchased large quantities of Broken Hill zinc takings. Together with two Melbourne financiers Montague Cohen and W.L. Baillieu and a young Chemical Engineer, Herbert Gepp, the syndicate built a flotation plant at Broken Hill in 1909. The refining of zinc was a process that evolved in many places between 1907 and 1914, small improvements being made by different people in different places. In 1913 and 1914 a Canadian company and an American company each obtained satisfactory results and each built a commercial plant in 1915.(4)

Now Broken Hill Proprietary has its headquarters in Melbourne, Amalgamated Zinc was floated in Melbourne, it was clear that cheap electricity would be necessary and Butters worked for a big manufacturer of electricity generation equipment in Melbourne in 1909 as their Australian agent. It would have been Butters job to know about Amalgamated Zinc and know its people too. He must also have had a strong personal interest in keeping the project going. It would not have done his professional reputation any good at all to have to go back to England or present himself to other employers as ex-Chief Engineer of a project that had gone bankrupt. Besides there may not have been many projects to go to with the Great War imminent.

Thus there is every reason to suppose that John Butters put the deal together that formed the Hydro-Electric

Department. Without him the power station may never have been built and that vital 88KV transline never have been completed. E.Z. would have gone elsewhere, the Hobart Gas Company would have continued supplying electricity and the H.E.D. never have come into existence. Probably the Gas Company would have upgraded its steam station in the 1920's as it had done before the Great War and Tasmania would have gone into the 1930's with twenty or thirty small but growing municipal electric undertakings. Tasmania might well have ended up with a Electricity Authority with regulatory powers only, plus a series of regional distribution authorities as in N.S.W.

John Butters was also involved in the H.E.D.'s purchase of the Hobart Gas Company's Electrical Undertaking in 1916. He would have known that it was offerred to the Hobart City Council two years earlier and its acquisition must have been defensive. The H.C.C. might change its mind as it would have been clear the Gas Company was fairly keen to sell. The steam station was an essential standby and the extra cash flow and opportunity to profit further by marketing electricity in Hobart must also have been attractive.

However, it is interesting to consider the long term alternatives. Launceston was already independent, there were several other small municipal electricity undertakings and Butters could certainly know of the opposition to Complex Ores and H.E.P.M. Co. among certain Hobart financial circles. Without some kind of homebase that enjoyed the benefits of cheap power the political path ahead might be rough. With an independent electricity supplier in Hobart, be it the Gas Company or the Hobart Council there would be no way to create the favourable public opinion necessary for long term survival and expansion. Butters was a good engineer and manager, but he was also a shrewd salesman and he must have realised the importance of a good public and political image. The acquisition of the Hobart Gas Company's Electrical Undertaking not only removed a potential long term opponent it provided a method of popularising electricity and influencing politicians. Fortunately there were good sound economic and technical reasons to acquire the undertaking. The

Hobart and Launceston Councils held regular meetings to agree joint policies[5] and if the Hobart Council had acquired the distribution system or had merely been lobbied by the Gas Company regarding independent supply of electricity, the H.E.C. may never have come into existence, let alone acquire the Launceston Undertaking.

The third set of decisions were positive decisions rather than defensive. The building of a transline to Launceston made it easy for the Launceston Council to take extra H.E.D. power rather than develop its own resources. Butters probably knew of the "High Level" proposal and although he could not stop it he could provide an attractive alternative. A similar argument can be advanced for the provision of a bigger steam station in Devonport in 1923.

The reason for these moves is clearly set out in Butters second report. He fervently believed in a state-wide system and in using cheap hydro-electricity to develop the state. John Butters' own words on policy are worth quoting. In 1915-16 he wrote: "I think it might be of general interest if I discussed here the general policy of the Department, in regard to which there appears to be misapprehension.

In the first place, the impression seems to exist that the Great Lake scheme is entirely a southern one; that the Arthur's Lakes scheme, if proved, and when developed will be for the north; whilst the Lake St. Clair scheme will be for the west. This is quite erroneous, as all the schemes on the Central Plateau would, if and when developed, be inter-connected in such a way as to enable power to be sent in any direction from any of the schemes. It is also probable that any additional schemes which might be developed from time to time would be connected to the central scheme for similar reasons."

"Then, again, I cannot too strongly emphasise the national character of the Department, nor say too emphatically that it has no local interests. It should not be necessary to labor this point in connection with a State Government Department, but at present the necessity seems to exist.

The contracts which have already been secured will load up the southern line, and further large contracts will necessitate the building of additional transmission-lines in some direction or other. In the general development of the State the Department will use its utmost endeavours to induce manufacturers to establish in divergent centres, such as Launceston and the West Coast, thus spreading the benefits of hydro-electricity throughout the State; but it must be borne in mind that the deciding factor in settling the site will be the manufacturers themselves."

Now that approach precludes independent local interests acting for local benefit.

The New Norfolk extensions in 1923 can be seen as a pilot study in direct distribution in country centres. It also provides us with an example of how supporting technologies can shape the organisation. A country depot is part of that township. The Divisional Mains Foreman (that little has been in existence since 1923) in 1985 is usually a local man. This was even more likely sixty years ago. His men are almost certainly local. This means that it is difficult for them to carry out actions that are seen to disadvantage their friends and neighbours unless they are clearly ordered to do so.

The connection of electricity requires that certain rules be adhered to regarding safety standards and who pays for what. Its continued supply is dependent on prompt payment of accounts on the customers part and knowledge of what the system is going to do on the D.M.F.'s part. Thus the successful management of a country depot requires good communications. In the 1920's there were only 12,000[7] telephones in Tasmania, all connected to manual exchanges.[8] In 1920 only 4,103 motor vehicles were registered in Tasmania.

New Norfolk, however was on a railway line and fairly close to Hobart. It had better communications than any other country town such as Huonville or Sorell. It was

therefore a good place for a pilot study which found that distribution could be successfully carried out by the H.E.D. In 1929 the first automatic telephone exchange was opened in Hobart.(10) In 1930 there were nearly 20,000 vehicles registered.(11) Communications were clearly improving and it should be no surprise that more extensive direct local electricity distribution was being implemented.

The concepts of a "Commission" and the use of cheap electric power as a vehicle for state development were also clearly established by the middle 1920's. Butters early training was in private enterprise. After he left the H.E.D. in late 1924 he became Chief Commissioner of the Federal Capital Commission and built the initial Canberra. He resigned from this in 1929, after the initial job was finished and the federal politicians started to dither regarding the transfer of the public service to Canberra, and went back to private enterprise as an engineering consultant and director of many companies. His ideas of a "Commission" are clearly modelled on a private company with the government of the day as its shareholders. His Commissioner is the Managing Director and the other Associate Commissioners, are Directors. Each is appointed by the government for a period in the same way as directors represent major shareholders.

By 1924 the H.E.D. had been managed for ten years as a quasi-autonomous authority. It was nominally a government department but it never seems to have acted like one. However it had been very successful and had enjoyed bi-partisan support in the House of Assembly. The policies of a state-wide enterprise, of attracting big electrometallurgical industries and of direct local electricity supply had been proved successful and it was only a matter of time before the necessary legislation was enacted. Really the H.E.C. Act 1930 only formalised existing de-facto practices in many ways.

One can summarise Butters influence by considering him as a very able Manager acting as if he was Managing Director of a large company. Its clear from his reports that he had a clear long term strategy and the H.E.D.'s activities in that ten year period fit consistently within that strategy. His influence lasted well after his departure as this dissertation shows. He might have been a little surprised at the magnitude of the power developments of the 1950's and 1960's, but not with the philosophy underlying them.

One can even argue that the problems of the late 1930's that led to the 1940 Inquiry were due to not operating any state-of-the-art technology. The H.E.C. was building 44KV and 88KV translines, well below transmission voltages elsewhere, their distribution activities although competent were fairly routine and the Tarraleah scheme was little different to the original Waddamana scheme of twenty years previously. There was little professional challenge and lots of problems. In 1985 parlance it is difficult to see much job satisfaction for a senior engineer in the H.E.C. of the late 1930's and there were a lot of Herzberg's dis-satisfiers.(12)

Political will and the insights forced upon Australia by World War Two changed all that and provided a different kind of engineering challenge that attracted the third man who thought in the long term, Allan Knight. Lowe in his book "Price of Power" spells out the political imperatives that led first Albert Ogilvie then Robert Cosgrove to "provide the necessary infrastructure for the future development of the State's natural resources." A "major focal point was the development of a rapidly expanding hydro-electric programme."(13) Once the aluminium industry had been secured in 1944 it must have become clear that major civil engineering, electrical engineering and management challenges were ahead.

Allan Knight oversighted the re-establishment of an effective H.E.C. in which the main imperative was to get the job done. The organisation that evolved in the 1950's was one that can largely be described as a set of fairly self sufficient but interdependent groups. Each group seems to

have had its task fairly clearly defined and to have had its own resources to carry out that task. Allan Knight, however, was known to watch the costs.

The civil engineers faced up to bigger dams on difficult foundations, tunnels, shafts and underground power stations. They also came to use the specialist skills of project management and were using computers in the early 1960's. There was no lack of engineering achievement and the H.E.C. became known for its civil engineering excellence. The electricals faced bigger machines and in the 1950's the problems of treating the generation system as a network. As the electrical problems became more complicated the Electrical Engineering Branch evolved into the H.E.C. authority on all electrical matters even when these aspects were carried out by the generation and transmission people or the distribution people. Even the support technologies evolved. The workshops separated into separate cost centres and grew, the surveyors and geologists acquired the latest skills such as photogrammetry and drilling techniques.

It was an effective organisation with no lack of job satisfaction well before such concepts started to appear in the literature. Allan Knight became Sir Allan Knight in 1970 and won the John Storey medal of the Australian Institute of Management in 1975.

Thus the organisation of electricity supply in Tasmania has passed through several phases. In each phase the organisation has been shaped by the technology, the supporting technologies and the task.

When the technology has been state-of-the-art, visionary men have been attracted. Out of it all has emerged the Hydro-Electric Commission a state-wide quasi-autonomous authority and a major vehicle for the development of the state.

1. Launceston City Electrical Engineers Report 1927-8, p.56.

2. Letter of application William Corin. Held in Queen Victoria Museum, Launceston.

3. Kozakiewicz, op. cit., p.58.

4. E.Z. Review: 1916-66, 50 years of progress. E.Z. Co. 1966, p.7.

5. Launceston Mayors Valedictory Address 1922-3.

6. H.E.D. Report 1915-16, p.7.

7. Tasmanian Year Book 1984, p.

8. Office History, op. cit., 1975, p.54.

9. Tasmanian Year Book 1973, p.388.

10. Post Office History, op. cit., p.54.

11. Tasmanian Year Book 1973, p.388.

12. Herzberg, F., Work and the Nature of Man, World Publishing Co. 1966

13. Lowe, D., op. cit., p.3.

BIBLIOGRAPHY

1. BOOKS & ARTICLES

Allbut, G. A brief History of some of the features of Public Electricity Supply in Australia, E.S.A.A., Melbourne 1958.

Appleyard, R. History of the Institution of Electrical Engineers, I.E.E. London 1939.

Bastow, A.H. "Construction of a Multiple Arch Dam at Miena", Hobart Engineering Conference 1926, pp 65-94.

Beever, E.A. Launceston Bank for Savings 1835-1970.

Binns, A.P. "The Development of Retail Supply in Tasmania", H.E.C. Bulletin 1973, pp 6-8.

Blainey, G. "Population Movements in Tasmania 1870-1901" in The Journal of the Tasmanian Historical Research Society, Vol. , pp 62-70.

Blainey, G. The Tyranny of Distance, Sunbooks, Melbourne 1966.

Butters, J.H. "Notes on the Development of the Power Resources of Tasmania." Hobart Engineering Conference 1926, p.15-36.

Butters, J.H. "The Great Lake Hydro-Electric Scheme of the Tasmanian Government", Electrical Association of Australian Conference 1916, Austral Printing Co. Melbourne (H.E.C. Archives).

Carrol, B. Getting around Town: A History of Urban Transport in Australia, Cassells Australia, 1980.

Court, W.H.B. A Concise Economic History of Britain, Cambridge University Press, 1967.

Curtis, H.A. "The extension of the Hydro-Electric Service to Tasmanian Country Towns and Rural Areas", Distribution June 1929, pp 10-11.

Dallas, K.M. "Waterpower in Tasmanian History" in Journal Tasmanian Historical Research Society, Vol. , June 1959, pp 85-93.

E.Z. Co. 1916-66: 50 Years of Progress, E.Z. Co., Hobart 1966.

Gillies, A.J. Tasmania's Struggle for Power, Francis & Lillas, Hobart 1984.

Green, F.C. A Century of Responsible Government in Tasmania 1856-1956. Government Printer, Tasmania 1956.

Herzberg, F. Work and the Nature of Man, World Publishing Co., 1966.

Hobart City Council Hobart Tramways Jubilee Booklet, Hobart City Council, 1943.

Hydro-Electric Department The Hydro-Electric Power of Tasmania, Tait, Melbourne, 1925.

Kozakiewicz, M. Duck Reach and the Electric Light, B.A. Thesis, T.C.A.E., 1982.

Launceston City Council Electric Light Works, Launceston Council, 1895.

Low, D.A. Heat Engines, Longmans, Green & Co., London 1920.

Lowe, D. The Price of Power, MacMillan Australia 1984.

Rackham, S. Hydro-Construction Villages, Vol. 1, H.E.C. Hobart, 1981.

Rackham, S. Hydro-Construction Villages, Vol. 2, H.E.C. Hobart, 1982.

Rowland, J. Progress in Power (Merz & McLennan), Newman Neame, London, 1960.

Strike R.J. & Basille, G.D. Report on Power Development, Launceston Council 1928.

Taylor, W.T. Overhead Electric Power, Transmission Engineering, Griffin, London, 1927.

Telecom A History of the Post Office in Tasmania, Telecom, 1975.

Townsley, W.A. "Tasmania and the Great Economic Depression" in Journal of the Tasmanian Historical Research Society, Vol. , pp 35-46.

Ward, R. A Nation for a Continent: the history of Australia 1901-1975, Hieneman, Australia, 1977.

Younger, R.M. Australia and the Australians, Rigby, Adelaide, 1979.

- "Sir Allan retires in the New Year", Cross Currents, December 1926, p.3.

- "Distribution Branch - New Organisation - New Name", Cross Currents, April 1979, pp 9-13.

- "Lake Margaret Scheme" in the Hydro-Electric Power of Australia and New Zealand, The Electrical Engineer & Merchandizer, 1946, pp 15-16.

- Rules and Regulations for the guidance of Certified Electrical Wiring Contractors, Launceston City Council, 1895.

- "Obituary of Sir David Solomons, J.I.E.E., Vol. 63, 1925, p.1158.

- "Obituary of C.R. Cooke" Journal of the Institution of Electrical Engineers, Vol. 64, 1926, p.1203.

2. REFERENCE BOOKS

Cyclopedia of Tasmania, Maitland and Krone, Hobart 1900.

Cyclopedia of Tasmania, 1931.

Encyclopedia Brittanica, University of Chicago 1982.

Grolier Australian Encyclopedia 1965.

Tasmanian Year Book 1973.

Tasmanian Year Book 1984. Commonwealth Bureau of Census and Statistics, Hobart 1984.

Walch's Almanac 1875-6-7-8.

World Book Encyclopedia, Field Enterprises, U.S.A. 1974.

4. NEWSPAPERS

The Advocate

Daily Post

Daily Telegraph (Launceston)

Examiner

Huon and Derwent Times, Huon Centenary Settlement Issue, December, 1936.

The Mercury

The Tasmanian

5. ANNUAL REPORTS

Hydro-Electric Commission 1929-30 to 1969-70.

Hydro-Electric Department 1914-15 to 1928-9.

Launceston Valedictory Address 1913-14 - 1943-44.

5. ARCHIVAL MATERIAL

Agreement between the Hydro-Electric Department and Launceston Council 1918, H.E.C. Archives.

Binns, A.P. Record of Progress 1973, H.E.C. Archives.

Correspondence Noyes Bros/Mt. Bischoff re Electrical Installation, Waratah 1904. Examiner Launceston (State Library Hobart, TCP 622.48 Nov.).

Hobart Gas Company's Directors Minutes, Tasmanian Archives.

Hydro-Electric Power and Metallurgical Co. Prospectus 1911. H.E.C. Archives.

6. PARLIAMENTARY MATERIAL (Parliament Library)

Hobart Town Gas Company Act 1854.

Electric Telegraph Act 1857.

Hobart Tramway Company Act 1884.

Launceston Electric Light Act 1887.

Town Boards Act 1891.

An Act to confirm the Agreement between the Hobart Tramway Co. and the Mayor Alderman and Citizens of Hobart. Tasmanian Acts of Parliament 1890-91.

The Town Boards Act 1891.

The Mining Act 1893, 57 Vic. 24.

Hobart Lighting Act 1896.

Hobart Town Gas Company's Electric Light Act 1896.

Parliamentary Paper No. 59, 1897.

Hobart Tramway Co. Amendment Act 1902

The Local Government Act 1906.

The Complex Ores Act 1909.

Hobart Tramway Company Purchase, Parliamentary Paper 33 of 1915.

Parliamentary Paper 23 of 1923.

The Rural Districts Electrical Undertakings Act 1928.

The Hydro-Electric Commission Act 1929.

H.E.C. Submission to Royal Commission on Municipal Government 5/12/38.

Hydro-Electric Commission Act 1940 (5 Geo VI No. 8).

Report of the Board of Inquiry on the Hydro-Electric Commission, 1941, Government Printer, Hobart.

Local Authorities Lighting Act 1942.

Parliamentary Paper No. 37 of 1943.

Hydro-Electric Commission Act 1944.

OTHER USEFUL MATERIAL NOT REFERRED TO DIRECTLY IN THE TEXT

Power in Tasmania, H.E.C., 1980.

A Million Horses, H.E.C., 1962.