

## CHAPTER 6 NOTES

1. The motion had influential support: it was moved by F.H.Campbell, then state president of the ALP, state secretary of the ETU, Electricity Commissioner, and later chairman of the Electricity Authority, and by E.C.Thom, former secretary of the ETU and former member of the Electricity Authority. It was not adopted by the government.

2. The proposal drew faint praise from the SMH's financial editor (SMH 4.3.59). It was, predictably, dismissed as unrealistic by the Minister for Local Government, J.Renshaw, who pointed out that electricity was generated by state undertakings in Victoria and SA, which both had Liberal governments (SMH 5.3.59).

3. During 1958 the Liberal MLA for the South Coast, J.Beale, publicised the difference between Victorian and NSW industrial electricity prices which, he claimed, was the reason many industries were locating in Victoria in preference to NSW, and which he attributed to the general "ineptitude and maladministration" of the Labor government (SMH 21.4.58).

4. The unions representing electricity workers had a direct voice in the management. R.A.Triggs, a member of the SCC for 11 of the 17 years to 1969 and its chairman in 1953, was at the same time secretary of the Municipal Employee's Union, to which most SCC employees belonged (SMH 11.1.53).

5. When the ECNSW took control of the RD electricity system in 1953, some 1800 power station workers received a 10% wage increase to bring them into line with the higher ECNSW rates, which were themselves set by the wages of the 2300 workers transferred from the SCC (SMH 8.9.52). As another farewell gesture, the SCC promoted all of its junior engineering staff to senior grades on the eve of their transfer to the ECNSW. The fact that senior managers in some county councils received higher salaries than those in larger councils, and more than government ministers, was made public for the first time in 1987 (Newcastle Herald 2&3.11.87).

6. The link between electricity workers and the NSW Labor party has always been a powerful one. Several ex-ETU officials and organisers became secretaries of the NSW Labor Council, presidents of the NSW Labor party and government ministers during this period. They include:

Frank Forde (briefly Prime Minister of Australia following John Curtin's death in 1945).  
 Harry Jensen (Lord Mayor of Sydney, later NSW Minister for Local Government 1976-82).  
 John McBean (president of the NSW branch of the ALP and the NSW Labor Council in the 1970s and 1980s, member EnANSW 1982-85).  
 John Beasley (wartime Federal Minister for Supply).  
 Fred Campbell (president of the NSW branch of the ALP in the 1950s, ECNSW Commissioner 1950-73).  
 Cliff Dolan (ACTU president, 1980s).  
 Paul Keating (Federal Treasurer from 1982).  
 Laurie Brereton (NSW Minister for Health, Public Works etc, 1982-87).  
 Barrie Unsworth (NSW Premier, 1986-88).

7. The federal government was also drawn into the protracted dispute, first by the action of the Minister for Energy, R.F.X.Connor, in instructing the SMHEA to reduce its output to the NSW grid in order to support the strikers, and then by the offer of the Prime Minister, E.G.Whitlam, to assist with the arbitration process (SMH 29.9.73, 5.10.73).

The Electricians' Award did not incorporate a reduction in working hours until 1982, when the 38 hour week, 19 day month was introduced (Pola 1983,34). Electricians' weekly wage as a percentage of the prevailing basic wage was as follows:

1952	125%
1957	121%
1962	134%
1967	137%
1972	180%
1977	225%
1982	289%

8. The Wran Labor government, for example, passed legislation allowing, and then requiring, county councils to give rebates to pensioners, funded almost entirely by electricity consumers, with only a small contribution from consolidated revenue (NSWPD 20.11.1980,3265). In 1986 the rebates paid to pensioners totalled \$ 21.3 m, of which only \$ 1.9 m was contributed by consolidated revenue. Furthermore, of the \$ 4.4 m paid out by non-metropolitan councils, \$ 2.0 m was subsidy from the metropolitan councils (EnANSW 1987,24,58).

9. The total amounts transferred to rural consumers via the Rural Assistance Subsidy Scheme introduced in 1946, and the Special Assistance Scheme introduced in 1967 was about \$110 m (historic cost) (EnANSW 1986a,14).

10. The \$52 m sought by the government in 1987 from the SCC for transfer to rural councils (SMH 29.7.87) represented less than 5% of the SCC's 1986/87 revenues (SCC 1987, 27).

11. The increased powers which the government gave itself in July 1987 had several immediate advantages. The Minister for Energy, P.F.Cox, was able to direct the SCC to make the payments, and also to specify its tariffs, so that average retail price increases could be limited to 7.5%. At the same time he was able to dampen the opposition of the local government lobby to the increase in government control over the rural county councils, since it was those very councils which benefitted from the funds prised from the SCC.

12. However commonplace these arrangements became, they did not always escape public comment. In a brief show of public defiance of the government, harking back to the heyday of the 1940s, the chairman of the SCC G.F.Moore claimed that the council could not provide the \$82 M in grants and loans required by the government without immediately increasing the price of electricity to raise an equivalent amount (SMH 19.5.87).

13. The ECNSW took operational control of the company and its subsidiary, the Parramatta and Granville Electric Supply Co. Ltd., in November 1950, pending the valuation (ECNSW 1952,10). It became evident that there was a difference of opinion between the government and the company on the interpretation of the 1950 agreement (NSWPD 30.10.56,3508). The ELPSC originally claimed L 10 m, calculated on the basis of the replacement value of its assets, less proper depreciation (ie on the principle of the cost avoided by the ECNSW). The ECNSW claimed that the proper amount was L 1.7 m, on the basis of the capitalised value of the company's profits (ie the value to the seller rather than the buyer). These figures were revised to L 8 m and L 1.9 m respectively after evidence. The Land and Valuation Court accepted the ECNSW principle, adjusted to L 2.4 m. The sharemarket had expected higher - ELPSC shares jumped from 54/6 to 62/- the day before the judgement, then slumped to 47/- (SMH 17.12.55). The shareholders were given debentures, not redeemable for cash until 1965. The SMH contended that this was shabby dealing (SMH 22.12.55). In order to avert a series of appeals which could further delay the company's acquisition by the ECNSW, and the final settlement to its shareholders, the government amended the Act in 1956 to make the 1955 valuation final.

14. Under legislation originally passed by the McGowen Labor government in 1912, the state had operated mines to supply government enterprises, principally the railways, with coal for locomotive and power generation purposes. By 1973 coal-fired traction had been replaced completely by diesel, and the government considered

"...that there would be general advantages in integrating the mining operations of the State Mines Control Authority and those of the Electricity Commission, since it is clear that the authority's main function is now related to the supply of coal for power generation" (NSWPD 10.4 73,4611).

15. Labor made much of the efficiency of the SCC and the sanctity of local government (though it was a Labor government which had originally taken generation out of the hands of the SCC in 1950 and reconstituted all Sydney local government boundaries in 1948).

16. He continued:

"The previous State Government dithered with the idea of establishing an energy authority for three years. The terms of reference given to the committee set up in 1973 to inquire into a proposal to establish an authority revolved more around electricity amalgamations and rationalization of tariffs rather than the wisdom of having a body capable of working out an effective energy policy for the State" (NSWPD 13.10.76,1755).

The 1973 committee comprised the Under Secretary, Department of Mines (chairman), and representatives of the Department of Decentralisation and Development, the Treasury, the ECNSW, and the EANSW.

17. The Act specified seven year terms for commissioners but they tended to be reappointed until they reached the 65 year age limit (which was waived on occasion by special legislation, eg for D.L.McLarty) or died. The first chairman, H.G.Conde, former manager of the ELPSC and former Emergency Electricity Commissioner during

the 1947 supply emergency, served as chairman of the ECNSW until his death in 1959. He was succeeded by another original commissioner, A.W.B.Coady, former under secretary of the Treasury, who served as chairman until 1974. Another long-serving original commissioner was (to 1973) F.H.Campbell, who was associated with the ETU.

18. The members represented the ECNSW, the SCC, metropolitan and country local government, the ETU and the electrical equipment industry. After the formation of the ECNSW in 1950 the chairman of the EANSW was invariably an electricity commissioner, and in 1951 the EANSW staff were placed on the ECNSW payroll (EANSW 1952,5). Originally the majority of members were non engineers, but with time the balance of representation shifted: after 1959 the SCC was represented not by an elected councillor but by its (engineer) general manager, and after 1973 its electricity commissioner chairman was an engineer.

19. The portfolio was allocated to the then Minister for Mines and Assistant Treasurer, W.Fife, and was later restyled the Minister for Mines and Energy (LGEA 1977,15). The administration of the portfolio involved also the Departments of Local Government, which since 1919 had supervised some aspects of county council activities, and of Mines, which in 1972 took over supervision of the gas industry from Local Government (EANSW 1974a,46). These functions were largely transferred to the EnANSW in the late 1970s. The separate control of coal resources by the Department of Mines (later Mineral Resources) created a further division.

20. These were Sydney, Newcastle, Wollongong (to the Victorian border), Northern Rivers (to the Queensland border), Northwest, Central and Murray regions (see map, EANSW 1978).

21. One solution discussed (and dismissed) was the absurdly contrived one of including a portion of Sydney within every area:

"To delineate say 9 areas of New South Wales which would have reasonable load balance, one would need to have areas fanning out over the State from the general Sydney area... It is difficult to see any community of interest or true local involvement in such fan type areas and with huge areas geographically at the periphery of the fan" (EANSW 1974a,38).

22. Hills told parliament:

"Those eleven years of Liberal-Country party government represent the greatest period of wasted effort in the history of the New South Wales electricity distribution industry. That Government established committee after committee but made no decisions on tariff rationalization policy or associated organizational changes...

Thousands of words and thousands of man-hours were wasted while the industry grew larger - nearly doubling in size - and the tariff rationalization problem compounded" (NSWPD 26.11.79,3664).

23. The formation of the LGEA is described by Maiden (1966,312- 319). It was in many ways analogous to the development of the SCC out of the SMC undertaking: an electricity advisory committee formed by resolution of the Local Government and Shires Association in 1948 became an independent Electricity Executive in 1955, and the fully autonomous LGEA in 1960.

24. At the same time the LGEA concurred with the EANSW's recommendations that the general manager system, then unique to the SCC, should become the model for all electricity councils constituted under the Local Government Act (EANSW 1972a,7) - ie that management should have greater independence from the elected councillors.

25. The local consumers were enjoying considerably lower prices than SCC consumers at the time, and ascribed this to the superiority of the locally based undertakings (NSWPD 16.9.52,649).

During the following 4 years, as the ELPSC valuation case dragged on, events appeared to be favouring the expansion of the SCC. The Sutherland Shire and the Bankstown Municipal undertakings found themselves in difficulties and approached the SCC for inclusion, which took place in mid 1955 and the beginning of 1956 respectively (SCC 1956,14). SCC Councillor Jensen (Lab) expressed the view that SCC policy was to take over all councils which requested it, but J.O.Cramer (Ind) wanted another county council set up to compete with the SCC (SMH 23.8.55).

Baulkham Hills Shire also began negotiations with the SCC in 1955 (SMH 9.8.55,4), but was eventually incorporated into the new PCC established in late 1956.

26. In December 1958 the Windsor, Penrith and Liverpool councils commenced action in the Supreme Court to prevent their incorporation in the PCC. The transfer was finally validated at the beginning of 1960 (SMH 2.1.60). The councils' opposition arose both from their wish to remain autonomous and the fact that they were the beneficiaries of historically low bulk supply prices from the Railways, which the ECNSW had undertaken to honour until their expiration in the early 1960s (EANSW 1957a,29).

27. In general they succeeded reasonably well in keeping domestic tariffs close to the SCC's. Typical SGCC and MCC domestic consumers paid about 20% more than in the SCC in the early 1960s (SMH 24.5.61). By 1974 the difference had been reduced to 4%, but achieved at the cost of about 10% higher business tariffs than in the SCC (EANSW 1974a,36).

There were other aspects of rivalry as well; in 1967 both the SCC and SGCC claimed the right to supply the extensions to Sydney airport, causing delay to the project (SMH 27.4.67).

28. According to P.D.Hills.

"...the St George County Council has been leading the campaign for an open inquiry. It is a past master at the art of using this technique to stall or stymie positive action. It was the St George County Council that sponsored the original motion within the Local Government Electricity Association, leading to an earlier inquiry. On this occasion that council's demand for an open inquiry is allied to the St George parochial pride. It has made no attempt to co-operate in the tariff rationalization problem, but has chosen to mislead its consumers, in the most outrageous fashion, into believing that the Government has selected St George County Council for special attention. Opposition members and many of the St George consumers have been hoodwinked by the plea for an open inquiry. Fortunately the industry could see through the ruse. After more than a decade of continual inquiries into tariff rationalization, it is sick of inquiries. It is time to take some action" (NSWPD 26.11.79,3664).

29. This was not the first time differences had emerged between the SCC and the other distribution authorities. In 1969 and 1972, SCC councillors put to the LGEA a radical proposal for the abolition of the then 39 county councils and their replacement by seven or eight area boards (DT 25.6.69,SMH 4.5.72). The proposal was overwhelmingly defeated. SCC councillors D.B.Carruthers and G.I.Ferris commented:

"It is clear to me that most of the opposition revolves around the fact that you don't want to vote yourselves out of office...

The consumer should come first, then the local government institution, and only then the elected representatives and staff - unfortunately, this works in reverse sometimes" (SMH 4.5.72).

30. The Minister responsible for implementing these changes, P.F.Cox, was careful to point out in a speech to Local Government Energy Association delegates:

"Firstly the proposals in no way involve the amalgamation of existing electricity councils" (LG Bulletin June 1987,24).

The only boundary changes associated with the new legislation was correction of a historical anomaly: the transfer to the PCC of the part of the City of Parramatta which had gone to the SCC as a result of the public acquisition of the ELPSC in the 1950s.

31. A 1986 report to the EnANSW considered three broad options:

- a) combination of the SCC, PCC, Shortland and Illawarra county councils
  - b) splitting the SCC into two or more bodies
  - c) transferring parts of the SCC's perimeter to the three neighbouring councils
- (EnANSW1986b,69).

The first option was discarded because it would create even greater disparities between the dense load areas and the rest of the state. The other options resulted in a smaller SCC, but an overall enhancement of its already strong financial position at the expense of the less well off neighbouring county councils (ibid,79).

32. The relative load densities were (Source: EnANSW 1986b, Appendix 7):

	Area (’000 sq km)	Consumers (’000)	Consumers/ sq km
SCC (1987)	3.5	998	285
PCC (1987)	16.0	412	26
NSW (1984)	694.5	2177	3.1

33. The 1980 amalgamations were not without some financial and personnel costs to the SCC (SCC 1980,6). References to the amalgamations still appeared occasionally in the Sydney suburban press years later, eg "Pat on the Back for SCC" (Lakes Advocate, 29.4.87): a former BWCC member and now local delegate to the SCC detailed a list of major projects undertaken in Wyong since amalgamation, saying "it would have been impossible for the former county council to have carried out so many big projects in the seven years". Also Central Coast Express (Gosford) 12.8.87: a local Liberal candidate for state parliament claimed that the promises of stable prices given to locals at the time of the BWCC's abolition had not been honoured.

34. Over half the NSW electricity use was concentrated in Sydney, and the inherently lower cost of supply there subsidised grid expansion and prices in other regions. In 1979, the year before both councils were enlarged, the SCC sold 40% of all electricity retailed in NSW; the PCC was next with 16% (EnANSW/EFS 1979,9). After the 1980 amalgamation the shares increased to 46% and 19% respectively in 1981 (ibid 1981,9).

35. One of the grounds on which the LCP government justified its attempted (unsuccessful) intervention in 1965 was the fact that it wanted the SCC to give more support to business consumers (NSWPD 1.12.65,2621).

36. Each reconstitution diluted the power of the City Council, which elected the councillors to the 'first constituency' of the SCC. From 1935 to 1947, 2 of the 5 SCC councillors represented the first constituency. From 1948 to 1968 it was 3 of 9, then 1 of 9 and, after 1980, 1 of 16. This reflected the relative growth of the suburbs, the progressive incorporation of neighbouring electricity supply councils, and deliberate policy of governments to reduce the influence of the City Council if it happened to be controlled by their political opponents.

37. Non-aldermen SCC members on the labor side included trade unionists, parliamentarians, Labor Council officials and failed candidates in City Council elections (SMH 20&21.1.60).

On occasion the pre-selection battles, expulsions for breeches of caucus solidarity and factional in-fighting on the Labor side mirrored party events at the state level. In 1955 an expelled Labor SCC councillor, F.Green, was manoeuvred into the chairmanship by the Independents (SMH 11.1.55). In 1971 two members of the left-wing Labor faction which won control of Leichhardt Council stood unsuccessfully against two sitting Labor SCC councillors.

Independent non-aldermen have also been elected: in 1969, only 3 of the 9 councillors (7 independent to 2 Labor) were aldermen (SMH 26.1.71).

38. The career of C.E.Ranger, general manager from 1952 to 1965, was surrounded by almost as much public controversy as that of Forbes Mackay. He was appointed in July 1952, by block vote of the Labor councillors, but they had cause to become increasingly wary of him.

Ranger's appointment was called "political" by J.O.Cramer, one of the minority Independents, who called for an inquiry by the Minister for Local Government (SMH 26.7.52, 6.8.52). Cramer contended that there were three staff members senior to Ranger, and that

"...because the SCC no longer controls the production of electricity but is now only a power distributor a commercial man should be general manager" (SMH 26.7.52).

Cramer also alleged collusion between Ranger and Maguire, who both belonged to a union affiliated with the one of which R.A.Triggs, a Labor SCC councillor, was secretary (SMH 19.8.52).

In the late 1950s Ranger tried to moderate Labor policies by recommending that domestic consumers should bear their fair share of rises when necessary, and industrial consumers should benefit from reductions when possible (eg SMH 9.4.58). In 1960 he appointed as his deputy F. Maguire, one of the best informed critics of the SCC's policy of preference for domestic consumers (SMH 30.10.56,28.6.60). The dispute over Ranger's power to make

the appointment raised important issues concerning the balance of control in local government electricity distribution.

The Labor councillors asked the Minister for Local Government for amending legislation to transfer some of the general manager's powers to the council: one of them, T.I. Morey, claimed that Ranger was a "dictator" and that members were "mere rubber stamps", terms almost identical to those used to criticize Forbes Mackay some 25 years earlier. The Labor councillors called on the Minister, P.D. Hills, to bring the SCC within the Local Government Act, a move which Hills had supported when he himself had been chairman of the SCC in 1951 (SMH 30.6.60).

Ranger received public support from several influential quarters, including the leader of the opposition, R. Askin (SMH 29.6.60), the former Professor of Public Administration at Sydney University, F.A. Bland (SMH 1.7.60), the Sydney Morning Herald (eg SMH 7.10.60) and, eventually, P.D. Hills himself (ibid). In one of its many editorials on the subject, the Sydney Morning Herald commented:

"One wonders, in fact, whether councillors have anything better to do than to intrigue against Mr. Ranger and in favour of their own self-aggrandisement. If this is the sum total of their useful activity, there seems to be no point in having any councillors at all" (SMH 17.1.61).

When Ranger retired in 1965, the SCC appointed as his successor the chief engineer, G. Washington, who like Ranger had spent his entire working life within the undertaking (SMH 10.11.64). Ranger's protege and deputy, Maguire, resigned from the SCC and wrote a number of detailed articles on the costs which local government policies were imposing on the NSW electricity system (eg Maguire 1966).

The differences between SCC councillors and general managers became less pronounced, or at least less public, with Ranger's retirement. Neither Washington nor his successors, R.W. Mitchell (1971-79) and F.J. Rainbird (1979-87) were associated with the same level of public controversy.

39. There were regular public calls in the mid 1950s for the SCC and the ECNSW to be merged into a single organisation, at least in the metropolitan area.

40. The actual cost of supplying electricity to any consumer or class of consumers varies from time to time, with many factors including the extent of demand by all consumers and the operating characteristics of plant installed. Residential loads such as water heating, cooking and space heating (in temperate climates such as Sydney's) tend to be costly for the generating system because relatively small amounts of energy are needed during brief periods when the demands of all householders tend to coincide. Therefore the plant installed to meet these daily and seasonal peaks tend to be under-utilised and costly to run. If the price to the users does not reflect the true cost, the net losses to the system arising from peak consumption must be made up by charging more than the true cost to domestic consumers at other times (setting average price to cover the peak costs) or by subsidising them at the expense of consumers with less peaky loads.

41. The NSW average load factor for the period 1978-1984 was 52.2% on average, and declining. Victoria's was 63.5% and also declining, while Queensland's was 59.2% on average and rising sharply (Garlick 1986,3). Significantly, only in NSW was the rate of increase in residential prices over the period lower than the rate of increase in all prices.

42. Areas with a high proportion of residential usage typically have a lower load factor. In 1984, when the load factor of the entire NSW system was 50.6%, that of the SCC was 46.0% and the PCC, with its greater proportion of residential consumption, only 43.7% (EnANSW 1986b,63). The former BWCC area, then within the SCC, had a load factor of only 39.0%. By contrast the ICC, with a similar balance of energy sales and prices to the SCC, had a much higher factor of 52.3%, suggesting that specific local factors, such as the historical promotion of peaky residential loads in competition with the gas company were partly responsible for the lower efficiency of capital utilisation in Sydney.

The SCC's load factor declined through the 1960s, and then recovered somewhat to stabilise around the state average in the 1980s. The PCC load factor followed a similar trend to the SCC's, though well below it because of the greater residential proportion of load. The three smaller councils with predominantly residential loads had still lower load factors. The NRCC's large industrial sales component gave it the highest load factor.

43. In 1982 the ECNSW introduced features in the BST to better reflect seasonal and time of use cost variations, yet in the SCC this resulted in a greater price increase for non-residential than for residential consumers.

The government experimented briefly with a domestic tariff structure in which the more energy used, the greater the average price (the so-called "inverted tariff"). Introduced during 1982 in the aftermath of the Liddell plant failures, and associated in the public mind more with those than with the long term economics of electricity supply, this was abandoned at the beginning of 1985 in favour of a flat rate for most residential consumers (EnANSW 1985,27).

44. The Industries Assistance Commission found evidence that industry development in all states was being impeded by power pricing policies which subsidised residential consumers (Melbourne Age,8.4.87).

45. Electricity generated by ECNSW, 1985/6:

	GWh	%
Steam plant	38359	92.9
Own hydro	292	0.7
Snowy purchases	2613	6.3
Gas turbine & internal combustion	13	0.03
TOTAL	41277	

Source: ECNSW 1986,102 (but note p 15: "91.8% of the electrical energy supplied to the NSW system was generated by coal-fired power stations")

46. Millions of Locomotive-miles, NSW (% of total)

	Steam	Electric(a)	Oil(b)	Total
1955/6	33.9 (69.3)	9.9 (20.2)	6.1 (12.5)	48.9
1961/2	15.3 (33.6)	13.5 (29.7)	16.7 (36.7)	45.5
1967/8	4.2 (8.6)	13.2 (26.9)	31.6 (64.5)	49.0

(Source: Department of Railways reports)

a. Metropolitan and inter-urban electric, and electric locomotive.

b. Diesel-electric, rail motor, rail tractor and diesel-hydraulic.

47. The transition from electricity to oil did not pass entirely without comment. A.H.Wilson, Professor of Mechanical Engineering at the NSW University of Technology wrote

"...oil supply is perhaps the most vulnerable point in our national security...Our railways should discount much of the technical superiority of diesel over electric traction on the ground of precious fuel supplies. Electric trolley-buses are immensely superior to the automotive type. Much of our road transport, particularly delivery vans, could be battery driven" (SMH 14.5.55).

48. Before 1966, when the EANSW began to publish collected statistics in its annual reports, the only sources of electricity sales data disaggregated by consumer classes were the annual reports of the retailing organisations, most of which no longer exist. Sydney electricity consumption from 1936 to 1986 is given in Table 6.5.

49. Total NSW sales declined 2% from 1981/2 to 1982/3, then recovered strongly, growing 6.7%, 8.3% and 8.3% in each of the following years to 1985/6. General system growth (excluding aluminium smelters) was about 3% per annum after 1982/3, rising to about 4% in the later part of 1985 (McDonell 1986).

Electricity sales by region and annual % increases, 1981-6:

	Sydney (a)		Rest of NSW (b)	
	GWh	%	GWh	%
1981	17355		9260	
1982	16829	-3.0	9575	3.4
1983	17136	1.8	9765	2.0
1984	17606	2.7	10141	3.9
1985	18472	4.9	10737	5.9
1986	19047	3.1		
(Average 1981-5)		1.6		3.8

a. Source: SCC reports and PCC reports

b. Source: EnANSW/EFS; excludes traction and other direct sales by ECNSW

50. Ratio of annual Sydney electricity consumption to production of power stations located in the metropolitan area:

1954	1.00	(Sykes 1960,140)
1958	0.75	(Wilson and Burke 1964,192)
1962	0.32	(calc. from ECNSW 1962, SCC 1983)
1965	0.10	(ECNSW 1965)
1970	0.04	(ECNSW 1970)

Production by ECNSW power stations (ECNSW 1962, 1965):

	1962	(GWh)	1965
Sydney stations	1668		651
Tallawarra	2075		1942
Wangi	2027		2087
Wallerawang	1379		1496
Vales Point	-		3267
TOTAL (inc hydro)	8106		10418

Years of decommissioning (McDonell 1986,1,88):

	YE Jun
Ultimo	1964
Balmain	1970-77
White Bay	1976-84
Bunnerong	1977-81
Pymont	1984

In the aftermath of the Liddell power station failures in 1981/2, Pymont and White Bay sent out 468 GWH, more than in 1969. In 1986 it was reported that the gas turbines at Bunnerong were to be relocated, so leaving all four Sydney sites vacant and available for redevelopment (SMH 28.2.86).

51. The government released the recommendations of the inquiry in March 1987, over a year after it received them (SMH 25.3.87). The ECNSW strongly attacked the recommendations, and claimed that there could be "serious power shortages" within 12 years if it were deprived of the Mardi site and forced to modify its construction programme. The Minister for Energy, P.F.Cox, publicly criticised the ECNSW for being alarmist, especially at a time when it had "a very expensive plant reserve, approaching 70 per cent" (SMH 16.4.87). It was a rearguard action on the part of the ECNSW. The Government restructured the Commission in July 1987.

Reliability, quality of supply and environmental effects were also important ECNSW planning criteria (Aston and Wilson 1964,297). The standards for each of these was left largely to the ECNSW's discretion. As long as the real cost of energy production was falling, the ECNSW could afford to, and did maintain high standards of reliability, even though this increased the cost of reserve plant as a proportion of the cost per unit of energy. The simultaneous exhaustion of cost reduction trends and the decline in load growth in 1982 exposed the extent and cost of the massive excess capacity to which the ECNSW had committed itself.



In 1964, the ECNSW was working to a reserve capacity of 6% of maximum demand plus the capacity of its largest unit (Aston & Wilson 1964,298). Had the same standard applied in 1987,

660 MW (largest unit)  
 + 540 MW (6% of max demand)  
 = 1200 MW, ie 13.3% of max demand.

In the event the reserve margin was never below 35% (in 1981) and reached a maximum of close to 75% in 1975 (McDonell 1986,I,93)

52. The manning levels in pre-war power stations were about 3 persons per MW, compared with 0.4 persons expected at Vales Point, with 200 MW sets (Sykes 1960,143). Sykes at first expected scale economies to be largely exhausted at 200 MW, and that the capital cost reduction per MW would reduce only 7% with further scales increases to 550 MW. In an addendum to his original paper he revised this to 20% (ibid, 148).

Tallawarra (100 MW sets, completed 1961) had a manning level of 1.4 persons per MW. This had fallen to 0.36 at Liddell (500 MW sets, completed 1973) but declined no further at Eraring (660 MW sets, completed 1984) (ECNSW 1983a,23).

There were substantial improvements in plant design in this period, and thermal efficiency improved from 20% on a sent- out basis in 1954/55 to 32% in 1982 (ibid).

53. The ECNSW planned to obtain 25% of its capacity and 15% of its energy from there in the 1960s (Sykes 1960,138). The mutual importance of the Snowy to the peak power needs of the ECNSW was recognised by planners on both sides. The Commissioner of the SMHEA wrote in 1962:

"The economy of the scheme is judged by its ability to supply peak power to the States at a lower cost than that of alternative thermal power of an equivalent load factor. The costs attributable to irrigation must be included in the cost of electricity production" (Hudson 1962,110).

54. The popular and the professional press in NSW showed considerable interest in nuclear power in the 1950s and early 1960s, but opinion in the latter at least was generally circumspect:

"Having regard to the time required for nuclear developments, it can only be concluded that there is little or no likelihood of nuclear power becoming economically favourable in the New South Wales power system before some indeterminable point of time beyond the year 1975" (Sykes 1960,146).

In April 1987 the chairman of the Australian Nuclear Science and Technology Organisation, the newly created successor to the Atomic Energy Commission, was reported as saying that Australia would not need nuclear power stations for the foreseeable future (Australian 28.4.87). It is fair to say that the NSW government did not change the course of the state's electricity generation development when it passed the Uranium Mining and Nuclear Facilities (Prohibition) Act 1986, which prohibited the construction and operation of nuclear reactors for the generation of electricity in NSW. (EANSW 1987,53).

During this period the ECNSW system also used small quantities of petroleum to fuel remote internal combustion plant, most of which were shut down as the grid advanced, and emergency gas turbines.

55. The Commonwealth committee concluded, rather cautiously, that

"New South Wales, Victoria and South Australia should actively pursue the development of an appropriate basis for the establishment of a limited extension of the existing New South Wales/Victoria interconnected system to South Australia and for the subsequent development of that interconnection as the parties deem appropriate" (Zeidler 1982,I,57).

The McDonell inquiry was more positive, noting that

"Within the interconnection with the Snowy Mountains Scheme and with other States...there are prospects for future development which, if realised, would have considerable benefits for NSW and which could have the effect of deferring the need for major new base load plant" (McDonell 1986,I,12).

The prospects for interconnection of the three state systems in fact advanced considerably in 1987. The Victorian and South Australian governments agreed on a route for a 275kV link between their systems, and the ECNSW agreed to contribute a small proportion of the cost, in recognition of the greater scope for importing lower cost energy during peaks on the NSW system (Business Daily 23.7.87). The possibility of building the next base load station after Mt Piper at Oaklands near the NSW border, at a time which suited the needs of both the ECNSW and the SECV, was also discussed (ibid,131).

56. Reliable and consistent ABS statistics on appliance penetration rates are only available toward the end of the period, but there is sufficient information in the censuses and in marketing surveys to follow the penetration curves of key appliances and fuels. Most appliance ownership rates show a classic exponential saturation curve over time (see Australian Minerals and Energy Council 1983) so some estimate of ultimate saturation rates can be made if two or more data points are available. The following information sources are the most useful for plotting NSW appliance saturation curves:

National Household Energy Surveys for 1980, 1982/3 and 1965/6 (ABS 1981, 1984a, 1987a), though these are not all consistent in survey formats or methodology

NSW Energy Survey 1984 (ABS 1985b)

Australian Women's Weekly (1963) special report has estimated ownership tables for most large appliances to 1962, and projections to 1970. Also refers to specific marketing surveys, mostly covering single years.

The 1947 and 1976 censuses surveyed the form of energy used for cooking, and the 1961, 1966 and 1971 censuses surveyed the ownership of television sets.

57. On the relative benefits household electrification for men and women see, for example, Arnold and Burr (1985).

58. ABS (1981,3) indicates that 99.4% of NSW households had an electric refrigerator, and 3.2% a non-electric one. ABS (1984a,7) gives numbers of households with one and with more than one refrigerator. If "more than one" is taken to be 2, then the average NSW and national ownership is 1.22. This is conservative, as some households will own more than 2.

Freezer purchases may be delayed or avoided by combined (ie 2 door) refrigerator-freezer purchases. ABS (1984a) gives the percentage of NSW households with at least one 2 door unit (ie 2 door + combination/total refrigerator owning households) as 55.1% in 1983. By 1986 this had increased to 61.0% (ABS 1987a).

59. The cooker was the most common gas appliance in gas- connected households in 1947, and in 1983, when 90% of gas- connected households used gas for cooking (ABS 1984b,9). Abandonment of gas cooking usually meant abandonment of gas altogether.

60. Space heating was the one market in which reticulated energy had serious competition. Oil heating enjoyed some popularity in the 1960s, but was fast disappearing in the 1980s. At the same time as many Sydney households heated with traditional solid fuels, predominantly wood, as with gas.

61. ABS (1987a,1) reported a decline in "regular" (more than once weekly) use of electric frypans and skillets, from 40.2% of households in 1980 to 38% in 1983, and a decline in regular vertical grill use from 8.9% to 6.9%. While almost 70% of households had an electric frypan and over 15% a vertical grill, half of owning households used them less often than once a week.

62. Number of broadcast licences (AYB):

1930/1	331128
1936/7	938297
1945/6	1506180
Dec 1951	2245307

This may underestimate actual radio ownership figures, because not all households would have obtained a licence (Gilbert at al 1987,IV, 365).

63. Isolated rural households made particular efforts to maintain batteries or pedal generators (ibid).

64. On the relations between local TV manufacturers (who wanted high tariff protection), the TV stations (who wanted cheaper sets for rapid market penetration), the Commonwealth Government and the Industries Assistance Commission, see Rattigan (1986).

65. In May 1987 the SMH reported the availability of an hour- long video cassette of an open fire, with stereo sound (SMH 25.5.87). Its was entitled "The Burning Log". "Fish Tank Tele" was also available.

66. Electricity demand forecasts for 1985/6 (EnANSW 1985a):

Iron and Steel	4.9 PJ
Aluminium smelters	16.8 PJ
	21.7 PJ (6028 GWh)

Industrial electricity demand in "rest of NSW" 1986 was 19212 GWh (see Table 6.5).

67. Industrial self-generation, NSW (BRE 1987,62, ESAA, EANSW reports), GWh:

	1960/1	1984/5
Private generation	929 (24%)	1099 (6%)
Industrial Sales	2889 (76%)	17700 (94%)
Total	3818	18799

No transmission losses assumed for self-generated energy.

68. Only the following declines have been recorded in Sydney and whole of NSW industrial electricity demand:

Sydney		Whole of NSW	
1961	1.7%		
1975	4.4%	1974/5	0.9%
1982	4.3%	1982/3	5.1%

69. The most electricity-intensive of the industries primarily located in Sydney were food, beverages and tobacco; textiles and clothing; petroleum and chemicals; fabricated metal products, machinery and equipment. The energy demands of the last group were roughly in the proportion one third power to two thirds process heat (EnANSW 1981b,20).

70. The role of coal in gas-making declined during the 1960s. The carbonisation of coal brought from the northern coal fields had been the technological basis of the Sydney gas system since the 1840s. In 1900, AGL introduced the less labour-intensive but more fuel-intensive carburetted water gas process, to make gas from coke enriched with oil, to supplement production during peak times (Broomham 1987,98).

71. The company had watched with interest as explorers tried to find natural gas in the Sydney basin (Sun-Herald 4.5.58). Its interest quickened with the first Australian discoveries of natural gas in Queensland in December 1961, and in 1964 it sponsored the formation of the Australian Natural Gas Development Association consisting also of major banks, insurance companies and the Gas and Fuel Corporation of Victoria (Proudley 1987,246). Esso-BHP made a large discovery of gas in Bass Strait in early 1965, and in November 1966 reached agreement with the GFCV for a long term supply contract (ibid,255).

AGL also commenced negotiations with Esso-BHP in 1966, and later with a consortium of Santos and other producers who had found gas in northeastern South Australia. The negotiations with Esso-BHP were eventually abandoned in 1970, partly because of Esso-BHP's insistence on direct supply to major industrial consumers (Broomham 1987,193).

72. One of the policies of the Whitlam Labor Government elected in December 1972 was a publicly owned national pipeline grid. It established The Pipeline Authority and took the construction of the Moomba to Sydney pipeline out of AGL's hands. Further delay was introduced when in 1973 the NSW government instituted a Public Environmental Inquiry which resulted in a change of pipeline route, from across the Blue Mountains to a more southerly route (Broomham 1987,195).

## CHAPTER 7 NOTES

1. One effect of this was a fall in manufacturing employment from 30.6% of the Sydney workforce in 1971 to 24.2% in 1981, and a rise in community and financial services employment from 21.1% to 28.6% over the same period (Fagan forthcoming, 11).
2. The information technology sector accounted for 25% of GNP in OECD economies by the early 1980s, and the proportion was projected to rise further (Kimbél/OECD 1987, 17).
3. More than any in other state, the NSW energy system clearly displayed another form of "parochialism" in the organisation of physical infrastructure, as identified by Power:

"We often hear complaints about undue fragmentation of our cities into small areas administered by parochial local Governments, but we hear rather less of what Wettenhall has called the functional parochialism of the guild [engineering] authorities and departments. In my opinion, this latter type of parochialism is probably of greater significance" (Power 1974, 304).

4. The authorities with poor load balances and low consumer density were amalgamated one by one into more financially stable units. Amalgamation was the main technique used by state governments to manage the distribution system until 1980, after which further reduction in the number of authorities offered no significant advantages over a single state authority. The state then turned its attention to unifying tariff structures as much as possible and then reviewing the operational and financial efficiency of each county council; it acted through the agency of the EnANSW.
5. Under the Local Government Act 1919, county councillors were nominated and elected by the councils of their municipalities and shires, not by the ratepayers directly.
6. In mid 1987 the Unsworth Labor government amended the electricity legislation to give the state power for the first time to co-ordinate planning throughout the entire electricity system, including the ECNSW. In 1988 the succeeding Greiner LNP government disbanded the Department responsible for administering the legislation.
7. The notion of public ownership of utilities was part of the political legacy of the United Kingdom, and in the Australian colonies at least public ownership of electricity supply advanced even faster than in Britain. While the British electricity supply industry was fully nationalised by the Electricity Act 1947, the NSW industry was in predominantly municipal ownership from the 1900s, and the pressure for nationalisation (ie full state ownership and control) was directed only at the few remaining private companies (especially the ELPSC).

The return of public utilities to private shareholder ownership became an issue in Australia in the mid 1980s, following the actions of the Thatcher Conservative government in Britain and the Lange Labor government in New Zealand (see for example 'Public Management Forum: Guidelines for Government Business Enterprises' *Australian Journal of Public Administration*, Vol XLV, No.4, December 1986, and Porter, 1986).

The issue touched the NSW electricity supply system directly after the election of the Greiner LNP state government in March 1988. A special report on the state's finances commissioned by the government recommended:

"The Government should move to corporatise its Statutory Authorities in order to improve services and returns on investment and to prepare the way for privatisation of those areas which can be operated efficiently and competitively by the private sector" (NSW Commission of Audit 1988, I, 55).

The report also recommended that the ECNSW's coal mines, a coal washery and the incomplete Mt Piper power station should be sold to the private sector, and that Mt Piper should be able to sell electricity independently of, and in competition with, the ECNSW (*ibid*). The report is silent on the efficiency of the county councils, considering them municipal rather than state owned enterprises.

## APPENDIX: A NOTE ON SOURCES

This thesis necessarily draws on a range of sources beyond the available literature on Australian electrical history, with its narrow emphasis on technological and institutional development. There is a wealth of qualitative information on the evolution of local energy demand, since almost every major development in the technology of the dwelling, of industry and of transportation has been associated with changes in the techno-energy system. The development of the supply and demand elements of the Sydney electricity system is well documented, albeit from a variety of sources which require considerable assimilation and reconciliation, especially of quantitative data.

Information on the governmental and political aspects of electricity supply is also readily available. While there are no specific studies of the politics of electricity supply in NSW, general political histories provide the background to those state and local government decisions about electricity which have proved crucial. Fortunately, most aspects of electrification have captured the public interest, making the popular press an invaluable source on novel technical developments, personalities and political conflicts.

### History of Energy Systems

There are relatively few comprehensive historical, theoretical or analytical works on electrification and its impact on society. Nevertheless, the wide range of material on general energy topics, urbanisation and technological history, used selectively, provides a solid basis for local studies.

The oil supply crises of the 1970s resulted in an explosion of interest in the global energy system, focussing at first on petroleum as a strategic commodity in global trade and in national economies (eg Odell 1970). This interest was given an urban dimension by the fact that most developed cities relied, then as now, on petroleum powered transportation. The emphasis of many studies was mathematical and prescriptive:

"Most existing urban energy studies concentrate on particular processes, such as transportation, abstracted from the spatial context of the city. They deal with them strategically, often with the assumption that great change is possible in urban structure, through growth or massive internal rearrangement. They tend to ignore critical variables...[and]...assume that reducing energy use is the dominant, if not the sole objective of urban planning" (Wilkenfeld 1980,21).

This emphasis was sometimes shared by studies at the state or national level. A notable Australian example is the *Seeds for Change* study of the Victorian and Melbourne energy systems by the Conservation Council of Victoria (1978). Whatever the limitations of such studies, they quantitatively disaggregated energy markets into subsectors of demand in a way unprecedented in studies of individual fuels or supply technologies. *A Low Energy Strategy for the United Kingdom* (Leach et al, 1979) established a systematic classification of energy use in the entire UK economy.

There are some monographs on longer term techno-energy changes in society, such as *Man and Energy* (Ubbelohde, 1954). Economic historians acknowledging the importance of energy include Cipolla (1974, Ch2), Landes (1969) and Braudel (1973). The treatment of energy among urban historians is more patchy. Mumford explicitly addresses some of the relationships between cities and energy in *The City in History* (1961). Histories of specific modern cities often yield considerable information on the development of their energy systems, even if the systems themselves are not explicitly recognised (see for example Cannon's *Life in the Cities* (1975) and Spearritt 1978).

Interest in the history of particular national or urban energy systems is relatively recent. Important articles on aspects of American energy history have appeared from time to time in the

*Journal of Urban History* (eg Rose and Clark 1979) and *Technology and Culture* (eg Bose et al 1984). Quantitative local energy history is even more rare. Long term time series on household energy consumption in the USA have been developed by Morrison (in Daniels and Rose, eds, 1982).

There are brief historical sketches on the development of the Australian energy system in Corbett (1976) and Saddler (1981). Comprehensive cross-sectional studies of the Australian energy system in 1888 (Davison 1982) and of the Sydney energy system in 1970 (Kalma et al 1972) have also appeared. There are a number of useful entries on individual energy industries in the *Australian Encyclopaedias* (1925, 1954, 1983). The best sources of quantitative data on Australian and NSW energy production and consumption are the *Returns of the Colony of NSW*, and later the NSW and Australian *Statistical Yearbooks*, but the data are not always disaggregated at the urban level. The time series of energy use in Sydney in this thesis are mostly built up from the records of the supplier organisations, some of them unpublished.

## Energy Demand

Information on the development in Australia of the residential, industrial, commercial and transportation energy markets is readily, albeit sometimes indirectly, available. Virtually all histories and contemporary accounts of technological innovation in the household and the workplace yield some material on patterns of fuel use.

Information on household energy use before the first world war is the most diffuse, in that small items of information are distributed throughout a wide range of sources. The recording of domestic regimes suffered, perhaps, from familiarity. Detailed descriptions of the organisation of households too humble to have servants were rare. The important role of servants in the organisation of middle-class households 19th century Sydney is apparent from the census statistics on servant numbers (see, for example, Mansfield's 1841 analysis) and from the accounts of contemporary social commentators such as Twopeny (1883).

Domestic technology in Australia changed slowly before the period of household electrification which commenced after world war two. It was based on traditional British modes of household organisation, modernised by imported or adapted technologies such as gas cooking. Histories of housework and domestic technology in Britain, such as those by Davidson (1982) and Yarwood (1983) have direct applicability to Australia. The history of particular types of domestic energy equipment in Australia can be followed in works such as Cuffley's catalogue of oil and kerosene lamps (1973). The introduction to Sydney of particular items of equipment throughout the 19th century can be dated through articles and advertisements in the daily press and in the women's journals which proliferated towards the end of the century.

A large proportion of Australian household energy demand revolves around the preparation of food. Contemporary cookbooks (eg Wicken 1891) and modern histories of Australian eating habits (eg Symons 1984) are fruitful sources for tracing energy use in cooking. Farrer's account of food technology in 19th century Australia (1980) links industrial and domestic energy use, through the development of such technologies as canning and refrigeration.

Apart from food preparation most household energy is consumed for space and water heating. The amount and type of fuel used in these activities is reflected in the evolution of service rooms such as kitchens, laundries and bathrooms, which is treated by historians of Australian domestic architecture such as Boyd (1962) and Evans (1983).

A good overview of the increase in electrical appliances in NSW households is that of A. Spearritt (1983). Data on the post 1945 production and sales of domestic electrical appliances is available from the publications of the various Commonwealth government departments concerned with industrial development and tariff protection. The censuses from 1947 yield regional data on the energy sources available to households, and fuels used to meet major demands such as cooking. Comprehensive national household energy surveys, of all appliances held, were conducted by ABS in 1980 and 1983.

The location and power sources of Sydney's earliest industries were mentioned in the correspondence of colonial officials, collected in the Historical Records of Australia. From the early 1820s, the numbers, sizes and locations of windmills, steam engines and factories can be traced in the *Returns of the Colony of NSW*. The *Sydney Gazette*, and later the *Sydney Morning Herald*, are also useful sources on the key events in the development of the industrial energy market. The *SMH* also printed several detailed reviews of particular industries, including weaving, flour milling and shale oil extraction, during the 1870s. The most useful of the large number of secondary sources include Walsh's article on the geography of manufacturing in Sydney (1963) Linge's *Industrial Awakening* (1979), and Coghlan's invaluable *Labour and Industry in Australia* (1918).

The demand for office, warehouse, shop and street lighting was particularly significant. This was the energy market through which gas and electricity were first introduced to Sydney. The state of public lighting was well covered in contemporary press accounts, often as a matter of civic pride. The commercial architecture of the late 19th century embodied some of the most progressive technology in Sydney, and the building trade journals of the period document local advances in the production, distribution and application of gas, electric and hydraulic power. Architectural histories of Sydney's commercial buildings (eg Balint et al, 1982) are useful secondary sources.

Transportation has always been one of the largest sectors of energy demand in Sydney and one of the most difficult to estimate. The number of horses and vehicles in public and private use is available in the statistical returns, but their level of activity, and the geographical area in which they operated, is not consistently reported. With the introduction of the railway in 1855, the government itself became the major innovator in transportation technology, as recorded in the centenary volume, *The Railways of NSW* (Paddison 1956). The annual and special reports of the Railway Commission enumerate the passengers carried by the metropolitan railways and, later, tramways. The accounts do not, unfortunately, record the actual quantity or value of the energy consumed (mostly coal) until the introduction of electric tramways in 1899.

The importance of electric traction, so significant in stimulating the electrification of Sydney, declined with the introduction of private, petroleum-powered transport. This decline, illustrated in the official statistics on public transport usage and private vehicle registrations, is analysed by Spearritt (1978), Spearritt and Wells (1984) and Hovenden (1981).

## Energy Supply

During the 19th century, the steam engine transformed both industrial production and transportation throughout the developed world. Gas reticulation and later electro-technology transformed urban energy systems. These key energy supply technologies were global, in the sense that they diffused rapidly and many countries contributed to their development. The history of steam, gas and electricity in Australia is inseparable from this pattern of innovation, which is admirably covered in reference works such as the *Oxford History of Technology* (Singer et al, 1958).

The development of NSW energy industries such as coal, whaling and tallow was covered in the reports of Collins (1798) and the special commissions set up from time to time (eg 1823). These have included Royal Commissions into the NSW coal industry in 1919 and 1930, and into the gas industry in 1918 and 1950. There are numerous sources on the development of individual coal producing regions and companies (eg Ellis, 1969).

The many histories of electro-technology tend to be coloured by their national origin. The British view of Dunsheath (1969) and Singer (1958) may be contrasted with the American view presented in Brittain (ed, 1977). Hughes (1983) gives a balanced account of all major contributions, including the European.

Overseas innovations and local developments in energy supply technology were often the subjects of papers read before the early engineering societies of NSW, the first such organisations in Australia. The papers published from the late 19th century to the present as proceedings of the Engineering Association of NSW, the Sydney University Engineering Society and the Electrical Association of NSW and later the Institution of Engineers, Australia are valuable sources. Developments in gas and electricity supply were widely reported in the building trade journals and even, at surprising technical length, in the Sydney dailies and in popular magazines such as the *Illustrated Sydney News* and *Town and Country Journal*.

There are few comprehensive histories of gas or electricity supply in Australia. Keating (1974) provides a brief historical overview of the gas industry, and Allbut (1957) of public electricity supply. Historical sketches have also appeared from time to time in gas and electricity industry journals (eg Smith 1924, Smedley 1941). Saddler (1981) and McColl (1976) preface their more general analyses of the politics and economics of energy supply in Australia with some historical background. So do Rosenthal & Russ (1988), but they miss the opportunity to fully draw out the implications of history to support their overview of the Australian Electricity supply industry in the 1980s.

Institutional histories, and biographies of individuals prominent in the major energy supply industries, are useful secondary sources. Allowance must be made, however, for their restricted and selective emphasis, especially in the case of official institutional histories. Writers on the origins of the Australian Gas Light Company include Ginswick (1960) and Lukey, the company secretary, writing on the occasion of its 60th anniversary. A useful historical sketch of the Australian petroleum industry was published by the Petroleum Information Bureau (1960). Broomham's official history of AGL on the occasion of its 150th anniversary is extremely useful, and generally succeeds in avoiding a one-dimensional and sanitised view of its subject.

The development of the State Electricity Commission of Victoria is well documented in two histories, one written internally (SECV 1949) and the other commissioned (Edwards 1969). The only account of a NSW electricity supply organisation is *50 years of Electricity Supply*, commissioned by the Sydney County Council (Anderson 1955). It is invaluable, partly for what its omissions reveal about the sensitivities of the organisation.

## **Institutions and Organisations**

The internal records, annual reports and other publications by the organisations involved in Sydney's energy supply constitute the most important source of information for this thesis. The early records of AGL are deposited in the Mitchell Library. The company's reaction to electric lighting is documented in the directors' minute books of the 1880s and 1890s. The internal production records provide a continuous record of gas consumption from the 1840s, and the company's press clippings files document the growing dominance of the residential energy market by electrical appliances from the 1950s.

The records of the Sydney Municipal Council are held by the Council's archives and the Sydney City Library. They include the minutes, annual and special reports of the Council subcommittees on lighting (from 1842) and later electricity (from 1891). The operations of the electricity undertaking figure prominently in the reports of the Town Clerk after 1904, and the reports on its operations by Smith and Johnson (1922), Pearce (1924) and the Civic Commissioners (1928-9) are particularly revealing. The annual reports of the undertaking and, after 1935, the Sydney County Council provide extensive data on costs, prices, energy sales, and all technical and commercial aspects of the system.

Several other organisations have also supplied electricity to the Sydney region. The annual and special reports of the St. George, McKellar, Brisbane Water and Prospect County Councils are all valuable sources. Information on some important organisations such as the Electric Light and Power Supply Company, which supplied the inner western municipalities, is more difficult to obtain, but some data could be compiled from secondary sources such as newspapers and Tait's



Electrical Directories. Electricity generation by the Public Works and Railways departments and, from 1951, the Electricity Commission of NSW, is documented in their annual reports.

The evolution of the organisational structures for electricity supply in NSW may be traced in a number of government- commissioned studies, perhaps the most influential of which was prepared in 1937 by the UK consulting firm of Rendel, Palmer and Tritton. The evolution of electricity administration is also documented in the minutes, annual and special reports of the state Electricity Advisory Committee (1934-1946) and its successors, the Electricity Authority of NSW (1946-1979) and the Energy Authority of NSW (from 1976). The reports and conference proceedings of the Local Government Association provide a direct counterpoint to the views of the statutory authorities.

The events of 1982/3 rekindled government interest in the electricity system. The Electricity Commission was required to present a report to Parliament appraising its own performance (1983). The subsequent Inquiry into Electricity Generation Planning (1985/6) exposed the Commission to unprecedented public scrutiny and yielded valuable information on its operations and planning procedures, many of which have changed little since the 1950s.

## Politics

Among the few studies of the political contexts of specific electricity systems, Hannah's account of the first 15 years of nationalised electricity supply in Britain (1982) and Hughes' comparative study of electrification in the USA, Britain and Germany between 1880 and 1930 (1983) are outstanding. Both studies help illustrate the British precedents which so influenced the legislative attitudes to electricity in NSW.

The context of the Sydney electricity system may be established from the extensive general literature on politics and government in NSW. The histories of NSW local government by Larcombe (1973) and Maiden (1966) include accounts of numerous local government gas and electricity undertakings, though the forces motivating local politicians to build and operate such undertakings is not fully explored. Additional sources such as Curnow's (1957) study of the party politicisation of the Sydney Municipal Council in the 1920s, and contemporary newspaper accounts, are essential to any understanding of the dynamics of local government.

Hawker's history of the NSW parliament (1971) and other studies of political alignments (eg Loveday and Martin 1966) contribute to an appreciation of the politics of electricity supply at the state government level. The biographies of William Mckell (Kelly 1971) and Michael Bruxner (Aitkin 1969) provide useful background on politicians who made or presided over major changes in electricity organisation. Mckell in particular was personally interested in electricity supply issues. The involvement of the Labor Party in electricity supply in NSW dates back to the party's support for local government and public ownership in the 1890s (see Black 1926) and continues up to the present, with strong links between Labor governments and the Electrical Trades Union (see Pola 1982).

Parliament referred a large proportion of the special legislation for the establishment of gas and electric companies in the 1880s and 1890s to select committees, the reports of which contain invaluable information on the political and commercial interests involved. The debates on the various bills themselves constitute essential, if sometimes tedious, expositions of the views on electricity of individuals and interest groups within parliament.

Finally, the daily press provides political background available nowhere else. Allowance must be made for vested interest: the Sydney Morning Herald, for example, has at times been strongly associated with AGL through common ownership, and other newspapers were linked with electricity supply consortia in the 1880s. Some newspapers are also notoriously partisan. Given these provisos, Sydney's newspapers constitute a primary source of the first importance, fleshing out the sanitised official records of organisations such as the Sydney County Council, illuminating the personal and political dynamics behind key decisions and, quite often, making intelligible otherwise inscrutable events.

# BIBLIOGRAPHY

## ADDITIONAL ABBREVIATIONS USED IN BIBLIOGRAPHY

(A list of abbreviations used in the text follows the Table of Illustrations)

AGPS	Australian Government Printing Service, Canberra
ANUP	Australian National University Press, Canberra
AEHR	<i>Australian Economic History Review</i>
ed	editor
EIANSW	Electrical Association of NSW
EngANSW	Engineering Association of NSW
IEA	Institution of Engineers, Australia
ML	Mitchell Library
MUP	Melbourne University Press
nd	no date
np	not published
OUP	Oxford University Press
(R)AHS	(Royal) Australian Historical Society
SUES	Sydney University Engineering Society
UQP	University of Queensland Press, St Lucia, Brisbane
vol	volume

## BIBLIOGRAPHIES AND RESEARCH AIDS

*Australian Dictionary of Biography* (ADB) MUP 1966+, 1788-1850, 2 vols., 1851-1890, 4 vols.

Australian National Library, Canberra *Australian Public Affairs Information Service* (APAIS) monthly and in annual accumulations, July 1945+

Borchardt, D.H. (1975) *Checklist of Royal Commissions, Select Committees of Parliament and Boards of Inquiry, Part IV, New South Wales 1855-1960*, La Trobe University Library, Bundoora

Havard, H.L. Card index to *Historical Records of Australia* ML

Radi, Heather et al (1979) *Biographical Register of the NSW Parliament 1901-1970* ANUP

Spearritt, Peter (1980) *Sydney 1900-1980: A Select Bibliography* Macquarie University, School of History, Philosophy and Politics, Sydney

*Sydney Morning Herald* indexes, ML, 1842-45, 1904-18, 1961+

*Sydney Morning Herald* quarterly index published by John Fairfax and Co. Ltd, 1927-Sept. 1961,

# GOVERNMENT AND STATUTORY AUTHORITY PUBLICATIONS

(Including annuals, serials, inquiries and minutes)

## COMMONWEALTH OF AUSTRALIA

ABS (1975) '1974-75 Household Expenditure Survey, Australia' Cat. 6530.0

\_\_\_(1976) '1975-76 Household Expenditure Survey, Australia' Cat. 6530.0

\_\_\_(1979) 'Domestic Appliance and Energy Usage: South Australia' Cat. 8208.4

\_\_\_(1981) 'National Energy Survey: Household Appliances, Facilities and Insulation: Australia November 1980' Cat. 8212.0

\_\_\_(1983a) 'Estimated Resident Population of Municipalities and Shires: New South Wales, 30 June 1982' Cat. 3206.1

\_\_\_(1984a) 'National Energy Survey: Household Appliances, Facilities and Insulation: Australia June 1983' Cat. 8212.0

\_\_\_(1984b) 'National Energy Survey: Household Energy Consumption: Australia 1982-83' Cat. 8213.0

\_\_\_(1985a) 'National Energy Survey: Household Energy Consumption: Australia 1982-83: Addendum' Cat. 8213.0

\_\_\_(1985b) 'New South Wales Energy Survey Part 1: Household Appliances, Facilities, Insulation and Appliance Acquisition, October 1984' Cat. 8211.1

\_\_\_(1986a) '1984 Household Expenditure Survey, Australia: Summary of Results' Cat. 6530.0

\_\_\_(1986b) '1984 Household Expenditure Survey, Australia: Detailed Expenditure Items. Cat. 6535.0

\_\_\_(1986c) 'Survey of Motor Vehicle Usage, Australia: Twelve Months Ended 30 September 1985. Preliminary' Cat. 9202.0

\_\_\_(1986d) 'Motor Vehicle Census, Australia. 30 September, 1985' Cat. 9309.0

\_\_\_(1987a) 'National Energy Survey: Household Appliances, Facilities and Insulation: Australia 1985-86' Cat. 8212.0

\_\_\_(1987b) 'National Energy Survey: Household Appliances, Facilities and Insulation: Australia 1985-86: Corrigendum' Cat. 8212.0

\_\_\_(1987c) 'Population and Migration: New South Wales 1985' Cat. 3101.1

\_\_\_(1987d) 'Estimated Resident Population of Statistical Local Areas: New South Wales, at 30 June, 1985 (Final) and 1986 (Preliminary)' Cat. 3210.1

\_\_\_(1987e) '1984 Household Expenditure Survey, Regions of New South Wales' Cat. 6530.1

\_\_\_(1988a) 'National Energy Survey: Annual Consumption of Reticulated Energy by Households: Australia 1985-86' Cat. 8213.0

Australian Minerals and Energy Council (AMEC), Co-Ordinating Committee on Energy Conservation (1983) 'Consolidated Papers on Energy Labelling' July

Bureau of Resource Economics (1987) 'Energy Demand and Supply, Australia 1960-61 to 1984-85' AGPS, Canberra

Department of Post War Reconstruction - Division of Industrial Development (1949a) 'Brief Review of the Australian Domestic Electric Appliance Industry' Melbourne

\_\_\_(1949b) 'Brief review of the Australian Domestic Refrigerator Industry'

Department of Resources and Energy (1984a) 'Energy Demand and Supply, Australia 1960-61 to 1982-83' AGPS, Canberra

Economic Planning Advisory Council (1987) 'Efficiency in Public Trading Enterprises' AGPS, Canberra

### Annals and Serials

*Census* 1947,1954,1961,1966,1971,1976,1981,1986

Year Book of the Commonwealth of Australia (AYB) 1906-85

### Inquiries

Gibson, A.J. Report on Power Development in Australia, 1929. The Parliament of the Commonwealth of Australia, Canberra

Proposal to Divert the Snowy River: Report by Commonwealth and State Officers, 1948. November

\_\_\_Second Report, 1949. January

Zeidler, D. Committee of Inquiry into Electricity Generation and the Sharing of Power Resources in South-east Australia. 1982, October

## NEW SOUTH WALES

### PARLIAMENT, GOVERNMENT DEPARTMENTS AND STATUTORY AUTHORITIES

DOE (1988) 'Household Energy Consumption: An Analysis of the 1984 ABS NSW Energy Survey' February

EANSW (1947a) 'Report on Failures of Electricity Supply in Sydney' June

\_\_\_(1954a) 'Organisation of Electricity Distribution in the County of Cumberland' March

\_\_\_(1965a) 'Organisation of State Electricity Distribution: Reports prepared for consideration by the Authority for the period April 1947 to December 1961' May

\_\_\_(1965b) 'Organisation of State Electricity Distribution: Summaries and abstracts of reports prepared for consideration by the Authority in the period 22 February 1963 to 12 November 1964' May

\_\_\_(1967a) 'Review of Functions of the Electricity Authority of New South Wales' April

\_\_\_(1972a) 'Report on the Investigation of Electricity Distribution in New South Wales' March

\_\_\_(1974a) 'Report of the Energy Authority and Electricity Tariffs Investigation Committee' August

\_\_\_(1976a) 'Electricity development of the Unsupplied Areas of the State' September

\_\_\_(1977a) 'Inquiry into the Feasibility of Combining 18 Nominated Electricity Distribution Areas into Four New Areas - Statement by the Electricity Authority of New South Wales' April

EnANSW (1979a) 'Energy Policy Summary and Background Paper' October

\_\_\_(1980a) 'Rationalisation of Electricity Tariff Structures in NSW' March

\_\_\_(1981a) 'Saving Money with Energy Conservation: An Energy Audit Workbook for Restaurants' March

\_\_\_(1981b) 'Energy Use in NSW Manufacturing 1978-79' September

\_\_\_(1982a) 'Natural Gas Demand Forecasts, NSW 1981-2005' February

\_\_\_(1983a) 'Energy Management in the NSW Government' November

- \_\_\_(1983c) 'FINMOD: A Financial Model of a Generalised Electricity Supply Utility' Report 1, January
- \_\_\_(1985a) 'Energy Demand Forecasts, NSW 1984-2005' January
- \_\_\_(1985b) 'NSW Coal Export Forecasts 1985-1995' September
- \_\_\_(1985c) 'Energy Flows in NSW 1983-84' September
- \_\_\_(1985d) 'The Management of Electricity Use in Industry' (3 vols.)
- \_\_\_(1985e) 'Applying Cogeneration in Industry' February
- \_\_\_(1985f) 'Commission of Inquiry into Electricity Generation Planning in NSW: EnANSW Officer Discussion Paper' August
- \_\_\_(1986g) 'Energy Management in Milk Processing' March
- \_\_\_(1985h) 'Cost Effective Energy Use in Meat Processing' March
- \_\_\_(1985i) 'Reducing Energy Costs in the Baking Industry' May
- \_\_\_(1985j) 'The Residential Demand for Energy in NSW' February
- \_\_\_(1985k) 'Appliance Penetration and Household Energy Consumption' September
- \_\_\_(1986a) 'The Supply of Power to Remote Areas of NSW' December
- \_\_\_(1986b) 'Report of the Inquiry into the Appropriateness of the Current Legislative and Operational Framework for the Sydney, Prospect, Illawarra and Shortland County Councils' np
- \_\_\_(1986c) 'Energy Management in the NSW Government' February
- \_\_\_(1986d) 'Petroleum in NSW' August
- \_\_\_(1986e) 'Coal in NSW' November
- \_\_\_(1986f) 'Gas in NSW' November
- \_\_\_(1987b) 'Gas and Electricity: Fuel Choices for Sydney Households' April
- \_\_\_(1987c) 'Submission to the NSW Bulk Supply Tariff Review Committee' January

### Published Annual Reports

(Dates refer to annual reports consulted, and do not necessarily cover the entire period of existence of the organisation. Some administrative units, notably those concerned with railways and local government, have undergone several name changes, reorganisations and amalgamations with other departments.)

Commissioner for Gas and Electricity (CGE) 1927-29

Commissioner for Motor Transport (CMT) 1980-86

Commissioner for Road Transport and Tramways (CRTT) 1944/5

Department of Energy, NSW (DOE) 1987

Department of Local Government (DLG) 1915-54

Department of Railways (1950-60)

Department of Works and Local Government (DWLG) 1935/6-1941

Electrical Contractors' and Electricians' Licensing Board (ECELB) 1932-33

Electricity Authority of NSW (EANSW) 1946-78

Energy Authority of NSW (EnANSW) 1976-86

Joint Coal Board (JCB) 1946-86

Metropolitan Water Sewerage and Drainage Board (MWSDB) 1983-86

Ministry of Transport (MT) 1986

Public Works Department (PWD) 1888-1951

Railway Commissioners/Railways Department (RD) 1881-1949

State Rail Authority (SRA) 1980-86

Traffic Authority of NSW (TANSW) 1986

Urban Transit Authority (UTA) 1980-86

#### Other Annuals and Serials

EnANSW/FES (Annual) 'Engineering and Financial Statistics Electricity Supply Authorities in NSW' 1979-85

EnANSW/FPB 'Industrial Fuel Prices, NSW' (later title: Fuel Prices Bulletin) 1984-88

NSW Government Gazette 1887-1987

NSW Official Year Book (NSWYB) 1907-86

NSW Parliamentary Debates (NSWPD) 1878-1987

NSW Parliamentary Record 1955-85

Official Year Book of NSW 1885-1909/10

Returns of the Colony (Blue Books of Statistics) (RC) 1822-81

NSW Statistical Register 1886-1909/10

#### Inquiries, Special Reports

(All NSW Parliamentary reports are in NSW Parliamentary Papers)

Bigge, R. Report of the commissioner of inquiry on the state of agriculture and trade in the Colony of New South Wales. House of Commons, London. 1823

Cancrude Engineering Ltd. Report on the Impact of Natural Gas on the Industrial Development of NSW, 1968

McKell, W.J. Electricity co-ordination in Great Britain and rural electrification in the United States of America, Great Britain and Canada. Parliament of NSW, November 1945

NSW Commission of Audit. *Focus on Reform* Report on the State's Finances, July 1988

Recommendations of the Electricity Advisory Committee on the question of the co-ordination of electricity generation and distribution. Parliament of NSW. November 1945

Rendel, Palmer and Tritton(RPT). Report on Electrical Development in New South Wales, 1937. Government Printer, Sydney.

Report of the Parliamentary Standing Committee on Public Works relating to the proposed electric tramway from Circular Quay, Sydney, to the Redfern Railway station, and also along Harris- St to the intersection of John-St, May 1896.

Report of the Royal Commission of Inquiry into the coal industry (RCCT) September 1929, April 1930

Report of the Royal Commission of Inquiry into the gas industry. June 1949

Report of the Royal Commission of Inquiry regarding the contract entered into by the Municipal Council of Sydney for steam- raising plant at Bunnerong power-house. September 1928.

Report of the Royal Commission of Inquiry respecting an increase in the standard price of gas. June 1918

Report of the Snowy River Investigation Committee on the Utilisation of the Waters of the Snowy River, 1944. Parliament of New South Wales.

Sydney Area Transportation Study (SATS 1974) (published separately, 4 vols. plus summary,)

#### Parliamentary Select Committee Reports

(All in NSW Parliamentary Papers of the sessions indicated: LC and LA indicate whether Select Committee was formed of members of the Legislative Council or the Legislative Assembly).

Australasian Rights Purchase Bill. November 1892 (LA, 1892)

Australian Gas-Light Company's Bill. September 1881 (LA, 1881)

Australian Gas-Light Company's Bill. March 1883 (LA, 1883)

Australian Gas-Light Company's Bill. March 1912 (LC, 1911-12)

Australian Gas-Light Company's Electric Lighting and Supply Bill. September 1891 (LC, 1891 second session)

Borough of Newcastle Electric-Lighting Bill. July 1890 (LA, 1890)

Borough of Newcastle Electric-Lighting Bill, No.2. November 1890 (LA, 1890)

Borough of Redfern Electric Lighting Bill. October 1895. (LA, 1895)

City of Newcastle Gas and Coke Company's Electric and Other Light Bill. June 1890 (LA, 1890)

Grafton Lighting Company's Bill. February 1884 (LA, 1883-4)

Hillgrove and Armidale Water-Power Electric Bill. November 1892 (LA, 1892)

New South Wales Electric Lighting and Power Bill. June 1888 (LC, 1887-88)

Public Vehicles and Boats. June 1876 (LA, 1875/6)

Saywell's tramway and Electric Lighting Bill. October 1898 (LA, 1898 second session)

Sydney and Suburban Electric Lighting Bill. May 1888 (LA, 1887-8)

Sydney Electric Lighting Bill. August 1891 (LA, 1891 second session)

Minutes, etc.

EANSW. Internal reports, 1957-66 (DOE Library)

EAC, Department of Local Government. Minutes, 1934-43 (DOE Library)

## ELECTRICITY AND GAS SUPPLIERS AND LOCAL GOVERNMENT

AGL (1890) 'Electric Lighting of Municipalities' (ML)

Cardew, P. Report to the Council of the City of Sydney on the Electricity Undertaking, 1909. SMC Proceedings, 1909.

ECNSW (1983a) 'Performance and Future Direction: Statutory Report to the Minister for Energy' February

\_\_\_(1985a) 'Power Station Development Options' July

Local Government and Shires Association of NSW (1950) 'Statement of Views on Proposal of the State Government to Create a Commission for the Control of Generation of Electricity Supply' January

Pearce, S.L. (1924) 'Municipal Council of Sydney - Electricity Supply Undertaking' SMC (SCC Library)

PCC (1977a) '20 Years of Electricity Supply'

SGCC (1932a) 'Twelve years of Progress 1920-1932'

SMC (1842) 'Report of the Committee appointed to enquire into the lighting of the City' 30 December (SMC archives)

\_\_\_(1843) 'Report of the Committee of the City Council, appointed to consider and report upon the most suitable means of Lighting the City of Sydney' 14 March (SMC archives)

Smith, F.J. and Johnson (1922) 'Municipal Council of Sydney Electricity Supply Department: Report by Messrs. F.J. Smith & Johnson' W.E.Smith Ltd, Sydney

### Published Annual Reports

Australian Gas Light Company (AGL) 1887-1987

Brisbane Water County Council (BWCC) 1943-1979

Electricity Commission of NSW (ECNSW) 1951-1987

Electric Light and Power Supply Corporation (ELPSC) 1936-39

MacKellar County Council (MCC) 1952-1979

Nepean County Council (NCC) 1955-1979

Prospect County Council (PCC) 1957-1986/7

St George County Council (SGCC) 1921-1979

Sydney County Council (SCC) 1935-1987

Sydney Municipal Council (SMC) 1888-1935

### Minutes

AGL. Manuscripts records held in the ML, including Directors' Minute Books 1836-1910, Coals and Working Expenses Books, Quantity of Gas Sold (1870-1930). Document numbers refer to ML index.

SMC. Minutes of the Electric Lighting Committee 1887-1935 (Sydney City Council Archives and in Proceedings, SMC)

SMC. Minutes of the Lighting Committee 1857-1887 (Sydney City Council Archives)



## OTHER ELECTRICITY AND GAS SUPPLIERS

Australian Gas Association (1985) 'Gas Supply and Demand Study' March

GFCV (1984a) 'Trends in Domestic Energy Usage in Melbourne 1977- 1983' Report No. 4/84. May

SECV (1984a) 'Energy use in Victorian Homes: Results of a survey of households in Victoria'

### Annual Reports

Central Electricity Authority, Great Britain 1950-58.

Gas and Fuel Corporation of Victoria (GFCV) 1986

South East Queensland Electricity Board (SEQEB) 1986

State Energy Commission of Victoria (SECV) 1980-86

### Other Annuals and Serials

ESAA 'The Electricity Industry in Australia'

## NEWSPAPERS AND MAGAZINES

(Published in Sydney unless otherwise indicated; dates refer to years consulted, not necessarily to full period of publication)

*Australasian Builders' and Contractors' News* (ABCN) 1889-95

*Australasian Electrical Times* (AET) 1922-30

*Australian* 1834-42, 1970-88

*Australian Financial Review* (AFR) 1960-88

*Australian Town and Country Journal* (ATCN) 1871-89

*Building* 1908

*Building and Engineering Journal of Australia and New Zealand* (BEJ) 1892-99

*Bulletin* 1880-93

*Cosmos Magazine* (Melbourne) 1895

*Daily Telegraph* (DT) 1890-1, 1982-8

*Home* 1920-26

*Illustrated Sydney News* (ISN) 1876-83

*Sun* 1890-1912

*Sydney Echo* 1890

*Sydney Gazette* (SG) 1803-41

*Sydney Mail* 1895-1920

*Sydney Morning Herald* (SMH) 1842-1988

## PERIODICALS

(Published in Australia unless otherwise indicated; all consulted for period 1982-88, not necessarily full period of publication)

*Annual Review of Energy (USA)*

*Australian Electrical Review*

*Australian Gas Journal (Journal of the Australian Gas Association)*

*AEDA Circuit (Journal of the Electricity Development Association)*

*Energy Policy (UK)*

*EPRI Journal (Journal of the Electric Power Research Institute, USA)*

*ESAA Quarterly (Journal of the Electricity Supply Association of Australia)*

*Flame (AGL house journal)*

*GRID (Journal of the Gas Research Institute, USA)*

*Local Government Bulletin (Journal of the Local Government Association)*

*Network (ECNSW house journal)*

*Petroleum Gazette 1957-87*

*Watt's News (Occasional publication of the SCC)*

## BOOKS, ARTICLES AND UNPUBLISHED MANUSCRIPTS

Abel, Mary Hinman (1921) *Successful Family Life on the Moderate Income* J.P.Lippincott Company, Philadelphia

Aird, M.V. (1961) *The Water Supply, Sewerage and Drainage of Sydney* MWS&DB, Sydney

Aitkin, Don (1969) *The Colonel: A Political Biography of Sir Michael Bruxner* ANUP

Alford, Katrina (1984) *Production or Reproduction? An Economic History of Women in Australia 1788-1850* OUP, Melbourne

Allbut, Guy (1958) *A Brief History of Public Electricity Supply in Australia and the Formation and Development of the Electricity Supply Association of Australia* The Association, Melbourne

Anderson, Gordon F. (1955) *Fifty Years of Electricity Supply: The Story of Sydney's Electricity Undertaking* Sydney County Council

Andrews, Graeme (1975) *The Ferries of Sydney* Reed, Sydney

Aplin, Graeme and Storey, John (1984) *Waterfront Sydney 1860-1920* George Allen & Unwin, Sydney

Arnold, Erik and Burr, Lesley (1985) 'Housework and the Appliance of Science' in Wendy Faulkner & Erik Arnold eds. (1985)

Ashton, N.A.W. (1984) *Sydney: Village to Metropolis. A Brief Review of Planning in the Sydney Region* Department of Environment and Planning, Sydney

Aston, F.J. and Wilson, B.E. (1964) 'Planning the Development of the Electricity Supply Industry in New South Wales' *IEA Journal* Vol. 36, December, 295-308

Australian Atomic Energy Commission (1958) *Proceedings of a Symposium on the Peaceful Uses of Atomic Energy in Australia* held in Sydney, June 2 to 6, 1958, MUP

*Australian Encyclopaedia* (1954, 1963, 1976) Grolier, Sydney

Australian General Electric (nd ?1936) *The Story of a Great Australian Industry*

Australian Labor Party (1946) *Five Critical Years: Story of the McKell Labour Government in New South Wales, May, 1941 - May, 1946*, Sydney

Australian Women's Weekly (1963) *The Growing Australian Market. Industry Study No 5: The Household Electric Appliance Market* Second Edition, Sydney

Bagshawe, F.T. (1885) 'The Manufacture of Ice by the "Beth Process"' *Proceedings, EngANSW* Vol. 1, 1889-6

Balint, E. et al (1982) *Warehouses and Woolstores of Victorian Sydney* OUP, Melbourne

Balzhiser, R.E. and Yeager, K.E. (1987) 'Coal-fired Power Plants for the Future' *Scientific American* August

Banham, Reyner (1969) *The Architecture of the Well-tempered Environment* The Architectural Press, London

Bartels, R (1988) *Household Energy Consumption: An analysis of the 1984 ABS NSW Energy Survey* ECNSW/DOE. February

Basalla, George (1982) 'Some Persistent Energy Myths' in G.H.Daniels and M.H.Rose, eds. (1982)

Bateson, Jeff (1986) 'Scale Economies in Electricity Supply: An Empirical Analysis of the NSW and Victorian Systems' paper presented to the Economics/Industrial Organisation Workshop, Australian Graduate School of Management, University of NSW, June np

Batson, L.D. (1927) *Electrical Development and Guide to Marketing of Electrical Equipment in Australia* United States Department of Commerce, Washington

Bereano, Philip et al (1985) 'Kitchen Technology and the Liberation of Women from Housework' in Wendy Faulkner and Erik Arnold eds.

Bertie, Charles H. (1933) *The Story of Sydney* Shakespeare Head Press, Sydney

Birch, Charles (1975) *Confronting the Future: Australia and the World: The Next Hundred Years* Penguin, Ringwood

Birmingham, J. et al (1979) *Australian Pioneer Technology: Sites and Relics* Heinemann, Melbourne

Black, George (nd,c.1926) *A History of the NSW Political Labor Party from its Conception until 1917* Sydney

Blainey, Geoffrey (1966) *The Tyranny of Distance: How Distance Shaped Australia's History* Sun Books, Melbourne

\_\_\_\_\_(1975) *Triumph of the Nomads: A History of Ancient Australia* Macmillan, Sydney

Boehm, E.A. (1955) 'The Impact of Electricity' *Economic Record* Vol. 31, No. 60, May

\_\_\_\_\_(1956) 'Ownership and Control of the Electricity Supply Industry in Australia' *Economic Record* Vol. 32, No. 63, November

Bose, C.E. et al (1984) 'Household Technology and the Social Construction of Housework' *Technology and Culture* Vol. 24 No. 1, January

Boyd, Robin (1968) *Australia's Home: Its Origins, Builders and Occupiers* Penguin, Ringwood

Branagan ,D. and Holland, H (1985) *Ever Reaping Something New: A Science Centenary* University of Sydney Science Centenary Committee, Sydney

- Bradfield, J.J.C. (1924) *The City and Suburban Electric Railways and the Sydney Harbour Bridge*. Thesis presented for the degree of Doctor of Science in Engineering, Sydney University (Fisher Library)
- \_\_\_\_ (1926) 'Electrification of the Sydney and Suburban Railway' *IEA Journal* V
- Braudel, Fernand (1974) *Capitalism and Material Life, 1400-1800* Fontana
- Brearley, J.H.D. (1900) 'Electric Tramways of Sydney' *SUES Journal*, No 5, 1900
- Brennan, T. (1970) 'The Impact of Technology on Urbanisation' *Proceedings, Joint Urbanisation Seminar*, ANU December
- Briggs, Asa (1968) *Victorian Cities* Penguin, Harmondsworth
- Brittain, J.E. ed. (1977) *Turning Points in American Electrical History* IEEE Press, New York
- Broomham, Rosemary (1987) *First Light: 150 Years of Gas* Hale & Iremonger, Sydney
- Butlin, N.G. (1962) *Australian Domestic Product, Investment and Foreign Borrowing 1861-1938/39* Cambridge University Press, Cambridge
- \_\_\_\_ (1984) *Our Original Aggression: Aboriginal Populations of Southeastern Australia* George Allen & Unwin, Sydney
- Butlin, N.G. ed. (1977) *Factory Waste Potential in Sydney* ANUP
- Butlin, S.J. and Schedvin, C.B. (1977) *War Economy 1942-1945* Australian War Memorial, Canberra
- Butters, J.W. and Davis, E.T. (1986) *The Importance of Underground Storage in a Natural Gas Pipeline System* AGL Sydney
- Cannon, Michael (1973) *Life in the Cities: Australia in the Victorian Age: 3* Nelson, Melbourne
- Cantor, Norman F. and Werthman, Michael S. eds. (1968) *The History of Popular Culture* (2 vols.) The Macmillan Company, New York
- Caves, D.W. and Christensen, L.R. (1983) 'Time-of-Use Rates for Residential Electric Service: Results from the Wisconsin Experiment' *Public Utilities Fortnightly*, March 17
- Chagnon, S. (1979) 'What to do about Urban-Generated Weather and Climatic Changes' *Journal of the American Institute of Planners* Vol 45, No 1, June
- Christensen, B.L. and Norgard, J.S. (1976) 'Social Values and the Limits to Growth' *Technological Forecasting and Social Change* 9
- Cipolla, Carlo M. (1962) *The Economic History of World Population* Sixth Edition, Penguin, Harmondsworth 1974
- Clarke, R.J. (1986) 'State Enterprise in the Australian Electricity Industry' in Clarke, R.J. et al eds. (1986)
- Clarke, R.J. et al eds. (1986) *Australian Energy Policies in the 80s* Allen & Unwin, Sydney
- Cochrane, P. (1980) *Industrialization and Independence: Australia's Road to Economic Development, 1870-1939* UQP
- Coghlan, T.A. (1921) *Labour and Industry in Australia: From the First Settlement in 1788 to the Establishment of the Commonwealth in 1901* OUP (reprinted 1969 Macmillan of Australia,
- Collins, D. (1798) *An Account of the English Colony in New South Wales* ML
- Cook, Earl (1976) *Man, Energy Society* W.H. Freeman and Company, San Francisco
- Cooksey, Robert (1971) *Lang and Socialism: A Study in the Great Depression* ANUP

- Corbett, A.H. (1969) 'Australian Engineering 1788-1969' *IEA Journal*, Vol.41, July-August, 83-9
- \_\_\_\_\_(1976) *Energy for Australia: Resources, Technology and the Environment* Penguin, Ringwood
- Coulter, C.G. (1988) 'The Greenhouse Effect and Electricity Generation in New South Wales' in G.I.Pearman, ed (1988)
- Cowan, Ruth Schwartz (1983) *More Work for Mother: The Ironies of Household Technology from the open Hearth to the Microwave* Basin Books, New York
- Croxon, Pauline (1982) *The Wran Government and the Electricity Commission of New South Wales: Glory Without Power?* BA (Hons) thesis, School of History, Philosophy and Politics, Macquarie University
- Cuffley, P. (1973) *A Complete Catalogue and History of Oil and Kerosene Lamps in Australia* Pioneer, Melbourne
- Curnow, G.R. (1957) *The Sydney Municipal Council 1919-1924: An Instance of Party Politics in Civic Government*. BA (Hons) thesis, University of Sydney
- Daniels, G.H. and Rose, M.H. eds. (1982) *Energy and Transport: Historical Perspectives on Policy Issues* Sage, Beverly Hills
- Davidson, C. (1982) *A Woman's Work is Never Done: A History of Housework in the British Isles, 1650-1950* Chatto and Windus, London
- Davison, Graeme (1970) 'Public Utilities and the Expansion of Melbourne in the 1880s' *AEHR*, X, Sept, 169
- \_\_\_\_\_(1982) 'The Australian Energy System in 1888' *Australia 1888 Bulletin* No. 10, September
- \_\_\_\_\_(1987) 'Energy' in Gilbert, A.D. et al eds (1987) vol III
- Davison, Graeme, McCarty, J.W. and McLeary, A. eds (1987) *Australians 1888* Fairfax Syme and Weldon Associates, Sydney
- Devine, Warren D. (1983) 'From Shafts to Wires: Historical Perspective on Electrification' *The Journal of Economic History* Vol.43, No.2, June
- Dick, H.W. (1980) 'Aluminium Smelters and the Price of Electricity: Laughing All the Way' Unpublished paper presented to the Hunter Social Research Co-operative
- Dickinson, T. (1894) 'Notes on Hydraulic Power Supply in Sydney' *Proceedings, EngANSW* 1893-4
- Diesendorf, W. and Hurley, J.J. (1955) 'The 330 kV Transmission System in NSW' *IEA Journal* Vol.27, October-November, 273-285
- Dixon, D.F. (1972) 'Origins of the Australian Petrol Distribution System', *AEHR* XII, No 1, March
- \_\_\_\_\_(1976) 'Competition in the Australian Petrol Market', *AEHR* XVI, No 2, September
- Dulhunty, J.A. (1966) 'Power - From Muscles to Atoms' in *A Century of Scientific Progress: The Centenary Volume of the Royal Society of New South Wales* The Society, Sydney
- Dunsheath, Percy (1969) *A History of Electrical Engineering* Faber and Faber, London
- Dunstan, David (1984) *Governing the Metropolis: Politics, Technology and Social Change in a Victorian City: Melbourne 1850-1891* MUP
- Dyer, S.W. (1981) 'Lies, Damned Lies and Dead Silence: How to make Numbers Talk' *Australian Historical Statistics* No 2, Feb
- Edwards, Cecil (1969) *Brown Power: A Jubilee History of the State Electricity Commission of Victoria* The Commission, Melbourne

- Ellis, M.H. (1969) *A Saga of Coal: The Newcastle and Wallsend Coal Company's Centenary Volume* Angus and Robertson, Sydney
- Evans, I. (1983) *The Australian Home* The Flannel Flower Press, Sydney
- Ewer, Peter et al (1987) *Unions and the Future of Australian Manufacturing* Allen & Unwin, Sydney
- Fagan, R.H. (1981) 'Geographically Uneven Development: Restructuring the Australian Aluminium Industry' *Australian Geographic Studies*
- \_\_\_\_ (forthcoming) 'Metropolitan Planning Issues in the Sydney Region: Employment' in E.Blakely, R.H.Fagan and G.H.Searle, *Planning Issues, Sydney* Department of Environment and Planning, Sydney
- Fairfax, John and Sons Ltd. (1931) *Sydney Morning Herald 1831- 1931 - A Century of Journalism* Sydney
- Farrer, K.T.H. (1980) *A Settlement Amply Supplied: Food Technology in Nineteenth Century Australia* MUP
- Faulkner, Wendy and Arnold, Erik eds. (1985) *Smothered by Invention: Technology in Women's Lives* Pluto Press, London
- Fleming, J.A. (1921) *Fifty Years of Electricity: Memories of an Electrical Engineer* The Wireless Press, London
- Foley, Gerald (1976) *The Energy Question* Penguin, Harmondsworth
- Fowler, J. (1890) *Working Tramways by Electricity: Report of Sir John Fowler, K.C.M.G. to the Agent-General for New South Wales*, printed by Spottiswoode and Co, London 1890
- Forbes Mackay, H.R. (1914) 'A Short Description of the Electric Supply Undertaking of the Sydney City Council' *Proceedings, SUES* Vol. XIX, 1914-15
- Fuel Merchants' Association (nd. ?1888) *Administration of the Weights and Measures Acts and the Local Government Bill*, Sydney (held in ML)
- Gammage, Bill and Spearritt, Peter eds (1987) *Australians 1938* Fairfax, Syme and Weldon Associates, Sydney
- Garlick, P.M. (1986) 'The Application of Performance Indicators in Supply Industry Comparisons' *Electric Energy Conference, IEA* Brisbane, 20-22 October
- Geidion, S. (1948) *Mechanization Takes Command* OUP, New York
- Gimpel, Jean (1976) *The Medieval Machine: The Industrial Revolution of the Middle Ages* Futura, London
- Ginswick, J. (1959) 'Early Australian Capital Formation, 1836-50 - A Case Study: The Australian Gas Light Company' *Bulletin of the Business Archives of Australia*, No 6
- \_\_\_\_ (1960) 'Foundations of the Australian Gas Light Company' *RAHS Journal* Vol. 45, Part 5, January
- Girouard, Mark (1980) *Life in the English Country House: A Social and Architectural History* Penguin, Harmondsworth
- Greaves, W.A.B. (1916) 'Recollections of Old Sydney: In 1852 and Since' *RAHS Journal* Vol III Pt IX, 1916
- Hallam, Jack (1983) *The Untold Story: Labor in Rural NSW* George Allen & Unwin
- Hannah, Leslie (1982) *Engineers, Managers and Politicians: The First Fifteen Years of Nationalised Electricity Supply in Britain* MacMillan, London
- Harker, J.H. and Backhurst, J.R. (1981) *Fuel and Energy* Academic Press, London
- Harpur, P. ed. (1982) *The Timetable of Technology* Hearst Books, New York

- Hawker, G.N. (1971) *The Parliament of New South Wales 1856-1965* NSW Government Printer, Sydney
- Hawkins, R.G. (1975) 'The Demand for Electricity: A Cross-section Study of New South Wales and the Australian Capital Territory' *Economic Record* Vol. 51, March
- Hennessey, R.A.S. (1972) *The Electric Revolution* Oriel Press, Newcastle-on-Tyne
- Henry, F.J.J. (1939) *The Water Supply and Sewerage of Sydney* MWS&DB, Sydney
- Hirst, Eric (1987) 'Electric Utility Energy Conservation and Load Management Programmes: R&D Opportunities' *Energy Policy* April
- Historic Records of Australia* (1914-25) Library Committee of the Commonwealth Parliament, Melbourne (36 Vols.)
- Hocking, D.M. (1986) 'Market Power in the Natural Gas Industry' in Clark, R.J. et al eds. (1986)
- Holle, H.G. (1910) 'House Wiring' *Proceedings ELANSW* Session 1909-10
- Hovenden, L.G. (1981) *The motor Car in New South Wales 1900-1937*. MA (Hons) thesis, Department of History, Sydney University (Fisher Library)
- Hudson, W.H. (1962) 'The Snowy Mountains Hydro-Electric Project' *IEA Journal* Vol.34, June, 107-113
- Hughes, T.P. (1983) *Networks of Power: Electrification in Western Society, 1880-1930* The Johns Hopkins University Press, Baltimore
- Huss, W.R. (1985) 'What Makes a Good Load Forecast?' *Public Utilities Fortnightly*, November 28
- Imperial Arcade, The (1891) *Illustrated from Photographs*, pamphlet held in ML
- Irving, R. et al (1987) *The History & Design of the Australian House* OUP, Melbourne
- Jack (1979) in Birmingham et al
- Jeans, D.N. and Spearritt, P. (1980) *The Open Air Museum: The Cultural Landscape of New South Wales* George Allen & Unwin, Sydney
- Johnson (1987) *Radio* Aust 1938
- Kahane, A. and Squitieri, R. (1987) 'Electricity Use in Manufacturing' *Annual Review of Energy* No. 12, 1987
- Kalma, J.D. (1976) *Sectoral Use of Energy in Australia* CSIRO Division of Land Use Research, Technical Memorandum 76/4, Canberra
- Kalma, J.D. et al (1972) 'Energy Use in the Sydney Area' in A.H.Nix ed. (1972)
- Kalma, J.D. et al (1978) 'Energy Use and the Atmospheric Environment in Hong Kong: Part II. Waste Heat, Land Use and Urban Climate' *Urban Ecology* 3
- Keating, J.D. (1974) *The Lumbent Flame* MUP, 1974
- Kellow, Aynsley (1986) 'Electricity Planning in Tasmania and New Zealand: Political Processes and the Technological Imperative' *Australian Journal of Public Administration*, Vol XLV, No.1, March
- Kelly, M. ed. (1978) *Nineteenth Century Sydney: Essays in Urban History* Sydney University Press
- Kelly, Vince (1971) *The man of the People: From Boilermaker to Governor-General. The Career of the Rt. Hon. Sir William McKell* Alpha Books, Sydney
- Kennedy, B. and B. (1982) *Subterranean Sydney: The Real Underworld of Sydney Town* Reed, Sydney

- Kohen, J.L. and Lampert, Ronald (1987) 'Hunters and Fishers in the Sydney Region' in Gilbert, A.D. et al eds. (1987), vol I
- Kolsen, H.M. (1966) 'The Economics of Electricity Pricing in NSW' *Economic Record* Vol. 42, December
- Kunz, E.H. (1967) *Blood and Gold: Hungarians in Australia* Cheshire, Sydney
- Lacy, R.L. (1985) 'Guidelines for Regulators in Evaluating Electric Demand Forecasts' *Public Utilities Fortnightly* November 28
- Landes, David S. (1969) *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present* Cambridge University Press, Cambridge
- Lang, J.T. (1956) *I Remember* Invincible Press. Reprinted 1980, MacNamara's Books, Katoomba
- Larcombe, F.A. (1973) *A History of Local Government in New South Wales* Sydney University Press, Sydney (3 vols.)
- Lilienthal, David E. (1944) *TVA: Tennessee Valley Authority* Penguin, London
- Linden, Henry R. (1988) 'World Oil - An Essay on its Spectacular 120-year Rise (1859-1979), Recent Decline, and Uncertain Future' *Energy Systems and Policy* Vol.11, 252-266
- Linge, G.J.R. (1979) *Industrial Awakening: A Geography of Australian Manufacturing 1788 to 1890* ANUP
- Little, Douglas (1927) 'Notes on the Heating of Water Electrically for Domestic Use' *IEA Transactions* Vol VIII, 328.
- Loveday, P. and Martin, A.W. (1966) *Parliament Factions and Parties: The First Thirty Years of Responsible Government in New South Wales* MUP
- Lovins, Amory B. (1977) *Soft Energy Paths: Toward a Durable Peace* Penguin, Harmondsworth
- \_\_\_ (1985) 'Saving Gigabucks With Negawatts' *Public Utilities Fortnightly* March 21
- Lukey, R.J. (1897) *Australian Gas-Light Company: An Historical Sketch Issued on Completion of its Diamond Jubilee 1837-1897* The Company, Sydney
- McBride, T.M. (1976) *The Domestic Revolution: The Modernisation of Household Service in England and France 1820-1920* Croom Helm, London
- McColl, G.D. (1971) 'Electricity Supply in NSW: Economic and Financial Analysis Prepared for the Labour Council of NSW' July, Sydney np
- \_\_\_ (1976) *The Economics of Electricity Supply in Australia* MUP
- McDonell, G. (1986) *Commission of Inquiry into Electricity Generation Planning in NSW* Sydney (4 vols.)
- McGuanne, J.P. (1900) 'Old Sydney Illuminations' *AHS Journal* Vol I, 1901
- Mackenzie, Compton (1947) *The Vital Flame* Frederick Muller, London
- Maguire, F. (1966) 'Instability in the Development of the Electricity Supply Industry in New South Wales' *Australian Quarterly* Vol. 38, March
- Maiden, H.E. (1966) *The History of Local Government in New South Wales* Angus & Robertson, Sydney
- Mann, L.F. (1933) 'Early Neutral Bay' *RAHS Journal* Vol XVIII, 1933
- Manners, Gerald (1964) *The Geography of Energy* Hutchinson University Library, London
- Mansfield, R. (1841) *Analytical view of the Census of New South Wales for the Year 1841* Kemp and Fairfax, Sydney



- Marchetti, C (1987) 'The Future of Natural Gas: A Darwinian Analysis' *Technological Forecasting and Social Change* Vol 31 No 6, April
- Marsden, E. and Fenton, E.W.J. (1921) 'Relative Efficiency of Coal, Gas and Electricity for Domestic Purposes' *New Zealand Journal of Science and Technology* January
- Martin, Louise and Spearritt, Peter (1984) *A History of Water Management in NSW, 1788-1980* NSW Water Management Audit, Working Paper No.2, November
- Maslow, Abraham H. (1954) *Motivation and Personality* Harper & Row, New York (2nd. ed.)
- Matthews, M.R. (1982) *Pymont and Ultimo: A History* Southwood Press, Sydney
- Matthews, Russell (1967) *Public Investment in Australia: A study of Australian public authority investment and development* Cheshire, Melbourne
- Mayne, A.J.C. (1981) 'Commuter Travel and Class Mobility in Sydney 1858-88' *AEHR* Vol. 21, No. 1, March
- \_\_\_\_\_(1982) *Fever, Squalor and Vice: Sanitation and Social Policy in Victorian Sydney* UQP
- Mazuzan, George T. (1986) "'Very Risky Business": A Power Reactor for New York City' *Technology and Culture* Vol. 27, No.2, April
- Melosi, Martin V. (1982) 'Energy Transitions' in G.H.Daniels and M.H.Rose, eds. (1982)
- Meyers, Steven (1987) 'Energy Consumption and Structure of the US Residential Sector' *Annual Review of Energy* No. 12, 1987
- Morrill (1970) *The Spatial Organisation of Society* Duxbury Press, Belmont
- Morrison, Bonnie Maas (1982) 'Household Energy Consumption, 1900- 1980: A Quantitative History' in G.H.Daniels and M.H.Rose, eds. (1982)
- Moyal, A. (1984) *Clear Across Australia: A History of Telecommunications* Nelson, Melbourne
- Mumford, Lewis (1934) *Technics and Civilization* Harcourt, Brace and Co, New York
- \_\_\_\_\_(1961) *The City in History: Its Origins, its Transformations and its Prospects* Penguin, Ringwood
- Murphy, Phyllis (1987) 'The Colonial Kitchen' in Irving et al (1987)
- Myers, W.H. (1944) 'The Supply of Electricity in Bulk. With Special reference to Conditions in New South Wales' *IEA Journal* Vol. 16, March
- Neufeld, J.L. (1987) 'Price Discrimination and the Adoption of the Electricity Demand Charge' *Journal of Economic History* Vol. 47, No. 3, September
- Neutze, M. (1977) *Urban Development in Australia: A Descriptive Analysis* George Allen & Unwin, revised 1982
- Newman, Peter (1981) *Domestic Energy Use in Australian Cities* Murdoch University, Perth
- Newman, Peter and Kenworthy, J. (1980) 'Land-Use Planning for Transport Energy Conservation in Australian Cities' *Search* Vol. 11, No. 11, November
- Nix, H.A. ed. (1972) *The City as a Life System?: Proceedings of the Ecological Society of Australia* Vol.7
- Norgard, J.S. and Christensen, B.L. (1984) 'Individual Attitudes in Scandinavia Point Towards a Low-Energy, Saturated Society' *Proceedings, American Council for an Energy-Efficient Economy 1984 Summer Study on Energy Efficiency in Buildings* Vol. F

- Norgard, J.S. and Heeboll, J. (1983) 'Radical Reduction in Domestic Need for Electricity, Exemplified by the Refrigerator' *Proceedings, International Seminar on Energy saving in Buildings* November
- Odell, Peter (1972) *Oil and World Power: A Geographical Interpretation* Penguin, Harmondsworth
- Odum, Howard T. and Odum, Elisabeth C. (1976) *Energy Basis for Man and Nature* McGraw-Hill, New York
- Olsen, Donald J. (1976) *The Growth of Victorian London* Penguin, Harmondsworth
- Owens, S. (1984) 'Spatial Structure and Energy Demand' in D.R.Cope et al eds. *Energy Policy and Land Use Planning: An International Perspective* Pergamon Press, London
- Paddison, I.L. ed. (1956) *Railways of NSW 1855-1955* Department of Railways, Sydney
- Painter, M. et al (1986) 'Public Management Forum: Guidelines for Government Business Enterprises' *Australian Journal of Public Administration* Vol. 45, No. 4, December
- Page, N.W. and Ketchion, I.R. (1980) 'Personal Energy Consumption - Determination of Indirect Contribution from Appliances' *IEA Electrical Engineering Transactions* 1980
- Parker, R.S. (1978) *The Government of New South Wales* UQP
- Pearl, Cyril (1958) *Wild Men of Sydney* Cheshire Lansdowne, London
- \_\_\_\_ (1974) *Australia's Yesterdays* Reader's Digest, Sydney
- Pearman, G.I. ed (1988) *Greenhouse: Planning for Climatic Change* CSIRO/E.J.Brill, Melbourne
- Peppercorne, G.R. (1844) *Horsepower Applied to Railways* John Ollivier, London
- Petroleum Information Bureau (1960) *This Age of Oil* Melbourne
- Pimentel, D. and Terhune, E.C. (1977) 'Energy and Food' *Annual Review of Energy* No. 2, 1977
- Pola, John R. (1983) *The Greatest Servant: A Social History of the Electrical Trades Union (NSW Branch)* 2B Graphics, Sydney
- Porter, M.G. (1988) 'The Burden of Government Regulation and Public Ownership' in *Proceedings, Australian Chamber of Commerce Conference: Extravagant Government or Prosperity*, McLaren Vale, June
- Poulsen, M. and Spearritt, P. (1981) *Sydney: A Social and Political Atlas* George Allen and Unwin, Sydney
- Power, J.M. (1976) 'The Emerging Politics of Engineering' in Henry Mayer and Helen Nelson eds. (1976) *Australian Politics: A Fourth Reader* Cheshire, Melbourne
- Primeaux, W.J. (1985) 'Estimate of the Price Effect of Competition: The Case of Electricity' *Resources and Energy* 7
- Proudley, Ray (1987) *Circle of Influence: A History of the Gas Industry in Victoria* Hargreen Publishing Company, Melbourne
- Pugh, Ann (1970) 'One Hundred Years Ago - Foundation of the Engineering Association of New South Wales' *IEA Journal* Vol.42, July-August, 83-9
- Quinn, J.B. et al (1987) 'Technology in Services' *Scientific American* Vol.257, No.6, December
- Rae, J. (1866) *Report on the Origins and Progress of the Railways of New South Wales* NSW Government Printer, Sydney
- Rae, J.L.C. (1900) 'The Deep Sinking of Shafts at the Sydney Harbour Colliery, Balmain, Sydney, New South Wales' *Proceedings, EngANSW* Vol. XV, 1900
- Rattigan, Alf (1986) *Industry Assistance: The Inside Story* MUP

- Raymond, Robert (1984) *Out of the Fiery Furnace: The impact of metals on the history of mankind* Macmillan Australia, Melbourne
- Reynolds, Paul (1987) 'From Department to Public Corporation: The New Zealand Case' *Australian Journal of Public Administration* Vol.46, December, 421-5
- Reynolds, P. and Irving, R. (1971) *Balmain in Time: A Record of a Historic Suburb and Some of its Buildings* The Balmain Association, Sydney
- Reynolds, T.S. (1984) 'Medieval Roots of the Industrial Revolution' *Scientific American* June
- Rimmer, P.J. and Black, J.A. (1981) 'Urban Goods and Commercial Vehicle Movements in Sydney: A Research Framework' *Australian Road Research* Vol. 11, No. 4, December
- Robinson, J.B. (1988) 'Loaded Questions: New Approaches to Utility Forecasting' *Energy Policy* February
- Roe, Jill ed. (1980) *Twentieth Century Sydney: Studies in Urban & Social History* Hale & Iremonger, Sydney
- Rooke, T. (1906) 'Notes and Observations on a Trip to Europe and America' *Proceedings, ELANSW* 15th Session, 1905-6
- Rose, M.H. (1984) 'Urban Environments and Technological Innovation: Energy Choices in Denver and Kansas City, 1900- 1940' *Technology and Culture* July
- Rose, M.H. and Clark, J.G. (1979) 'Light, Heat and Power: Energy Choices in Kansas City, Wichita, and Denver, 1900-1935' *Journal of Urban History* Vol.5, No.3, May
- Rosenthal, S. and Russ, P. (1988) *The Politics of Power: Inside Australia's Electric Utilities* MUP
- Rumer, T.A. (1984) 'Corporate History - One Company's Approach' *Public Utilities Fortnightly* July 19
- Rumford, J.B. (1906) 'Electricity Supply to Small Townships' *Proceedings, ELANSW* 15th Session 1905-6
- Saddler, Hugh (1981) *Energy in Australia: Politics and Economics* Allen & Unwin, Sydney
- Sant, R.W. et al (1986) 'America's Least-Cost Energy Strategy' *Economic Impact* No. 53, 1986/1
- Schipper, Lee (1983) 'Residential Energy Use and Conservation in Denmark, 1965-1980' *Energy Policy* December
- Schipper, Lee et al (1985) 'Explaining Residential Energy use by International Bottom-Up Comparisons' *Annual Review of Energy* No. 10, 1985
- Scott, E. Kilburn (1905) 'Considerations Governing the Establishment of a Power Station to Supply the Various Buildings Within the University Area' *Proceedings, SUES* Vol.X, 1905-6
- Selfe, Norman (1885) 'Compressed Air and its Applications' *Proceedings, EngANSW* Vol. 1, 1885-6
- \_\_\_\_\_(1888) 'The Operation of Power Companies and Power Transmission by Compressed Air' *Proceedings, EngANSW* Vol. IV, 1888-9
- \_\_\_\_\_(1894) 'The Rise and Progress of Lift Construction in NSW' *Proceedings, EngANSW* Vol.X, 1894-95
- \_\_\_\_\_(1902) 'Some Notes on the Sydney Windmills', *AHS Journal* Vol I Pt VI
- Sharpe, R. et al (1979) *Energy and Resource Modelling at the Urban Level* CSIRO Division of Building Research, Technical Paper (Second Series) No.28, Melbourne
- Simpson, R.C. (1921) 'Cost of Boiling Water by Gas and Electricity' *Technical Gazette, New South Wales* Vol II, pt 1, January

- Sing, M. (1987) 'Are Combination Gas and Electric Utilities Multiproduct Natural Monopolies?' *The Review of Economics and Statistics* Vol. 69, No. 3, August
- Singer, C. et al eds. (1958) *A History of Technology* OUP, London (5 vols.)
- Smedley, A.H. (1941) 'The Romance and Development of a Great Public Utility Service' *Blennerhassett's Commercial Education Society of Australia* 1941, No 23-25
- Smith, A.K. (1855) 'On Gas and Gas-Works' *Transactions of the Victorian Institute* 1854-55
- Soddy, Frederick (1912) *Matter and Energy* Williams & Norgate, London
- Spann, R.N. (1979) *Government Administration in Australia* George Allen & Unwin, Sydney
- Spearritt, A (1983) 'The Electrification of the Home in New South Wales, 1920-1960, BA (Hons) Thesis, Department of History, University of Sydney
- Spearritt, P (1978) *Sydney Since the Twenties* Hale & Iremonger, Sydney
- \_\_\_\_ (1986) 'Sydney and Melbourne at the Census' in J.Davidson ed. *The Sydney Melbourne Book* Allen & Unwin, Sydney
- Spearritt, P. and Martin, L. (1983) 'How it Has Happened, in Ken Maher ed. *Quay Visions* NSW Chapter, Royal Australian Institute of Architects, Sydney, May 1983
- Spearritt, P. and Wells, J. (1984) 'The Rise and Decline of the Public Transport City 1900-1980' *Australian Historical Statistics* Bulletin No. 8, May
- Squitieri et al (1986) 'The Coming Boom in Computer Loads' *Public Utilities Fortnightly* December 25
- State Energy Commission of Victoria (1984a) 'Energy Use in Victorian Homes: Results of a Survey of Households in Victoria' The Commission, Melbourne
- Strickland, T.P. (1904) 'The Three Phase Generation, Transmission and Conversion System of the Sydney Electric Tramways' *SUES Journal* 1904
- Stringer, M. (1980) *Australian Horse Drawn Vehicles* Rigby, Adelaide
- Sutherland, D.E. (1981) *Americans and Their Servants* Louisiana State University Press, Baton Rouge
- Sykes, F. (1947) 'A Superposed Power Station at Balmain, NSW' *IEA Journal* Vol. 19, March
- \_\_\_\_ (1960) 'Development of the Electricity Supply System and the Future of Nuclear Power in New South Wales' *IEA Journal* Vol. 32, July-August
- Symons, Michael (1984) *One Continuous Picnic: A History of Eating in Australia* Penguin, Ringwood
- Tait's Electrical Directory of Australia and New Zealand* (1929, 1940, 1948/9) Tait Publishing Company, Melbourne and Sydney
- Thompson, Peter (1981) *Power in Tasmania* Australian Conservation Foundation, Melbourne
- Tindale, H. (1923) 'Progress of the Gas Industry' *Sydney Technical College Chemistry Society Journal* Vol 2, 1923-4
- Tourney Hinde, A.W. (1892) 'The Electric Lighting of Sydney and Suburbs' *Proceedings, EngANSW* Vol. VII, 1891-2
- Turnbull, A.P. (1909) 'Some Notes on the Electric Lighting of NSW State Railways and Tramways' *Proceedings, EIANSW* Session 1908-9
- Turvey, Ralph (1968) *Optimal Pricing and Investment in Electricity Supply: An Essay in Welfare Economics* George Allen & Unwin, London

- Twopeny, R.E.N. (1883) *Town Life in Australia* Elliot Stock, London
- Ubbelohde, A.R. (1963) *Man and Energy* Penguin, Harmondsworth
- Upton, W. (1982) *The Power House Ultimo, The Tram Depot Ultimo*: NSW Department of Public Works
- Van de Velde, H. (1890) 'Van Rysselberghe's Hydro-Dynamo System of Electric Lighting' *Proceedings, EngANSW* Vol. V, 1889-90
- Vatter, H.G. (1967) 'Has There Been a Twentieth-Century Consumer Durables Revolution?' *The Journal of Economic History* Vol. 27, No.1, March
- Walker, William (1985) 'Information Technology and the Use of Energy' *Energy Policy* October
- \_\_\_\_ (1986) 'Information Technology and Energy Supply' *Energy Policy* December
- Walsh, G.P. (1963) 'The Geography of Manufacturing in Sydney 1788-1851' *Business Archives and History* No.3, May
- \_\_\_\_ (1971) 'Factories and Factory Workers in New South Wales, 1788-1900' *Labour History* November
- Webber, W.H.G. (1907) *Town Gas and its Uses: For the Production of Light, Heat and Motive Power* Constable, London
- Weller, P. and Grattan, M. (1981) *Can Ministers Cope?: Australian Federal Ministers at Work* Hutchinson, Melbourne
- White, Deborah et al (1978) *Seeds for Change: Creatively Confronting the Energy Crisis* Patchwork Press CCV, Melbourne
- White, Lynn (1962) *Medieval Technology and Social Change* OUP, Oxford
- Wicken, H.F. (1891) *The Kingswood Cookery Book* Edwards, Dunlop & Co, Sydney
- Wilenski, Peter (1986) *Public Power & Public Administration* Hale & Iremonger, Sydney
- Wilkenfeld, G.L. (1980) *Energy Considerations in Urban Redevelopment: A Study of the London Docklands*. Thesis for the degree of Master of Philosophy, Council for National Academic Awards, London
- Williams, Rosalind (1984) 'The Other Industrial Revolution: Lessons for Business from the Home' *Technology Review* July
- Williams, R.H. et al (1987) 'Materials, Affluence and Industrial Energy Use' *Annual Review of Energy* No. 12
- Wills, N.R. ed. (1955) *Australia's Power Resources* Cheshire, Melbourne
- Wilson, J. and Burke, E.H. (1960) 'Planning of the Electricity Supply System in Sydney' *IEA Journal* Vol.34, June 107-113
- Wilson, M.G.A. (1967) 'Town Gas Manufacturing in Australia' *Australian Geographical Studies* Vol. V, No. 2, October
- Windett, N.M. (1933) *Australia as Producer and Trader 1920-1932* OUP, London
- Winner, L (1982) 'Energy Regimes and the Ideology of Efficiency' in G.H.Daniels and M.H.Rose, eds. (1982)
- Woolf, Arthur G. (1984) 'Electricity, Productivity and Labour Saving: American Manufacturing, 1900-1929' *Explorations in Economic History* 21
- Yarwood, D. (1983) *Five Hundred Years of Technology in the Home* Batsford, London