5. THE STATE TAKES CHARGE, 1932 - 1950

Up to the 1930s electricity supply in NSW was still organised largely on the municipal model established in the 1880s. State government involvement was limited mainly to matters of public safety, price control and rationing in emergencies. After the depression, however, successive state governments took action to co-ordinate the generation and distribution of electricity. The ensuing period of structural change commenced with new legislation in 1932 and the formation of the Sydney County Council in 1935, and culminated in the establishment of the Electricity Commission of NSW in 1950.

The two main objectives of governments were to accelerate rural electrification and to increase the efficiency of the electricity systems which by then covered the entire metropolitan area. The two issues were initially treated separately, but governments gradually realised the potential for a state wide electricity grid incorporating the major cities and the smaller regional systems.

The reliability and efficiency of electricity supply to industry became a matter of direct concern to both state and federal governments. The growth of manufacturing industry in Sydney, Newcastle and Pt Kembla was seen as essential to the state's economic recovery after the depression, to wartime national security and to post-war economic growth. In Sydney there was also strong growth in residential electricity consumption, which had been modest up to the 1930s. This was due partly to the electricity suppliers' success in penetrating the thermal energy market, a success which rebounded on the SCC when the war extended the delivery time for generating plant ordered from the UK. The problem of meeting demand was compounded by recurrent industrial problems on the NSW coalfields, and after 1945 day-time blackouts and rationing became chronic. This was understandably unpopular with the many residential consumers by then dependent on electricity for cooking and water heating, and disastrous for industries trying to meet post-war production demands.

The state Labor government, and a Sydney County Council increasingly identified with its political opponents, attempted to deflect blame on to each other. The government finally took steps to centralise the control of generation and formalise its administrative separation from distribution.

5.1 THE CENTRALISATION OF POWER

The year 1932 marked a transition to greater stability of government in NSW. In the 18 years to 1932 conservative and Labor governments had alternated at each election, but in the following 18 years there were 9 years of conservative coalition government followed by 9 of Labor. Governments had more opportunity to turn their attention to longer term issues such as electricity supply, to commission expert inquiries and implement legislative programmes.

The shortcomings of municipal electricity supply were becoming apparent. There was a large number of mainly small, independent undertakings owned or franchised by local authorities. Many of these had invested considerably in extending supply to neighbouring local government areas, under a variety of agreements which, as they neared termination, threatened large financial liability for ratepayers in some areas. Municipal undertakings were also financially and organisationally incapable of developing capital intensive electricity projects, such as hydro-electric development or rural distribution schemes, outside the towns they served. To overcome these difficulties state governments had to further develop the county council as a special form of local government, undertake the work directly through their own departments, or set up new statutory bodies. With every difficulty and crisis which required government intervention, the control of the electricity system became more centralised, though not without local government resistance.

The Development of Electricity Policy

As electricity supply became associated with economic development and standards of living it assumed a more prominent place in the political programmes of state governments, and came to be mentioned in party platforms and election policy speeches. The parties' electricity policy sometimes drew on the recommendations of expert inquiries, and was given effect, to greater or lesser extent, through legislation and administrative practice.

Governments to 1932

One of the objectives adopted at the NSW Labor Party's 1905 conference was "the collective ownership of monopolies and the extension of the industrial and economic functions of the State and Municipality" (Cooksey 1971,4). As an influential parliamentary opposition in the 1890s, Labor had supported the municipalisation of electricity supply. When in power, the party seemed content to leave electricity matters as they were, and concentrated its attention on private monopolies. The Labor governments of 1910-16 and 1920-22 imposed extensive controls on gas company profits and prices, but did not seek to extend control over

electricity.[1] The conservative parties had no formal policy on electricity supply, but rural electrification found a place on their agenda because of its significance for development, and because of the growing political influence of the rural interests.[2] In the Progressive Partys's policy speech before the 1922 elections, M.F.Bruxner, leader of the party from 1922 to 1926 and again from 1932 to 1958, referred to the need for the state to improve power supplies to country areas (Aitkin 1969,62).

Once in government the conservative parties did not pursue electricity development with any urgency. The Fuller coalition government of 1922-25 continued the hydro-electric development initiated by the previous Nationalist government in 1919, and transferred the Nymboida hydro scheme to the Clarence River County Council. The Bavin government of 1927-30, in which Bruxner was Minister for Works, constructed no major projects but took some administrative steps towards supplying rural areas from existing PWD power stations. It was criticised for its piecemeal legislative approach by J.M.Baddeley, who was to be Minister for Labour and Industry in the succeeding Lang Labor government:

> "Not only this government but others should have taken steps to co-ordinate electricity supplies throughout the State ...The co-ordination of all our electricity supplies is important to the whole state" (NSWPD 18.12.28,2933).

The only significant energy legislation introduced by the Lang governments of 1925-27 and 1931-32, however, was the Gas and Electricity Act 1932. It contained no proposals for electricity co-ordination other than price control by a Commissioner for Gas and Electricity, and mostly reflected the continued preoccupation of the Labor party with the private gas companies.[3] The deputy leader of the opposition, B.S.Stevens, claimed that the act was designed to bring the gas and electricity industries under the control of the Crown, just as the government's recently constituted boards for the milk, transport and coal industries were intended to do (NSWPD 3.3.32,8155). He said

> "...it is a very subtle and very deceitful way of giving us the sovietization of industry in this community - giving it to us in such a way that it will make some appeal to the housewife and to the average man in the streeet, who will be only too glad to say that the Government has brought in a bill to reduce the price of gas" (ibid, 8157).

As it happened, the Lang government was dismissed from office at about the time the Act came into effect.

The succeeding Stevens-Bruxner government made limited use of the Commission for Gas and Electricity before repealing the Gas and Electricity Act 1932 in its entirety in 1935, claiming that it was a "dead letter" which could not effectively control prices without unwarranted intrusion into company affairs (NSWPD 6.3.35,6089).[4] It replaced it with the Gas and Electricity Act 1935, the first attempt at central co-ordination of the NSW electricity system. The new act was intended to

> "... make better provision for and with respect to the supply and use of gas and electricity, the regulation of dividends, funds, accounts and shares of gas companies, and the charges made for electricity by the Electric Light and Power Supply Corporation Limited; to alter the law relating to the licensing of electrical contractors and electricians; to make certain provisions in relation to electricity generating stations, new main generating units and transmission lines; to constitute the Sydney County Council, and to transfer the Electricity Department of the Municipal Council of Sydney to such County Council; to repeal the Gas and Electricity Act 1932..."(NSWPD 6.3.35,6088).[5]

Even so, the government's statutory powers over electricity development were still limited: it could not force suppliers to act, but it could refer their proposals to its Electricity Advisory Commitee for review, and if necessary veto them.[5] The Minister for Local Government, E.S.Spooner, expressed his government's intention to use these powers for co-ordination but "to allow self-expression and self-management to all local undertakings" (NSWPD 6.3.35,6093).

At first the government enthusiatically promoted the extension of electricity supply to rural areas, and price reductions in towns and districts already served. In December 1935 it amended the Local Government Act to allow subsidy of the capital cost of extensions (SMH 14.1.36). Nevertheless, rural electrification proceeded more slowly than expected, and even the provision of bulk supply by the government failed to speed it up.[6] Local authorities with their own generating plant, such as Goulbourn, preferred to retain it rather than compromise their autonomy (SMH 7.8.36). As for areas without supply, Spooner complained:

> "In many cases the shires are backward in seeking to extend electricity supplies and they prefer to leave it to the government to extend and control the retailing of electricity in their area. There will be much more progress when all the shires realise the advantages of electrification and their opportunities for undertaking functions of local government that are important to their areas" (SMH 29.7.38).[7]

The L 0.75 million in capital subsidies which the government managed to press on rural local authorities by March 1939 (SMH 5.3.39) was a small proportion of the total capital investment in distribution over the period, most of which was concentrated in Sydney. The government was constrained by its committment to allow local authorities "free expression" - presumably to

do nothing if they wished. It was less inclined to forcibly reorganise electricity authorities in the country, where it drew much of its electoral support, than in Sydney, which generally voted Labor in any case.

In January 1937 Premier Stevens, who had recently inspected electrical developments abroad, presented to cabinet a scheme to unify the state's largest electricity systems which would cost L 12 million and take a decade to complete (SMH 15.1.37). The electrification of the main rail lines was to be the means by which low cost energy from large power stations in Sydney and other urban load centres was to be transmitted inland. Neither rail electrification nor a transmission grid were economic on their own, but they would be so in combination. The possibility of a central authority with its own borrowing powers was foreshadowed.[8]

While local government had been apathetic on rural electrification, the very hint of a central co-ordinating body provoked vocal opposition.[9] The proposals were discussed at length in the next 18 months but no steps were taken toward an integrated grid until 1939, under the pressure of war time security needs. The state co-ordination scheme, now including hydro-electric development in the Snowy Mountains, was floated again in late 1940 and again withdrawn in the face of local government protest.[10] The SMH commented:

> "A curious aspect of the movement for the co-ordination of electricity development in New South Wales is the apparent ruling out, by tacit political consent, of the chief solution towards which modern opininion trends...This indisposition freely to examine the merits of the commission system of central control may be a tribute to the efficiency of the existing methods of distribution, in which the local government bodies are largely interested, or it may reflect the political embarrassments attendant upon attempts at reform along centralised lines...Even the proposed plan for co-ordination of those schemes under a "representative" State Electricity Committee, executive only by delegation of [local government] authority, suggests a patching-up of a system which has had its day, instead of the full-blooded reform of control which alone can satisfy the future requirements of the greatest industrial State in the Commonwealth" (SMH 26.3.41).

The Labor Government, 1941-1950

Following the prominence given to it by the Stevens-Bruxner government, electricity development became a fixture in the election platforms of all parties. According to Hallam (1983) rural electrification was a cornerstone of McKell's successful strategy to regain power for Labor in the 1941 election. McKell was personally interested in the matter, and like Premier Stevens before him, he visited major electricity developments overseas, including the Tennessee Valley Authority in 1945 (Kelly 1971,106). Posibly because of the demands of the war, however, the McKell government devoted little attention to electricity supply during its first term of office, apart from reorganising the state-owned Burrinjuck and Pt Kembla systems, which had been linked at the initiative of the previous government.[11]

Before the 1944 election McKell gave specific undertakings:

> "Another step which will be taken at once when my government is returned again will be the setting up of a State Electricity Development Authority. This is no new thought; the need for such a body has long been apparent" (NSWPD 20.11.45,1315).

It was in fact almost identical with the proposal which the previous government had tried to put into effect and failed, in the face of opposition from local government.[12] While the government was drafting the legislation during 1944 and 1945, the Minister for Public Works and Local Government, J.J.Cahill, found it necessary to defend it against criticism from the LGA, the SCC and other local government interests.[13] The SCC feared that it provided for a board of control for all metropolitan electricity supply (SMH 17.6.44). The LGA feared the establishment of a full scale electricity commission (SMH 8.10.45). The opposition's view as expressed by E.S.Spooner was that existing legislation was quite adequate for the subsidisation of rural electricity supply (SMH 14.11.45).

In the event, the Electricity Development Bill, introduced in October 1945 and passed by the end of the year, was evolutionary rather than revolutionary. It provided for the replacement of the existing Electricity Advisory Committee by a smaller Electricity Authority (EANSW), with powers to require, co-ordinate and finance electricity development instead of merely advising on the proposals put forward by local government. The bill's most innovative feature was the provision for payment for the state's largest electricity suppliers to pay about 2.5% of their revenue for the administration of the EANSW and to provide some of the funds for rural electricity development, to supplement the contribution from consolidated revenue (NSWPD 20.11.45,1324). The EANSW also had the power to fix prices for bulk supply. These were the basic mechanisms of the regional cross-subsidisation that became a permanent feature of state electricity policy.

Both the government and country electricity authorities did well out of the Electricity Development Act. The former finally acquired an instrumentality capable of carrying out the rural electrification necessary to its development and decentralisation policies, and the latter were the main immediate beneficiaries. The Sydney electricity consumers who were to bear about a quarter of the identified costs of rural subsidy (and much of the hidden cost via the uniform BST) were less fortunate. In August 1946 the Premier announced the EANSW's 10 year plan to connect 36,000 rural consumers, at a cost of L6 million (SMH 3.8.46). Up to 45% of the cost was to be subsidised: L1 m from consolidated revenue and up to L1.7 m from the contributions of urban electricity consumers.

As soon as the Electricity Development Act was passed, the state government was forced to turn its attention to the post war crisis in the Sydney electricity system. From early 1945 there had been almost continual disruptions from strikes and shortages of coal and generating plant, with far reaching consequences. Federal Labor parliamentarians urged the NSW acting premier not to impose formal restrictions in mid 1945 for fear of antagonising voters in the impending federal election (SMH 23.6.45). The state government left the SCC to cope with blackouts as best it could in 1945, but as the problems spread to the rest of the now inter-connected system, it became more difficult for the government to remain aloof.[14]

As the crisis dragged on from year to year, the political risks of allowing it to continue eventually exceeded those of rationing, for which the state government took responsibility in the winter of 1948. In May 1949, with another winter of coal strikes and plant shortages looming, it declared a state of emergency under the Gas and Electricity Act and appointed the ELPSC's manager, H.G.Conde, as Emergency Electricity Commissioner, with powers to control the generation and consumption of electricity throughout the interconnected system (SMH 3.5.49). The government could do little more in the short term to alleviate electricity shortages in the short term, but was finally in a position to create a central generating organisation to plan for the longer term .

The Electricity Commission Bill was introduced by J.J.Cahill in March 1950, two months before a state election. He dwelt on its significance for the long term development of the state, rather than its relevance to the existing shortages, but observed in passing that the SCC itself had shown the need for it through a demonstrated incapacity to carry out its task (SMH 13.4.50).[15] Cahill made no apology for the fact that the ECNSW was to be under ministerial control:

> "...the government has been unfairly citicised for alleged sins of omission or commission which were in fact attributable to independent bodies over which it had no control. In setting up this Commission the Government is giving effect to its settled policy and for which it accepts full responsibility. In accepting this responsibility it is only reasonable that the Government should retain the power, if necessary, to ensure that its policy is carried out" (NSWPD 12.4.50,5719).[16]

Cahill sought to mollify the local government lobby by pointing out that the ECNSW would make possible a uniform bulk tariff throughout the state, which local government had been advocating for many years (ibid,5715). There was no intention that the government would ever take over reticulation. In fact, the bill would not interfere with any local government body with the sole exception of the SCC, whose generation and transmission assets were to be acquired immediately (ibid,5678).[16]

The government's tactics were sound. For once it was dealing from a position of strength with a local government lobby by no means united behind the cause of the SCC.[18] In February 1950, at a Local Government Association meeting of 80 councils called to plan the customary protests over the "further encroachment of the powers and functions of local government", there emerged instead support for the government's proposal, on the grounds that the SCC was not a true local government body and that too much power was invested in the general manager (SMH 23.2.50,5). The Association nevertheless circulated a protest pamphlet to the effect that the real purpose of the proposal was an attack on the SCC. It concluded rather melodramatically:

> "If electricity passes to centralized control it will ring the death knell of a Greater Local Government and eliminate any hope of a real and living democracy in New South Wales" (LGA 1950,16).

The Electricity Commission Act was assented to on 16 May 1950 and commenced with the appointments of H.G.Conde, as full time chairman, and four part time commissioners, none of whom represented local government.

It is difficult to say whether Sydney's postwar electricity crisis would have been any less severe if a central generating authority had been formed in 1938, when the Stevens government had first taken steps towards it. It is likely, however, that no state government could have intervened so decisively in electricity supply except in a crisis atmosphere. A conservative state government in the same situation would probably have acted similarly to Labor. Despite the differences in rhetoric, the electricity policy which had emerged in the 1930s and 1940s was largely bipartisan. All parties wanted the extension of the grid to rural areas, and after the war realised the importance of a sound metropolitan electricity supply to industrial development. Labor was better placed to make the necessary structural changes. The conservative parties had been able to restructure the SMC undertaking because it was urban and identified with their Labor opponents, but were hampered from moving towards state wide co-ordination by their reluctance to centralise control, and by their links to rural local government.

The Problem of Co-ordination

After the first world war, several NSW governments set up inquiries to grapple with the problem of state wide co-ordination of electricity supply. In some cases politicians felt they lacked the experise to make decisions about technical matters, or genuinely wanted the views of all interested parties aired. On the other hand, establishing a committee or an inquiry was a time-honoured way of deferring difficult decisions, or forcing fundamentally opposed interest groups to compromise or paralysis. The recommendations of inquiries naturally reflected the predispositions of the governments initiating them and of the organisations represented on

them, but all conceded the need for some form of central co-ordination. Three main forms of organisation were recommended: a statutory commission with wide powers to generate and supply (modelled on the SECV), a central organisation to generate and distribute in bulk to existing retailers (the form, eventually, of the ECNSW), and co-ordinating bodies with varying degrees of statutory authority. The main inquiries and their findings are summarised in Table 5.1.

In 1920 a committee appointed by the Minister for Public Works in the Storey Labor government recommended the appointment of an electricity commission similar to the SECV, which had begun operation in the previous year.[19] It was to have power

> "...to investigate resources, to grant franchises, to control extensions and new systems of supply, to fix prices, to acquire land, to construct stations, to generate and supply; in short, national ownership of electricity as well as administrative control of private undertakings in the field" (CGE 1934,5).

In May 1929 the Bavin Nationalist government established a Royal Commission into the NSW coal industry. In June 1929 the same commission was directed by the Commonwealth government to make substantially identical inquiries, and became in effect an investigation into the major elements of the predominantly coal-based national energy system.[20] Its report recommended that the Commonwealth and State governments co-ordinate the development of Australia's energy resources through the establishment of "Central Power Boards" in each state (RCCI 1930,72). These boards were to have statutory powers of co-ordination, along the lines suggested by the 1920 NSW inquiry, but limited executive powers. It was specifically recommended that, to "economise administrative costs", the boards should not be empowered to construct works (ibid,73).

Other investigators were openly critical of what they saw. In September 1929, shortly after the Royal Commission into the Coal Industry had commenced its investigation, the Commonwealth Parliament received a report on power development in Australia, by the engineer A.J.Gibson. Surveying the situation in each state, Gibson noted that NSW

> "...lacks definite control in power matters. The various Supply Authorities co-operate amongst themselves, and with other States, with a view to adopting standardized rules, systems, frequency and pressure, but there is a lack of cohesion and co-ordination in matters of supply. Local politics too frequently play a part in determining matters of extension of generating capacity and distribution, without reference to any authority capable of exercising independent judgement of the actual economic requirements of the position" (Gibson 1929,23).

Gibson's recommendations were very similar to those of the Royal Commission: the establishment of state power commissions or boards with statutory powers of co-ordination but not of construction (ibid,44).[21]

Gibson also chaired a special committee formed by the Stevens-Bruxner government in February 1933, to advise it on the control of electrical appliance safety and on the organisation of supply. As the first electricity inquiry since 1920 not to be complicated by national or coal issues, it raised expectations within the NSW electricity supply industry that some action would at last be taken, prompting other organisations to release their own, pre-emptive reports.[22] In the event the Gibson committee's recommendations were mild in comparison with the suggestions of previous inquiries, including Gibson's own 1929 report to the Commonwealth.[23] On this occasion he recommended that the government establish a permanent "Electricity Advisory Committee" without statutory powers, attached to the Department of Local Government. This was to be the official link beween the government and the electrical industry, and would advise on all relevant legislation and "any steps thought to be needed to promote the general well-being of the electrical industry" (CGE 1934,4). There were no specific recommendations for re-organisation of supply, even within the government: each of the departments involved in generation or safety was to retain its functions.

The government formed an Electricity Advisory Committee (EAC) almost immediately, and gave effect to Gibson's other recommendations through the Gas and Electricity Act 1935. In January 1937 it asked the EAC to consider a L 12 m scheme for the co-ordination of supply, railway electrification and hydro-electric development (SMH 15.1.37). The proposals received favourable publicity, but the SMH commented on the need for a suitable organisation to put them into effect:

> "...the way is open for undue operation of political elements in a sphere where they are unnecessary and perhaps, under possible Governments of the future, definitely harmful. Why does the government not take the opportunity to initiate a truly comprehensive scheme of co-ordination under one controlling authority, such as an electricity commission? Complete co-ordination could then be achieved, not merely a partial one." (SMH 18.1.37).

The government referred matters to yet another inquiry, this time by the British consulting engineers Rendel, Palmer and Tritton. The firm's December 1937 report was considered "easily the most comprehensive one in the long history of electrical power reports so far shelved in the governmental archives of the State" (Myers 1944,41). it recommended that a central authority be established with statutory powers to raise finance and construct works. The authority was to take over immediately the electricity supply activities of government departments, and in due course acquire all other major generating systems for integration into a state grid. Distribution was to remain a matter for local bodies (RPT 1937,xii). After much discussion and some dissent, the EAC endorsed the recommendations and they became the blueprint for the present structure of the NSW electricity system, though they was not given full effect until the establishment of the ECNSW in 1950.[24]

The difficulties of co-ordinating the haphazard development of the NSW electricity system were reflected in the government's own complex administrative arrangements. Its increasing involvement in all aspects of the system - from appliance safety to policy development to actual electricity supply - were carried out through a number of government departments and instrumentalities. There were major shifts in administrative responsibility from time to time, but electricity administration remained a fragmented subcategory of established departmental functions. The instrumentalities with the longest history of involvement were the Railway (RD) and the Public Works (PWD) Departments, which had built and operated power stations from as early as 1899, initially for departmental purposes but later contributing significantly to public supply.[25] These departments had considerable influence over the technical aspects of supply, while the commercial operations of local government electricity and gas undertakings were supervised by the Department of Local Government (DLG).[26]

With so many instrumentalities involved, some duplication and inefficiency was inevitable . In 1935 the SMH commented on the administrative confusion and lack of co-ordination in electricity supply:

> "At least four Government departments exercise powers in dealing with the supply of electricity in bulk - the Public Works, Railways, Local Government and Mines Departments - and the Labour Department has some supervisory rights under the Factories Act. Inspectors from these departments frequently disagree in exercise of their powers in matters of detail. There is no authority to say whether new generating stations which may be proposed are necessary or not" (SMH 7.3.35,2).

The amalgamation of the DLG with the PWD in 1935 provided the greatest opportunity for the rationalisation of government energy administration in this period. For the first time, the supervision of both private and local government gas and electricity undertakings, the co-ordination of electricity development, the construction of the government's major electrical works and the operation of one of its two regional systems (the other being the RD's) were combined in the one agency. The departments were separated again in 1940, and the opportunity was lost.[27]

In the 1940s another opportunity arose for the government to demonstrate that co-ordination begins at home. The PWD operated the power stations it had built at Pt Kembla (1915) and Burrinjuck (1928) and, like the RD, proceeded to develop public supply. It sold electricity in bulk, if the local authorities were willing to undertake reticulation, and retail if they were not. In the late 1930s the two power stations were interconnected by a transmission line, and in 1942 the government formalised the arrangement:

> "With the passage of the Southern Electricity (Administration) Act, 1942, the Port Kembla and Burrinjuck electricity supplies, with Yanco power station incorporated, have been combined in the one generation, transmission and distribution system. The scheme is designed to facilitate further construction of electrical plant and expansion of distribution so enabling greater consumption of electricity in the southern industrial and rural areas" (PWD 1941-42,4).

The administration of the Southern Electricity Supply (SES) was vested in the Minister for Public Works, who was constituted a corporation sole for the purposes of trading as an electricity supplier (NSWPD 21.4.42,2922). This was the first and only instance in NSW of direct ministerial control of a fully fledged regional electricity utility.[28] It was pronounced a conspicuous success by the Labor government which established it, and its co- ordination of disparate generating elements held up as the model for the ECNSW (NSWPD 12.4.50,5709). Local government control of distribution was so entrenched, however, that the precedent of the SES as an integrated retailer could not be followed state-wide.

TABLE 5.1
MAJOR INQUIRIRES INTO ELECTRICITY CO-ORDINATION
NSW
1920 - 44

COMMISSIONING AGENCY	REPORT YEAR	CHAIRMAN OR CONSULTANT	MAIN RECOMMENDATIONS
Story Labor Government	1920	committee; not known	State electricity commission for generation & distribution
SMC	1924	S.L.Pearce	Co-ordination of SMC and RD metropolitan systems
Bavin Nationalist & Comonwealth Governments	1930	Royal Comm into Coal Industry	State co-ordinating board without executive or construction powers
Commonwealth Government	1929	A.J.Gibson	State power commissions: statutory powers as above
Stevens-Bruxner Govt.	1933	A.J.Gibson	Electricity advisory committee; no statutory powers
Stevens-Bruxner Govt.	1937	Rendel, Palmer & Tritton	Central constructing & generating body to take over existing systems; local government to retain distribution
McKell Labor Government	1944	S.F.Cochran	Area boards; co-ordination and construction powers

Summarised from text.

TABLE 5.2
CURRENT AND ADJUSTED AVERAGE PRICES BY CONSUMER CLASSES
SCC
1934 - 49

YEAR	PRICE INDEX (a)	PRICES (pence/kWh) RESID Act	RESID Adj	COMM Act	COMM Adj	INDUST(b) Act	INDUST(b) Adj	BULK Act	BULK Adj	TOTAL Act	TOTAL Adj
1934	100.0	2.05	2.05	2.17	2.17	1.13	1.13	0.83	0.83	1.51	1.51
1939	112.6	1.59	1.41	1.59	1.41	1.00	0.88	0.70	0.62	1.21	1.08
1944	137.8	1.30	0.94	1.65	1.20	0.99	0.72	0.79	0.57	1.13	0.82
1949	173.2	1.62	0.94	2.23	1.29	1.40	0.81	0.79	0.45	1.43	0.83
% REDUCTION(c)		34		8		9		27		24	

(Source: SCC annual reports, Gilbert et al 1987,X,213)
a. Comomwealth "C" series index of prices, combined categories.
b. LV industrial (about 30% of sales; cf HV indust 6-8%)
c. % reduction in inflation-adjusted prices, 1939-49.

5.2 THE SYDNEY COUNTY COUNCIL: NEW NAME, OLD HABITS

With the creation of the Sydney County Council in 1935, the major part of the Sydney electricity system came under a new form of political control, ostensibly more democratic and representative, and serving as a prototype for the electricity organisation favoured by the Stevens-Bruxner government. At the same time the power and independence of the utility's managers were enhanced, as they had been by every previous administrative change. The nominal political controllers of the SCC had a limited and essentially negative impact on its policies: they could veto and delay, but the initiative clearly lay with management.

Industrial electricity sales increased in the 1930s and 1940s as the economy recovered from the depression and then geared up for armaments production. The geographic expansion of the system continued, albeit more slowly: every local government area in Sydney had made some arrangement for supply, but many potential consumers in each area remained to be connected. Residential sales per consumer grew as appliance ownership increased, stimulated by the promotional efforts of the suppliers.

The need for security of supply in case of enemy attack finally brought about the interconnection of the metropolitan electricity systems. This proved valuable in ameliorating the difficulties caused by lack of new plant after the war. The system managed to live for years on its excess generating capacity, until an accumulation of crises overwhelmed it and gave the state government further opportunity for structural reorganisation.

Formation of the County Council

After the allegations of corruption over Bunnerong and the Civic Commission of 1928-30, the relationship between the SMC and its electricity undertaking became a matter of perennial public debate. Most bodies of opinion, other than th e Labor Party, agreed that there was too much scope for SMC aldermen to interfere in the affairs of the undertaking. Several alternatives for making political control less direct were canvassed.[29] For the Stevens-Bruxner government, concerned with finding a suitable model for the organisation of electricity throughout the state, the SMC offered a convenient opportunity for experimentation. It was assisted by expressions of discontent with the SMC among the suburban municipalities, some of which considered that they could obtain electricity cheaper from other suppliers and wanted the opportunity to do so as soon as their contracts with the SMC expired.[30] The government needed a model with general applicability, and one consistent with its committment to local government, and it lost

no time in floating the idea of a county council, on which the suburban municipalities would be represented (SMH 25.5.33).

The proposal united SMC aldermen, both Labor and Civic Reform, in opposition to it.[31] Nevertheless, in March 1935 the government introduced the Gas and Electricity Act, two of the main provisions of which were the removal of the electricity undertaking from the SMC and the constitution of the SCC.[32] The government sought to justify its action in a number of ways, not all of them credible or consistent.[33] The Labor opposition fought the bill energetically. Its defence of the inviolability of the existing structure was based on rather shaky ground, however, since many Labor members supported proposals to transfer the undertaking to a Greater Sydney Council (NSWPD 12.2.35, 6207,6225).

The role of the EAC, formed in 1934 and given statutory status by the 1935 Act, was the subject of considerable criticism by the opponents of the legislation.[34] One of the 10 members of the EAC was H.R.Forbes Mackay, the general manager of the SMC electricity undertaking, who was approaching the retirement age of 65. The Act made provision for him to remain in charge of the undertaking, once it was transferred to the SCC, until he reached the age of 68. The powers of the general manager were also to be strengthened, so much so that the SMC noted:

> "...although the Bill is put forward as providing a County Council Scheme it is very largely a scheme for autocratic control by a General Manager" (SMC 1935,99).[35]

Both the government and the management of the undertaking gained considerably from the legislation. The government had stabilised the structure of the Sydney electricity system and created a prototype for electricity development:

> "The scheme for a county council for Sydney and certain suburbs is part of a policy of co-ordination for electricity control and development throughout the State. It places both the city and the suburbs upon a better footing, and removes anomalies that otherwise must remain to impede the complete electrification of Sydney" (NSWPD 12.3.35,6216).[36]

The management of the undertaking, already effectively independent of the SMC in long term policy, was now freed from day to day interference in staffing and administration. In fact, with the establishment of the EAC, all major decisions regarding the Sydney electricity system could now potentially be taken at the level either of management or of state government. This was to prove the case during normal operations, but the arrangement proved inadequate to handle the post war crisis.

The SCC was formally constituted by proclamation of the Governor on 17 August 1935. On 1 January 1936, 2394 staff and L 21.9 m of assets were transferred to it from the SMC (SCC 1935,5). The transition proved less smooth in other respects, and the controversy surrounding the SCC's formation was prolonged by tensions between elected councillors and ambiguities in the division of powers between council and management. For some years the Minister for Works and Local Government still found it necessary to defend the government's action, and SCC councillors continued to publicly advocate other forms of organisation (SMH 19&20.10.36). The Sydney County Council as such consisted of 5 members, elected at three year intervals by the aldermen of the municipalities within the undertaking's retail district. Each councillor represented both geographical and party interests [37]. No single group dominated at first: the SCC did not become strongly polarised in its party alignments until after the war, when it was in continual conflict with the state Labor government.

The first priority of both councillors and management was the definition of their respective roles and powers, made necessary by the Gas and Electricity Act which, in the opinion of a King's Counsel,

> "...was so ambiguous in many respects that it was difficult to understand what object in view the framers of the Act had..."(SMH 3.9.37).[38]

The councillors soon discovered that their administrative powers were severely circumscribed by the Act, and their first attempts to assert themselves on major issues of technical policy were unsuccessful.[39] Defeated by management in every trial of strength, the councillors were understandably frustrated. At one stage a councillor suggested that the SCC should resign en masse in protest against the "dictatorial powers given to the general manager" (SMH 14.7.37). The tension between the council and its management became less visible after 1938, when the councillors took steps to keep controversial matters out of the public eye, and Forbes Mackay retired after 31 years as general manager of the undertaking.[40]

Pricing and Promotion: Maintaining the Momentum

The pricing structure inherited from the SMC was a complex one, with considerable scope for cross-subsidisation between consumer classes and supply areas. The council at first made some half-hearted attempts to discover the true costs of supply, but found the information either unavailable or unpalatable.[41] The SCC's pricing policies remained those of its predecessor, reconciling the demands of the various consumer groups and promoting consumption within the framework of an annually balanced budget. Issues such as "principle", "equality" and plain sectional self-interest exerted a greater influence on pricing than the actual cost of supply.[42]

The council had to deal with pressure for lower prices from various interest groups. Early in 1936 commercial users began to complain that they were unfairly subsidising small domestic users through punitive maximum demand tariff, and councillors promised a deputation from the Chamber of Commerce that they would look into a more equitable basis of charging (SMH 23.4.36,27.6.36). The chairman of the SCC tried to mollify the complainers by telling them, in effect, to count their blessings:

> "...it would be unfair for the consumers of electricity to place undue importance on the present costs of production and overlook the substantial reductions in prices which had been granted during the past six years" (SMH 10.12.36).[43]

The council soon abandoned any initial desire it may have had to restructure prices, whether in the direction of greater simplicity or greater cost-reflectiveness. All price adjustments until 1947 were minor. They came out of the need to appease different groups of consumers at different times, according to how vocal and organised they were (ie commercial consumers), whether they could substitute other fuels or generate their own electricity (ie industrial users), go to alternative bulk suppliers (ie the outer municipalities) or affect the re-election of the councillors (ie residential consumers).

Average prices to all SCC consumer classes declined steadily until the 1940s, as shown in Figure 5.1, within a tariff structure which remained essentially stable from 1933 to 1947.[44] Residential consumers benefited more from this trend than others, mainly because of the retention of the promotional residential tariff structure introduced in the 1930s to increase consumption and to capture thermal loads from gas.[45] Figure 5.1 indicates that average prices to commercial and industrial consumers remained relatively stable from 1936 to 1946, despite considerable growth in consumption. They did not benefit from promotional tariffs to the same extent as residential consumers, though some customers were able to take advantage of "optional" rates (SCC 1939,15).

Despite the absolute and relative decline in residential prices, the increasing likelihood of constraints on supply due to war time conditions, and management advice to the contrary, the council took steps in 1943-44 to reduce residential tariffs even further.[46] All councillors seeking re-election at the SCC elections on December 1944 were returned (SCC 1944,3) suggesting that the reduction of residential tariffs, even at the expense of other consumers, was popular with the SCC's electorate.

The downward price trend could not be maintained. Between August 1947 and January 1949 the SCC was forced to increase prices three times, by a total of 35% for residential users, 33% for commercial and industrial users and 31% for bulk users (SMH 31.12.48).[47] The effective result was a restoration of prewar real price levels (see Table 5.2).[48] There was,

however, a permanent change in relative consumer class prices. Table 5.2 shows that real prices to residential consumers declined by about 34% between 1939 and 1949, compared with 8% for commercial and 9% for industrial.

The SCC continued to promote electricity use almost without interruption throughout the war and the supply crises which followed it. It opened an appliance showroom in the Queen Victoria Building in December 1935, even before the undertaking was transferred from the SMC.[49]. During 1937 it subsidised the installation costs of electric ranges, which it regarded as "the focal point of home electrification" (SCC 1938,16).[50] The SCC stimulated the market for other appliance types as well. From 1938 it promoted storage hot water systems, including off peak, in preference to the instantaneous type (SCC 1939,16). At the end of 1939 it began a "co-operative merchandising plan" with refrigerator manufacturers, offering a 5 year hire purchase scheme.[51] According to SCC annual reports the Electricity Sales Branch's promotional activities accounted for fully 45% of the total increase in the SCC's energy sales between 1935 and 1946: 14% through equipment sales, 4% through hiring and 27% through advisory services.[52] Even allowing for some exaggeration in these results, it is clear that direct promotion was an important part of the growth in SCC sales during this period [53].

Promotion proved a difficult habit for the SCC to break, despite years of chronic electricity rationing. It continued almost almost without interruption throughout the war.[54] By 1944 the SCC was looking towards the future with "advertisements ... designed to create good-will and to maintain public interest in the use of electricity in all fields, and particularly in the complete electrification of post-war homes" (SCC 1944,8). When supply problems intensified from 1945 on, the council still encouraged consumption which supposedly did not contribute to the day time peak.[55] In August 1950 the Chirman of the ECNSW H.G.Conde publicly criticised the advertising campaigns of the SCC and other suppliers:

> "There is a moral obligation on all generating authorities now to put the soft pedal on sales promotion of electrical equipment while there is a shortage of generating plant. Super-optimism about our capacity to supply power is deplorable. There is no room for it. The fact is we haven't enough generating plant to supply ordinary needs" (SMH 3.8.50,3).

The legacy of the SCC's pricing and promotional policy was a price structure distorted in favour of residential consumers. This had little basis in real costs of supply: it had been established for essentially short-sighted political reasons and, for the same reasons, proved difficult to reverse. It also rebounded on the SCC. The greater use of domestic electrical appliances increased the incidence of post war rationing and supply disruptions as well as their political costs, and helped legitimise turther intervention by the state government.

The Post War Crisis

The SCC's orderly growth was disrupted by events largely beyond the control of the council or its management. Anderson's summary of the causes is a fair one:

> "The failure to obtain on time new generating plant which was on order, the poor quality coal which the Undertaking was forced to use, and the difficulty in the carrying out of maintenance of the existing plant were the basic factors that profoundly affected the Undertaking during the war years and the immediate post-war period" (Anderson 1955,198).

The war increased the delivery time of plant already ordered and prevented new orders being placed in Britain, the traditional source of the SCC's equipment. There was a threefold increase in plant lead time, and virtually no new generating plant was installed in any of Sydney's major power stations between 1941 and 1947.[56] The war was clearly the main cause, but both the SCC and the government contributed to avoidable delays in plant ordering.[57]

The second major factor was the uncertainty of coal supply. The intensification of industrial problems on the NSW coal fields after 1942 contributed to a protracted national energy crisis. Butlin and Schedvin (1977) conclude that "The shortage of coal was easily the most important material supply deficiency of the final three years of war" (p453). NSW coal stocks declined by more than two thirds between 1942 and 1945 due to production shortfalls (ibid,444). This left consumers vulnerable to further stoppages in coal production and led to regular restrictions on coal use in almost every year up to 1950. The SCC had difficulty in obtaining priority in coal allocation, and substituted fuel oil where possible.[58] Furthermore, it could not always obtain the quality of coal for which the Bunnerong boilers had been designed, so the energy output per ton also declined. In addition to the plant and fuel problems common to all Sydney electricity suppliers, the SCC experienced protracted industrial disputes at Bunnerong power station. Plant maintenance schedules began to slip in 1940 due to wartime shortages in skilled manpower (Anderson 1955,206). There were two major strikes of power station workers, totalling 55 days, in 1945 alone (SCC 1951,13).[59]

The plant, fuel and industrial problems compounded to make the system chronically unreliable. Maintenance fell further behind at the very time when the ageing of plant, the enforced use of unsuitable fuel and growth in demand made it more urgent. Boilers were regularly working at reduced output or out of service entirely because of overdue maintenance. Furthermore, the coal supply situation was so critical that the SCC's stocks were down at times to just a few hours' consumption (SMH 23.6.48). In short, all the normal margins of safety in power system operation - generating reserves, fuel stocks and the capacity to overstress plant for short periods - were exhausted.

Whenever the supply available fell short of the demand, consumption had to be curtailed to avoid the complete collapse of the system. If there were sufficient advance warning, specific groups of consumers could be asked or required to reduce their demand, but in emergencies the system managers had to make quick decisions on which consumer groups or areas to black out. Understandably, no single group of consumers wanted to bear the burden of power cuts, and none of those responsible for the management of the energy system at the local, state or federal government level wanted to assume sole responsibility for them.

In the years leading up to the crisis the SCC, and its Labor members in particular, had shown itself reluctant to assume responsibility for potentially unpopular decisions, such as the cessation of appliance hire (SMH 12.11.41). When the possibility of supply restrictions due to coal shortages was first raised the SCC chairman S.E.Parry came out against them, and said that if they were to be imposed the Commonwealth government should impose them (SMH 13.10.43).[60] In April 1944 the Department of War Organisation of Industry foreshadowed winter rationing of domestic fuels and electric radiators. The Labor councillors said there was no cause for alarm, and accused the Coal Commissioner of deliberately diverting SCC coal to other states (SMH 19.4.44).

While reportedly criticising the handling of the coal disputes by its federal Labor counterparts, the state Labor government became reluctantly involved in managing the consequences (SMH 23.6.45). At first it received little assistance from the SCC, which tried to distance itself on the basis that the coal shortage was not of its making.[61] Finally, in February 1948, SCC chairman J.O.Cramer publicly set out the elements of the problem. He admitted that blackouts could go on for another two years, but did not accept that the SCC should take resposibility for systematic rationing, and concluded that the "...helpful thing for everybody to do is to turn off unessential electrical appliances about the peak hours" (SMH 2.2.48).

Cramer contended that the reponsibility lay with the state, and that resolving the competing interests of various consumer groups was a matter of "high government policy" (SMH 17.4.48). [62] In fact the government had little choice but to take drastic action in the face of what had become a major obstacle to postwar industrial development:

> "Sydney is not merely the greatest concentration of people in the Commonwealth, and the blackouts mean a great deal more than irritation and scratch meals. The city is Australia's greatest centre of production, and the blackouts dislocate output, making goods scarce and dear" (SMH 4.9.50).

In 1948 and 1949 the government gradually assumed reponsibility for co-ordinating rationing, with measures that included legal restrictions on certain uses between certain hours, and a system of rotational blackouts around which industries could plan production. At first the

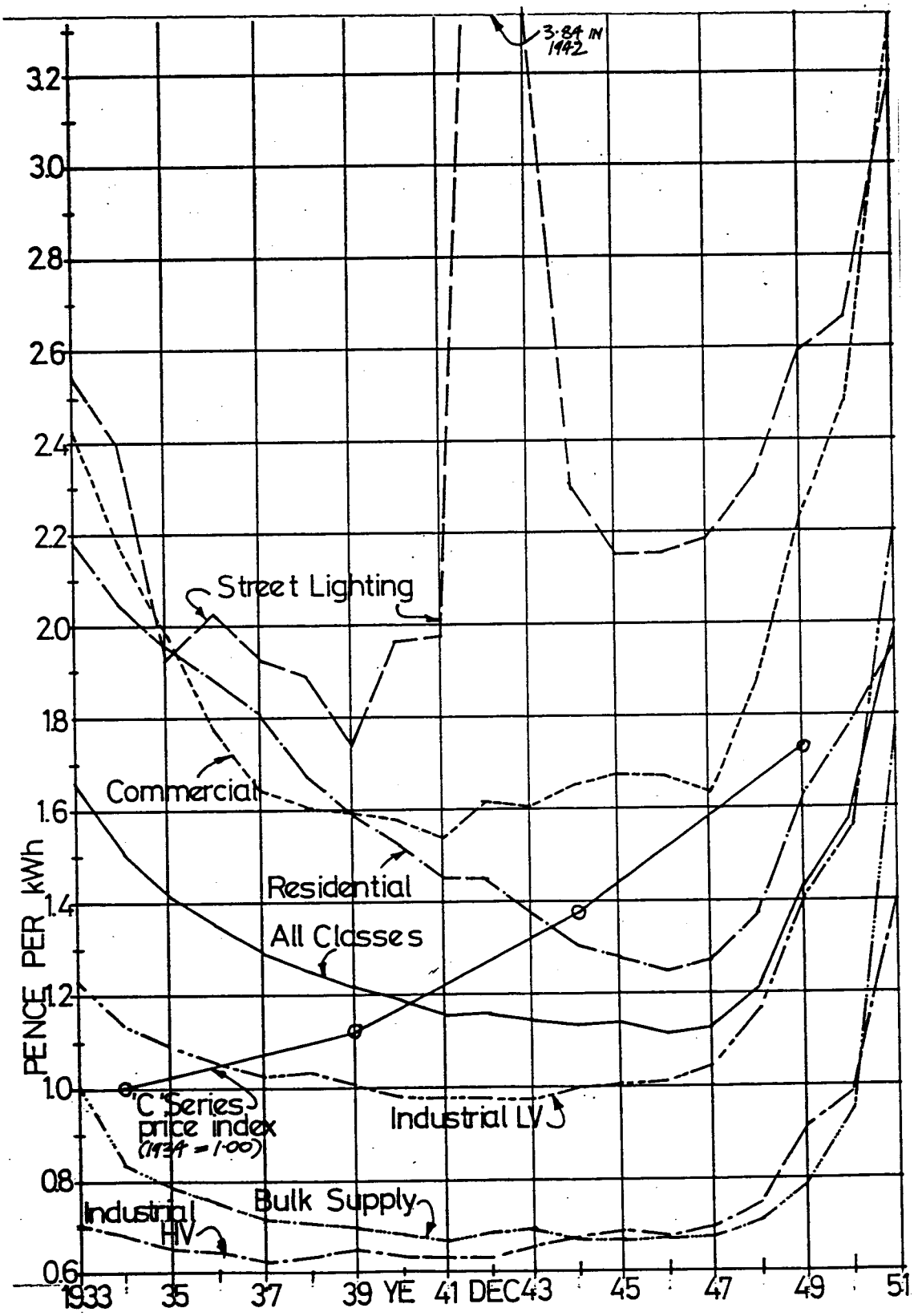
government attempted to reach a consensus on rationing with suppliers and consumer groups (SMH 2&22.2.49). Then on 2 May 1949 it declared a state of emergency under the Gas and Electricity Act 1935 and appointed H.G.Conde, general manager of the ELPSC, Emergency Electricity Commissioner, with complete control over electricity production and consumption throughout the interconnected grid (SMH 3.5.49).[63]

By 1948 the SCC had become a focus for party political rivalries at state and even federal level, and its claim to be a distinct local government body was wearing thin.[64] In that year the state government reduced the number of municipalities in Sydney, and reconstituted the SCC.[65] From then on the SCC became even more polarised along party lines and less reflective of the views of its constituent municipalities.[66] This provided ample excuse for the government to make revolutionary changes to the organisation of electricity generation, as urged by Conde, and in late 1949 it announced its intention to create an Electricity Commission to take control of all generation, including the SCC's.

The proposal immediately became another focus for the continuing conflicts within the SCC. The Labor councillors openly supported the plan. When J.O.Cramer, SCC chairman in 1948 and 1949, relinquished the office in 1950 to contest the federal seat of Benelong for the Liberal Party, his parting minute to the SCC described the proposal as "highly political, socialistic and dangerous".[67] All pretensions to management impartiality dissoved when the chief servant of the Council, the general manager G.S.Boyd, took the lead in opposing the establishment of an Electricity Commission, claiming that it would place the SCC "under the domination of militant sections of the trade-unions, with strong Communist tendencies" (SMH 18.2.50).[68]

The political organisation of the Sydney electricity system had shown itself incapable of managing the crisis of supply. The SCC was preoccupied with its own divisions between factions of councillors, management and workers, many of which reflected external political alignments. These divisions frustrated efforts to deal co-operatively with rationing and other emergency measures, may well have exacerbated the crisis, and gave the state government ammunition and opportunity to reorganise the state's electricity system.

FIGURE 5.1
AVERAGE PRICES BY CONSUMER CLASSES
SCC 1933-51



5.3 THE SYDNEY ENERGY SYSTEM AFTER THE WAR

By the end of the war the first phase in the electrification of the Sydney energy system was complete. With virtually every building connected to the grid, every household and business joined the market for the electrical products of a demobilised postwar industry, itself highly electrified. The war had both stimulated and over-stressed the energy system. Its major negative impact was the disruption to electricity supply brought about by plant and material shortages and industrial disputes. On the positive side, the manufacture of armaments had accelerated the demand for energy services and built up expertise in electricity-intensive production techniques:

> "Munitions production had forced the pace of industrialisation; new industries had been established; the level of technological sophistication in the metals and engineering group had increased substantially..." (Butlin and Schedvin 1977,742).

Beneath the temporary setbacks, the current of electrification was strong and irreversible. Industral demand accelerated, though many firms were forced to generate more of their electricity needs on site until the problems of the grid were resolved. The war and its aftermath failed to dampen residential electricity demand, despite a sharp curtailment of appliance production after 1941. The most important qualitative change in electricity supply was the long delayed integration of the separate systems in Sydney and the surrounding region. The new interconnected system formed the nucleus of a state wide electricity grid, permitting regional generating resources to be harnessed during the following period of intense growth.

The Demand for Electrical Energy Services

Sydney electricity demand increased considerably in the period 1936 to 1946. The residential sector emerged as the fastest growing sector of electricity demand, while the transport share declined. This is illustrated by Table 5.3, showing consumption trends by SCC retail consumers, and Table 5.4, which gives the 1946 sectoral breakdown for the entire Sydney electricity system. Growth was slowed only slightly by the supply difficulties of the late 1940s. The various consumer classes were affected in different ways, according to their priority of access to the limited supplies and their degrees of electrification.

Despite the supply problems industrial electrification was irreversible. The installation rate of electrically-powered machinery slowed only slightly between 1942 and 1950, when very little central generating plant was installed and supply restrictions routinely disrupted production. Manufacturers made their investments in the expectation of unlimited electricity supply in due course, and in the meantime preferred to install their own generators rather than switch fuels.

The high degree of industrial electrification reached in the 1930s was maintained. Table 5.5 shows that the aggregate horsepower of machinery in NSW factories almost tripled between 1936 and 1950, the power per factory employee increased by some 50%, and the proportion of power supplied by electricity increased from about 77% to 80%.[70]

Industrialists responded ad hoc to the first round of supply crises in 1945 by shifting starting times and trying to find workers tasks which did not require electricity (SMH 27.6.45). By early 1947 it was clear that supply restrictions would last for years, and industrial demand would have to be reduced if blackouts were to be avoided during the approaching winter. No option satisfied all parties, including the unions and the government, and it took two more years for rationing to become fully systematic.

Industrial electricity restrictions were avoided as long as possible while residential districts took the main burden of supply failures, but they became inevitable as the supply situation worsened.[71] The SCC's industrial sales fell 10% from 1948 to 1949, though the actual decline in industrial electricity use was probably much lower. Faced with directions to reduce their energy consumption by 30% for an indefinite period, many manufacturers obtained supplementary supplies by installing their own generators (SMH 27.5.49). There was a boom in the market for war surplus generator sets, and, ironically, for plant made redundant as country power systems were connected to the Sydney-centred grid (SMH 1.6.49). The utilities made arrangements for consumers who had their own generators to reduce their demand, and if possible to export power to the grid at times of stress.[72]

Household electrification proceeded steadily. Table 5.6 summarises the results of the 1947 census, the first reliable survey of the types of energy used by Sydney households. It shows that the electricity system had been better able than gas to keep up with Sydney's rapid inter-war suburbanisation. The electricity connection rate in the inner and middle suburbs was 98.7%, and in the outer suburbs it was 93.1%. Gas connection rates differed widely: 91.8% in the inner area but only 47.5% in the outer.

Electricity connection meant that a household almost certainly used electric lighting, probably possessed an iron and a radio and possibly other small appliances. It did not necessarily mean high electricity use. Thermal energy for cooking still accounted for the major energy demand in most households.[74] Despite nearly two decades of intensive electricity promotion, the preferred Sydney cooking fuel was still gas.[73] Only 12.3% of households connected to electricity cooked with it, whereas 94.7% of gas consumers used gas for cooking.[74] Nevertheless there were signs of a trend towards electric cooking.[75]

The rate at which electricity could penetrate the cooking market was limited by the rates of new household formation and of cooker replacement in existing households. The markets for other large appliances were much less developed and offered more scope for rapid growth. Only about 2% of Australian households possessed a washing machine in 1946, but by 1951 the figure was nearly 14% (Australian Women's Weekly 1963,28). The penetration of refrigerators also rose sharply from less than 16% in 1946 to 36% in 1950 (ibid,19).

Washing machines and other appliances supplying the energy service of power were all equipped with electric motors, so increasing penetration led to increasing electricity demand. The demand for refrigeration services did not fully translate into electricity demand, however, until electric refrigerators captured market share from other types. The technologicaly distinct alternative to the electric motor-powered compressor was the absorption refrigerator, operated by the application of heat from an electric element or a fuel source. The local production and sales of all refrigerator types rose immediately after the war, but electricity rapidly emerged as the preferred energy form and the motor-compressor as the preferred technology.[76]

The uncertain supply situation did not appear to inhibit Sydney householders from acquiring electrical appliances or from using them. Average consumption per SCC residential consumer doubled between 1939 and 1951 while the average for LV industrial consumers increased only 43% and average commercial consumption actually fell 8% (see Table 5.4). Electric room heating became sufficiently common in the post war period to place particular stress on the supply system during the frequent periods of coal shortage, so radiator use was generally prohibited.[77] There was also steady growth in permanent off peak demand with the increasing penetration of night rate storage water heaters, the SCC's major selling appliance line in the late 1940s (SCC 1947,11).

As the electrification of the household proceeded, householders became less willing or able to reduce their demand for electrical energy services, however temporarily. Unlike the other categories total residential sales showed no decline at all in the worst years of supply restrictions, and it was generally agreed that residential consumers took less heed of restrictions than other classes.[78] The constant electricity and gas supply difficulties temporarily increased the demand for traditional solid fuels, for kerosene lamps and cookers, and for candles (SMH 45.6.48,3.7.48). Even so there was no permanent threat to the image of the modern 'all-electric' home promoted by the SCC and the electrical industry. Articles in the press foreshadowed homes filled with electric appliances of every kind, including microwave ovens.[79]

The commercial and institutional demand for electricity grew steadily up to the beginning of the war. Illumination intensities for retail and office space were constantly increasing. Display lighting extended beyond individal shop windows to so-called "white way" lighting - the illumination of entire shopping precincts. With the active support of the SCC, electricity competed successfully against gas for commercial cooking and water heating.[80] Commercial food preparation also provided a natural market for electric refrigeration.

Although commercial demand had been of central importance to the development of the Sydney electricity system in the 1900s, this sector received the least favourable treatment from the electricity suppliers, possibly because they could be confident that the sector's dependence on electricity was irreversible. Commercial consumers paid more for their electricity than others (see Fig 5.1) and they suffered more, as a group, during times of restrictions.[81] SCC commercial sales actually declined in five of the ten years between 1942 and 1951, compared with three years for industrial sales, and uninterrupted growth in residential sales.

The one sector of energy demand which was on the verge of a major trend away from electricity was transportation. Although the greatest number of electrified trips in Sydney's transport history were made in the last years of the war, the transport mode showing the greatest proportional increase was petroleum-powered.[82] Bus trips nearly quadrupled between 1936 and 1946 and the petroleum share of public transport energy rose from 10% to 22%, mirrored by a fall in electricity's share from 85% to 76% (see Tables 4.7 and 5.7). Buses provided an alaternative to trams on most routes, and after 1933 replaced them outright on some (Spearritt 1978,153).[83]

Competition from petroleum-powered private transportation had been temporarily stalled during the war. New motor vehicles had been practically impossible to obtain, and NSW per capita car ownership remained steady at about .068 between 1935 and 1947. Only 13% of daily trips made in Sydney in 1947 were by private vehicle (Spearritt 1978,166). By 1954 the number of cars had nearly doubled and the ownership rate had risen to 0.116. Petrol rationing, which had also restricted vehicle use during the war, especially in the years 1942-44, was gradually relaxed and finally lifted in 1950 (Petroleum Information Bureau 1960,73). [84] The impact on public transport was rapid. By 1956 only two thirds as many trips were made by electrified modes as in 1946.

The Sydney Grid Becomes the State Grid

Electro-technology entered a new phase of development in the 1920s and 1930s. In the 1880s DC electricity supply had been confined to a relatively small radius around the power station. The introduction of AC distribution after 1890 had allowed urban electricity networks to reach the boundaries of their cities, and for small local networks to develop in rural areas. The next phase was the interconnection of several power stations and load centres.

Interconnection offered economies of scale and other operational advantages for the electricity systems they incorporated.[85] The managers of Sydney's various electricity supply systems had been aware of this at least since the first world war, when the RD began to operate Ultimo and White Bay Power stations, with their mix of traction and general loads, as a unified system. from then on there was no technical or economic reasons for the electricity system to observe administrative and geographical boundaries. The interconnection of all the power stations and load centres of the separate Sydney utilities into a unified regional system was a logical and inevitable development, provided that political differences and organisational insularity could be overcome.

Hughes (1983) describes the development of the main regional systems in the USA and Europe in the 1920s and 1930s.[86] He draws his illustrations from countries where high and even load density led to the development of adjacent utilities of roughly equal size, and either central planning was strong, as in Britain, or the political environment was conducive to utility mergers and takeovers, as in the USA. None of these conditions applied in NSW: central electricity planning was non-existent up to 1935 and rudimentary thereafter, the boundaries between utilities were almost inviolable, and the load density was highly uneven except in the metropolitan area. As a consequence the development of regional electricity systems in NSW was delayed.

While the Sydney region was not unified until the 1940s, a number of small regional systems did develop before the second world war.[87] The Railway Department systems at Lithgow, Newcastle and Sydney were interconnected with the SES and the SMC systems between 1939 and 1941. The SMC and the SES were also interconnected, so that by the end of the war the unified grid extended from Taree in the north to Canberra in the south, and as far west as Griffith. This formed the backbone of the NSW grid. By 1952 Tamworth was the only one of the 8 regional systems identified by RPT in 1937 still isolated, and it was connected in 1958.

The advantages of integrating the Sydney regional grid were first demonstrated after the first world war, when a 12 MW link between the SMC and the RD systems had enabled the former

to keep expanding without installing new plant. Progress towards more formal co-ordination of the systems was frustrated in 1925 by the political circumstances leading to the construction of Bunnerong power station. In 1930 arrangements were again made for the regular interchange of energy (SCC 1935,47), but there was no co- ordination between the two systems in planning for expansion.

In 1938 the Minister for Works and Local Government asked the EAC to advise on the best means of co-ordinating the development of the metropolitan electricity system on both economic and security grounds (SMH 30.12.38).[88] It was defence rather than the economic considerations which finally brought the systems together, and only after more false starts.[89] By the end of 1940 there were new 15 MW links between the SMC and RD systems at St Leonards and Marrickville, and the first ever link between the SMC and the ELPSC, at Five Dock (SCC 1940,22).[90] Since no part of the system was ever subject to enemy bombardment, the defence value of the links was never tested. Their economic value, on the other hand, was immense. In normal circumstances interconnection would have allowed the SCC to defer plant installations by two years.[91] With the war putting an end to planned expansion, the links proved even more more valuable as emergency supports for the Sydney system during its worst years of stress from 1945 to 1951.[92]

By the end of the war, most of the state's consumers were connected, for better or worse, to an integrated electricity grid. Just as the grid pooled resources it also distributed problems. The SMH observed:

> "When electric clocks run slow in the Murrumbidgee irrigation area it is probable that Bunnerong power station, 400 miles away, is having another of its bad spells" (SMH 10.1.48).

Interconnection was a mixed blessing for consumers of the ELPSC, arguably the healthiest part of the metropolitan system.[93] The ELPSC managed to avoid restrictions and blackouts until they were, in effect, imposed by the grid for both political and technical reasons. The political consideration was that the exclusion of the ELPSC from rationing would have made the night time contrast between houses and factories on the opposite sides of its long boundary with the SCC all too graphic (SMH 16.6.48).[94] Until 1948 the ELPSC was able to fully supply its own consumers while at the same time supporting the grid to the limit of its single 15 MW link. The completion of a second 15 MW link at Camperdown in 1948 meant that the grid could draw on two thirds of the ELPSC's installed capacity, so removing the technical barrier to ELPSC consumers sharing in the general suffering.

In 1946 over 84% of NSW electricity was generated within the newly-completed Sydney regional grid, 11% in systems not connected to the grid, and 5% in private plant.[95] About

48% of the grid's energy was produced by the SCC, 38% by the RD, and the rest about equally by the SES and ELPSC. Figure 5.2 shows the energy flows between the four interconnected systems during 1946. While the metropolitan area relied on support from remote power stations at peak times, it still produced as much electricity as it consumed.

Immediately after the war the SCC began to plan for its next generating station.[96] In September 1947 it decided in principle that a new power station should be constructed in the metropolitan area (Anderson 1955,217) although grid meant that new capacity no longer had to be located within Sydney itself and the RD, for example, was planning to build its next power station at Lake Macquarie. In 1948 the SCC selected a site a Lugarno on the George's River, and in the following year the EANSW gave tentative approval for construction (ibid,219). The SCC was on the point of opening tenders and resuming the site when the ECNSW was formed in May 1950. All documentation was handed over to the ECNSW and the project eventually lapsed. No major generating plant was planned for the metropolitan area after 1950, and none installed after 1956.[97]

In the late 1940s Sydney again contained a majority of the NSW population, for the first time since settlement had diffused from the township in the 1790s. The total and per capita production of gas and electricity in Sydney, the rest of NSW and Australia in 1946 is given in Table 5.8, and the trends from 1933 to 1952 are illustrated in Figure 5.3. Total reticulated energy production (gas plus electricity, expressed in common energy units) in Sydney increased from 1780 kWh per capita in 1933 to 2840 in 1946. The rest of NSW was still far less energy-intensive, but the rate of increase was greater, from 370 kWh per capita in 1933 to 770 in 1946.

In 1937 the electricity share of reticulated energy production in NSW exceeded gas for the first time. The electricity share was far higher outside Sydney, where it increased from 68% in 1933 to 79% in 1946.[98] The economic efficiency of the NSW system was considerably lower than the national average in 1936, with a greater ratio of capital investment and capacity installed to the energy generated (see Table 5.11). Efficiency improved markedly in 1946, with the interconnection of the metropolitan system. The apparent further improvement in 1950 is an illusory one, since even though the system's load factor increased, it could not meet the minimum operational criterion of serving all demand.

The Gas System: Losing Momentum

The changes in the Sydney energy system meant that "...the gas industry did not participate in the wartime flowering of Australian manufacturing" (Broomham 1987,151). Unlike electricity, which was beginning to penetrate the residential thermal energy from a solid base in the other sectors, gas remained a predominantly residential energy form: AGL derived 77% of its 1948 revenue from residential sales and only 13% from industrial, compared with 38% and 42% respectively for the SCC [99].

The Sydney gas system shared many of the difficulties of the electricity supply system during and after the war, including shortages of coal, labour and equipment, and the industrial militancy endemic to the war time economy. During coal supply difficulties, AGL at first adopted the ad hoc approach of the electricity utilities, appealing for restraint on the part of consumers and leaving the problem of rationing to the government (SMH 16.4.44,11.8.44). As rationing became inevitable the gas companies participated in it more willingly than the electricity utilities, and were also better able to solve their equipment shortages.[100]

The gas suppliers were, like the electricity suppliers, subject to chronic labour disputes over weekend and overtime pay rates. In May 1948, after a series of strikes leading to loss of gas pressure and eventually complete cessation of supply, the Premier J.J.McGirr announced a Royal Commission into the gas industry (SMH 18.6.48).[101] The government used the Royal Commission as an instrument in the traditional Labor party antipathy towards AGL, and in particular to delay a 15% price rise granted at the end of 1948 by a Board of Inquiry constituted under the general provisions of the Gas and Electricity Act. Before that the only price increase since 1938 had been a 12% rise granted in February 1948 (SMH 7.1.49).[102] The government relented to the extent of amending the Gas and Electricity Act in October 1952 to permit automatic price rise adjustments at regular intervals to cover the the rise and fall of basic costs (NSWYB 1950/1,913). By June 1953 the standard price of gas was almost double that of June 1950 (ibid).

Increases in the standard price were not necessarly reflected by the actual average price charged to all consumers. In 1938 AGL adopted a block pricing structure, modelled on the one introduced by the SCC in 1925 to spearhead its penetration of the household thermal energy market. By 1951 AGL offered special discounts in newly developing markets where competition with electricity was especially keen, such as residential water heating and refrigeration, and industrial steam raising (NSWYB 1950/1,913).

The gas industry had the advantage of organisational stability compared with the turbulent restructure of electricity supply, and performed creditably.[103] Table 6.7 shows a respectable 60% growth in annual Sydney gas sales between 1936 and 1946. Nevertheless management and workers in the Sydney gas system were well aware that the initiative had passed to electricity, where sales increased 90% in the same period.[104] In Sydney, the site of nine tenths of NSW gas production, electricity increased its share of reticulated energy from 40% to 46% between 1933 and 1946, and then finally overtook gas in 1950, the year in which the ECNSW was created.

FIGURE 5.2
INTERCONNECTED ELECTRICITY SYSTEM ENERGY FLOWS
1946

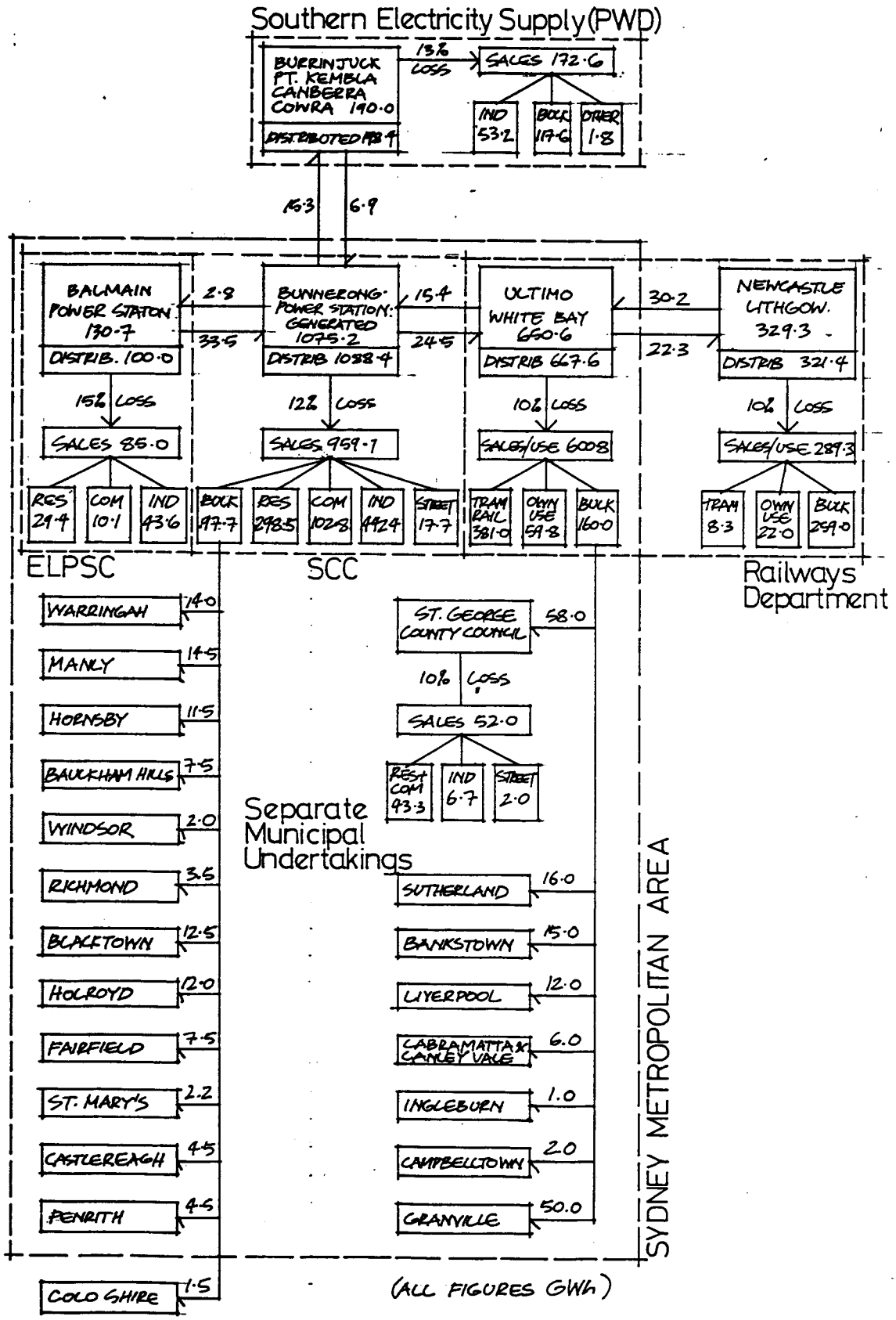


FIGURE 5.3
PER CAPITA ELECTRICITY AND GAS CONSUMPTION
SYDNEY, REST OF NSW AND OTHER STATES
1933-52

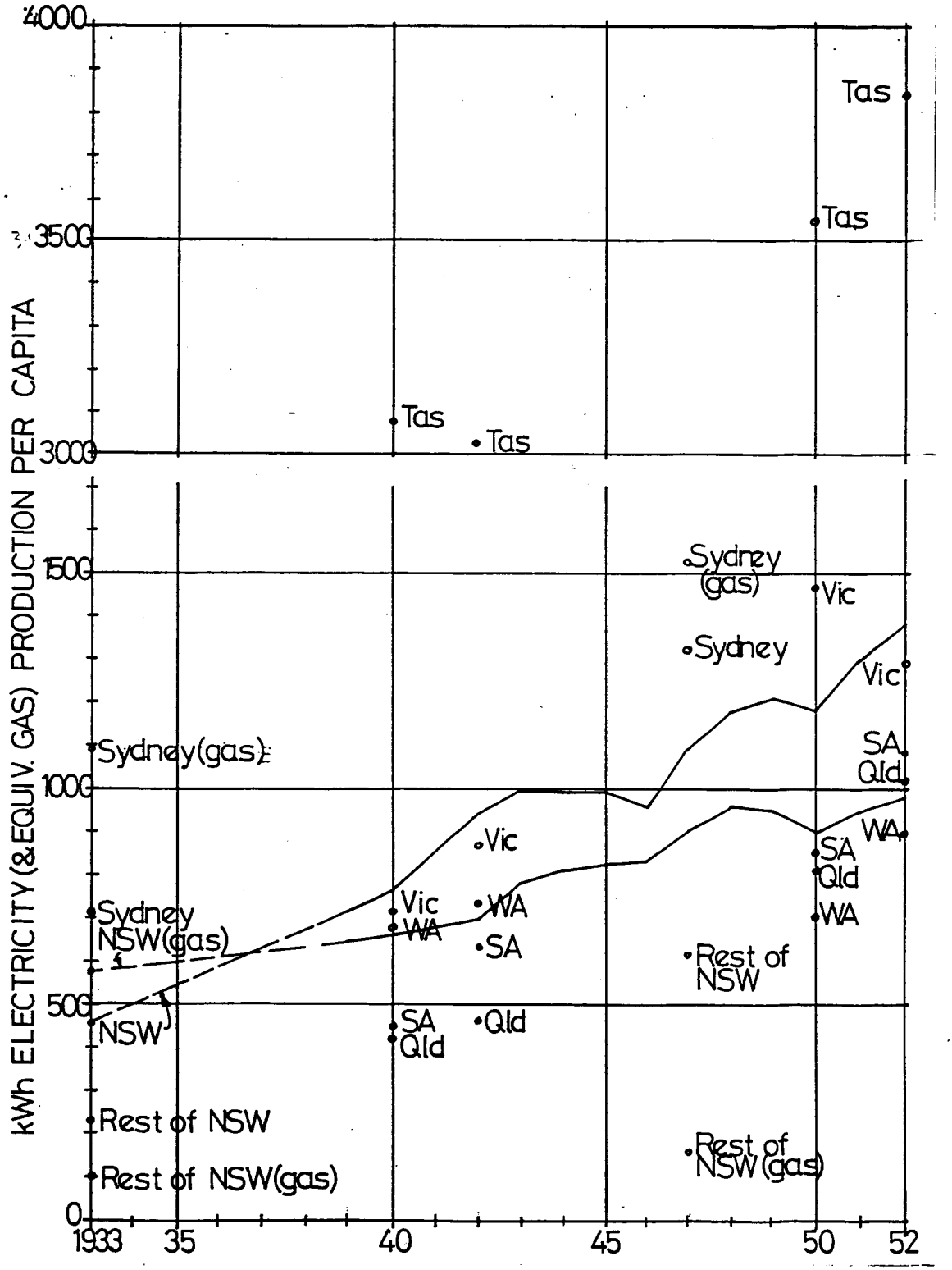


TABLE 5.3
ELECTRICITY CONSUMPTION BY CONSUMER CLASS
SYDNEY COUNTY COUNCIL
1933 - 51

YEAR	RESID kWh/ cons	COMM kWh/ cons	LV IND KWh/ cons	HV IND KwH/ cons	TOTAL SALES GWh	STREET LIGHT %	BULK SALES %(c)	% OF RETAIL SALES RES	COMM	IND	RESID % OF INC(d)
1936	590	3549	29309	241141	416.2	3.0	10.9	8.1	19.4	52.3	23.9
1941	925	4750	39809	308804	681.1	2.2	11.9	32.4	16.5	50.9	40.6
1946	1208	4057	42185	332495	843.7	1.8	13.4	35.3	12.1	52.4	60.4
1951	1588	4241	46829	315387	1106.4	1.5	12.4	38.9	10.5	50.4	70.1

(Source SCC annual reports)
a. LV consumers: about 92-98% of total industrial consumers, accounting for 70-75% of industrial sales.
b. HV consumers.
c. The number of final consumers in the SCC's bulk supply areas is not consistently recorded. In 1935, kWh/consumer was 880 in the bulk supply areas, compared with 1611 in the SCC retail area. In 1951 it was 2734 and 3405 respectively. The lower figure in the bulk supply areas is consistent with a greater proportion of residential consumers.
d. Increase in residential sector retail sales over the previous year, as a percent of the total increase in retail sales over the same period.

TABLE 5.4
ESTIMATED ELECTRICITY CONSUMPTION BY CONSUMER CLASS
SYDNEY
1946

(GWh)	RESID	COMM	INDUST	STREET L	TRACTION	TOTAL	%
SCC RETAIL	298.5	102.8	442.4	17.7		861.4	52.3
RAILWAYS (OWN USE)			59.8		381.0	440.8	26.7
BULK SALES(a)	170.0	25.7	51.5	10.3		257.7	15.6
ELPSC	29.4	10.1	43.6	1.7		85.0	5.1
TOTAL	524.6	137.0	570.7	31.4	381.0	1644.9	
SECTORAL %	31.8	8.3	34.6	1.9	23.1	100.0	
BULK % (b)	66.0	10.0	20.0	4.0			
SCC % (c)	34.6	11.9	51.3	2.0			

(Sources: SCC, RD, ELPSC reports)
a. Bulk sales by both SCC and RD .
b. Sectoral distribution for bulk sales estimated, based on reported sales by major purchasers, eg SGCC.
c. See above; note that these are % of all non-bulk sales (including street lighting).

TABLE 5.5
POWER OF MACHINERY USED IN CENTRAL ELECTRICITY SYSTEMS
AND IN MANUFACTURING, BY ENERGY TYPE
NSW
1936 - 50

YEAR	AVERAGE HORSE-POWER OF MACHINERY IN USE (%)								
	Heat,Light & Power	FACTORIES							hp/emp (elec) (c)
		Steam Engines	Steam Turbs	Gas	Electric	Oil	Total(a)	Own Gen(b)	
1936	586929	85726(d)		3706	329604	11478	430574	68800	2.27
		(19.9)		(0.9)	(76.5)	(2.7)	(100)	(e)	(1.74)
1942	1116649	108785	59667	4383	623879	17899	814666	87733	2.73
		(13.4)	(7.3)	(0.5)	(76.6)	(2.2)	(100)		(2.09)
1946	1203094	104638	56812	3221	766967	20546	952325	81674	3.06
		(11.0)	(6.0)	(0.3)	(80.5)	(2.2)	(100)		(2.47)
1950	1270624	107681	75824	2648	1032999	65752	1285130	74162	3.36
		(8.4)	(5.9)	(0.2)	(80.4)	(5.1)	(100)		(2.70)

(Sources: NSWYB, AYB)

a. Total power of all machines using energy forms (including purchased electricity) delivered to site: excludes power of generators attached to on-site steam, gas or oil engines; includes small amount for gas works equipment and water power.

c. Factory employment taken to be a subset of "Industrial", excluding building trades, construction etc, and excluding Heat, Light and Power; lower figure is electrical machinery (excluding on-site generators) per employee.

d. Not disaggregated in statistics.

e. Estimated from RPT 1937,83: installed capacity of private generators was

TABLE 5.6
RESIDENTIAL ENERGY USE CHARACTERISTICS
AT THE 1947 CENSUS
SYDNEY, NSW AND AUSTRALIA

	NUMBER	WITH ELEC	WITH GAS	ELEC STOVE	ELEC OTHER(a)	GAS STOVE	GAS OTHER(a)	SOLID FUEL	OTHER (b)
		SINGLE-FAMILY DWELLINGS - SYDNEY AND NSW							
INNER CITY	224260	221018	206032	16569	4990	130482	59853	9362	503
% TOTAL		98.5	91.8	7.3	2.2	58.1	26.6	4.1	0.2
% COOKING(c)		9.7	92.3						
OUTER CITY	73491	68444	34942	11029	3200	22050	11071	22865	2449
% TOTAL		93.1	47.5	15.0	4.3	30.0	15.0	31.1	3.3
% COOKING		20.7	94.7						
SYDNEY TOT	297751	289462	240974	27598	8190	152532	70924	32227	2952
% TOTAL		97.2	80.9	9.2	2.7	51.2	23.8	10.8	0.9
% COOKING		12.3	92.7						
REST OF NSW	302119	200143	64910	14488	4096	33347	16613	219671	7855
% TOTAL		66.2	21.4	4.7	1.3	11.0	5.4	72.7	2.5
% COOKING		9.2	76.9						
TOTAL NSW	599870	489605	305884	42086	12286	185879	87537	251898	10807
% TOTAL		81.6	50.9	7.0	2.0	30.9	14.5	41.9	1.8
% COOKING		11.1	89.3						
		OTHER DWELLING TYPES - NSW							
SHARED HSE	51811	48964	36230	2329	909	16164	6893	9769	557
% TOTAL		94.5	69.9	4.4	1.7	31.1	13.3	18.8	1.0
% COOKING		6.6	63.6						
FLAT & TENE	80829	80104	73034	2881	1174	42980	23923	3728	403
% TOTAL		99.1	90.3	3.5	1.4	53.1	29.5	4.6	0.4
% COOKING		5.0	91.6						
TOT NSW DWE	732510	618673	415148	47296	14369	245023	118353	265395	11767
% TOTAL		84.4	56.6	6.4	1.9	33.4	16.1	36.2	1.6
% COOKING		9.9	87.5						
		SINGLE-FAMILY DWELLINGS - AUSTRALIAN METROPOLITAN AREAS							
OUTSIDE SYD	663736	654614	575021	21209	8557	295916	192059	101739	3067
% TOTAL		98.6	86.6	3.2	1.3	44.6	28.9	15.3	0.5
% COOKING		4.5	84.9						
AUST METRO	961487	944076	815995	48847	16747	448448	262983	133966	6019
% TOTAL		98.1	84.8	5.0	1.7	46.6	27.3	13.9	0.6
% COOKING		6.9	87.1						
TOT AUS	1873623	1526488	962562	92817	28946	510958	296152	837403	31063
% TOTAL		81.4	51.3	4.9	1.5	27.2	15.8	44.6	1.6
% COOKING		7.9	83.8						

(Source: Extracted published 1947 Census data)
a. Mainly hotplates and gas rings. b. Mainly kerosene. c. % of households with gass or electricity using that form of energy for cooking.

TABLE 5.7
PUBLIC TRANSPORT TRIPS BY ENERGY TYPE
SYDNEY
1945/46

MODE	PASSENGER-JOURNEYS (million) ELECTRIC	STEAM	PETROLEUM	MODE TOTAL
RAIL Suburban	284.4			284.4
TRAM (a)	386.3			386.3
BUS Private	5.5(c)		59.5	183.9
Government (b)			118.9	
FERRY (d)		17.9	17.9	35.8
ALL MODES	676.2	17.9	196.3	890.4
(%)	(75.9)	(2.0)	(22.1)	(100)

(Sources: NSWYB; Spearritt and Wells, 1984)

a. 417.3 for all NSW, less 31 (est.) for Newcastle.
b. Estimated from all NSW bus data, assigning 95% of government and 90% of private bus journeys to Sydney.
c. Estimate for trolley buses; Road Transport and Tramway Commission 1948/9 gives 5.2 m trolley bus trips that year.
d. Recorded ferry journeys assigned equally to steam and oil; 1946 was about midpoint in 1936-59 conversion of coal ferries to diesel (Andrews 1975,34).

TABLE 5.8
ESTIMATED GAS AND ELECTRICITY PRODUCTION PER CAPITA
SYDNEY, NSW AND AUSTRALIA
1946

	SYDNEY	REST NSW	TOT NSW	TOT AUST	%(a)
POPULATION ('000)	1452	1501	2932	7430	39
GAS MADE (m cu ft)	13771	1531	15302	31954	48
GAS/CAP ('000 cu ft)	9.5	1.0	5.2	4.3	121
(kWh equiv)	1520	163	835	688	
ELEC GEN (GWh)	1920	912	2832	6909	41
ELEC/CAP (kWh)	1320	610	966	930	104

(Sources: NSWYB 1950/1,912; Own estimates for Sydney electricity).
a. NSW total as a percentage of Aust total.

TABLE 5.9
POWER STATIONS AND ELECTRICITY GENERATION
NSW AND AUSTRALIA
1936-50

YE JUNE	1936		1942		1946		1950	
ESTABLISHMENTS (No)								
Australia	404		372		372		358	
Sydney (% Aust)	124	(31)	96	(26)	100	(27)	92	(26)
EMPLOYEES (No)								
Australia	6283		5677		7071		9595	
Sydney (% Aust)	2033	(32)	2315	(41)	2859	(40)	3968	(41)
INVESTMENT (L m)								
Australia	33.9		38.1		41.4		58.9	
Sydney (% Aust)	15.1	(45)	16.7	(44)	15.1	(36)	22.2	(38)
CAPACITY ('000 hp)								
Australia - steam	(a)		2566		2844		3244	
generators	(a)		2429		2752		3175	
effective	1135		2169		2321		2808	
Sydney (%A) steam	(a)		1117	(44)	1203	(42)	1271	(39)
generators	(a)		1129	(47)	1205	(44)	1315	(41)
effective	582	(51)	990	(46)	1049	(45)	1140	(41)
GENERATED (GWh)								
Australia	3528		6281		6909		9508	
Sydney (% Aust)	1465	(41)	2657	(42)	2832	(41)	3758	(40)

(Source: AYBs)

6. TRIUMPH OF THE GRID, 1951 - 1986

The centralised electrical energy system reached its pinnacle in the three decades after 1951. Economic development, geographical expansion and household electrification all contributed to its growth. The grid extended progressively inland from the densely populated coastal region until all but the remotest of the state's dwellings were connected. The energy it distributed was at first generated mainly in Sydney, where the bulk of consumption remained concentrated, then increasingly at the coalfields and from the water resources of southern NSW.

The cost of grid extensions into ever more remote regions could not be met without subsidy from areas of greater load density, and a complex system of regional cross-subsidisation evolved. It was superimposed over the consumer class cross-subsidisation developed by the SCC, which spread throughout the whole state. The uneven distribution of the benefits and costs of electricity supply was masked as long as the scale of production increased, and the real price of electricity to all consumers declined. Electricity consumption grew faster than population up to 1982/3, when significant declines in both total and per capita consumption marked the first major interruption to 33 years of growth. These declines were associated with rationing due to plant failures and with an economic downturn, and were followed by renewed growth. However, they drew attention to some of the longer term trends affecting the electricity system.

The saturation of residential electricity demand was the most obvious trend. In 1947, nearly half the households in rural NSW had no electricity, but by 1971 all but 3% were connected. Thereafter, the number of domestic consumers could increase only at the rate of household formation. Certainly, consumption per household increased as the penetration of major appliances rose, but it peaked in 1981/2 and then remained almost constant.

Each successive thermal power station built after the war delivered energy at a lower price. Fuel transport costs declined as new power stations were built at the coalfields, and the scale and technological efficiency of generator sets increased. These economies were substantially exhausted by the mid 1970s. The ECNSW stated in 1983 that no power station built after Liddell, completed in 1973, was likely to produce power more cheaply (ECNSW 1983a,27). The reverse in the price trend for electricity coincided with an opposite reverse in the price of its historic competitor: the advent of natural gas after 1976 marked the resurgence of the NSW gas industry after a long period of stagnation. Natural gas was the historic successor to electricity in many thermal energy markets, much as electricity had displaced coal gas in the 1950s and 1960s.

As long as the price of electricity declined, the main concerns of governments and the electricity industry were the promotion of sales and the selective distribution of benefits. Government and public attention focussed more critically on the industry after the plant failures of 1981-2. A series of inquiries (notably McDonell 1986) identified weaknesses in the planning, efficiency, and structure of both the generating and distributing organisations. In July 1987 the Unsworth Labor government introduced wide ranging legislative changes which greatly increased its powers over the county councils, gave it direct control over energy planning by substitution of a Department of Energy for the EnANSW, and brought the planning of the ECNSW under direct parliamentary scrutiny.

6.1 ELECTRICITY AND THE STATE

The organisation of the NSW electricity system remained substantially unchanged after 1950, when the state government established the ECNSW to take sole control of generation and transmission. Within this structure, state governments increasingly used the electricity system for political purposes such as regional development and the redistribution of wealth, which had previously been practised on a smaller scale within local government undertakings.

Sydney remained the largest and best developed part of the system. Its well balanced, compact load was the most economical to service, and it subsidised the extension of the grid to the remote areas of the state, through mechanisms like the uniform Bulk Supply Tariff. With the loss of control of generation to the ECNSW, the Sydney County Council became but one of many distributing units within the state system, albeit retaining many distinct features which gave it influence beyond its own boundaries.

The size of the Sydney electricity market allowed the SCC considerable scope in shifting the burden of costs between its consumers. This resulted in somewhat arbitrary tariff structures which smaller county councils felt compelled to emulate. The size of the SCC and its metropolitan location gave the elected councillors a prominent platform from which to irritate state government in the 1950s. Nonetheless the councillors' real influence over electricity policy was constrained. They were caught between, on the one hand, a management given unusual autonomy by the SCC's special legislation, and on the other, powerful state and party political interests.

Electricity Policy: The Distribution of Costs and Benefits

In the 1950s there were still strongly diverging views on electricity policy within the various political parties. In June 1958, when memories of the post war turmoil in the industry were still fresh, the state ALP conference adopted a motion asking the government to set up a single authority to control both production and distribution (SMH 16.6.58).[1] The conservative parties also proposed radical reorganisations. Before the 1959 state election, the leader of the opposition, P.H.Morton, said that a Liberal-Country Party government would establish a department of fuel and power, reform the EANSW to plan the production of fuels and electricity generation as well as distribution, and reconstitute the ECNSW "as a publicly owned corporation to be run on lines similar to Qantas" (SMH 4.2.59).[2] Because Labor won the election, the conservatives did not have an immediate opportunity to act on these policies, and when they eventually came to power in 1965 they chose not to alter the course which the previous Labor government had set for the electricity system.

In fact, whatever the parties said when in opposition, there turned out to be little difference between the electricity policies of successive governments and ministries from 1950 to 1981. Sir Edward Warren MLC, chairman of the Colliery Proprietors' Association and of the International Executive Council of World Power, was able to say in 1966:

> "...I have no hesitation in saying that in many respects the previous government did a good job. I cite as an example of this good work the establishment of an efficient electricity generation and supply industry" (NSWPD 18.8.66,321).

Governments were not reluctant to borrow ideas from their opponents. The Wran Labor government which followed 11 years of conservative administration in 1976 transformed the Electricity Authority into a more general Energy Authority, as proposed by the Liberals 17 years earlier. The major objectives of this largely bipartisan electricity policy were security and low cost of supply, the extension of the electricity grid, the expansion of generation and greater uniformity in tariff structures throughout the state. With the formation of the ECNSW, state governments took at least indirect responsibilty for ensuring that capacity kept up with demand. Even brief failures in local distribution systems and the pattern of retail tariffs reflected on the government, insofar as it supervised the county councils, periodically adjusted their boundaries and implicitly guaranteed their competence to the public.

It became a priority of all state governments to keep bad news about electricity off the front pages. There was plenty of news about rationing, blackouts and conflict within the electricity utilities in the early 1950s, while the system struggled to recover from its postwar crises. As time passed the intricacies of system organisation, planning and pricing lost the attention of the public as well as the government. Public interest in electricity became focussed almost

exclusively on price, except on the increasingly rare occasions when plant breakdown or industrial dispute threatened supply. Price reductions were good news, as was each announcement of a new, more efficient power station.

The most significant differences in party policy revolved around the degrees of willingness to take on local government, and around the distribution of benefits and costs: which group in the community would bear the brunt of price rises (in the 1950s) and which would benefit most from the steady increase in the productivity of the electricity system during the 1960s and 1970s. All parties agreed on the regional cross subsidisation institutionalised by the uniform Bulk Supply Tariff (BST) adopted in 1953 by the ECNSW, with the blessing of the Local Government Electricity Advisory Committee (ECNSW 1953,8). Even with the help of the uniform BST and other subsidy mechanisms, the smaller regional county councils were chronically short of the resources necessary to extend and maintain their widespread and uneconomic networks. They were constantly caught between the competing demands of their constituents to reduce prices and the need to maintain a satisfactory level of security and maintenance. Their failure to satisfy everyone could, and often did mean amalgamation, at least when Labor governments were in power.

The distributional issues in Sydney were of a different order. The management of the SCC was able to invest in ever greater levels of redundancy and system security, while leaving the councillors sufficient surplus to regularly reduce prices (in inflation-adjusted, if not always absolute terms). While Labor Party councillors constituted a majority on the SCC between 1952 and 1969, it generally favoured residential consumers, though it also responded to threats from larger industrial consumers to relocate, generate their own electricity or shed workers unless they received concessions. The most disadvantaged consumers were the smaller industrial and especially the commercial users who had limited market power and did not enjoy political patronage.

The SCC's pricing structure was emulated throughout the state, and the effect of the high level of industrial electricity prices on NSW's competitiveness with Victoria drew public attention in the late 1950s.[3] The SMH correctly attributed the price differetials to the SECV's policy of allowing prices to reflect regional and seasonal variations in costs, and to the political bias inherent in the local government control of electricity in NSW:

> "In NSW this divorce of generation and distribution gives to the domestic consumer a power which he does not enjoy in Victoria. It is the domestic consumer who elects the aldermen, and it is the aldermen who constitute the various distributing authorities throughout the State...They retain the favour of their master, the domestic consumer, by forcing the industrial consumer to subsidise him" (SMH 16.6.58).

The issue of industrial prices was defused in the 1960s, when the high cost of construction of large new brown coal power stations drove Victorian electricity prices above those in NSW. However NSW continued to compete with other states to attract the most electricity-intensive industries such as aluminium smelters, which were able to negotiate favourable prices and conditions in return for assisting governments with their state and regional development objectives.

Another important group of beneficiaries were the managers and workers within the electricity industry. While under the control of Labor state governments and councillors, both the ECNSW and the SCC were sympathetic to workers' claims for improved wages and conditions.[4] The Labor governments which presided over the amalgamation of electricity generating and distributing organisations throughout the 1950s, and in 1980, were careful to ensure that in each case the wage levels and conditions of all workers in the merged organisations were uniform (eg NSWPD 26.11.79,3661). This policy generally received the support of the LCP opposition (ibid 24.11.61,3026). It meant that the highest wage structures and best conditions flowed through to all workers, absorbing a proportion of any increases in efficiency brought about by economies of scale.[5] Labor government-appointed ETU officials or Labor Council members served on both the ECNSW and the EANSW from their inception until 1973, well into the life of the succeeding LCP government, and again from 1977.[6] The influence of the unions on electricity policy waned during the period of the LCP government of 1965-76. The ACTU campaign for the 35 hour week in 1971 was spearheaded by ECNSW employees, then working a 40 hour week (SMH 11.7.71). The Askin government resisted the campaign, which over the following four years involved periodic reductions in output leading occasionally to blackouts.[7]

A special attraction of the electricity system as an agent of state development, regional and welfare policy was the fact that the resources for distribution did not come from consolidated revenue but from other electricity consumers.[8] The extent of resource transfer could be kept out of the public eye by the complexity of the transfer mechanisms and, where necessary, by secret arrangments with the beneficiaries. This made it difficult to determine whether electricity-intensive industries were effectively subsidised at the expense of other consumers, and if so, what compensating benefit they brought to the state economy, and how the costs and benefits were distributed.

NSW economic growth declined in the 1970s after the long postwar boom, and the Wran Labor government saw the electricity system as a means of securing a share of dwindling national economic development. In the late 1970s the major international aluminium companies began to negotiate with the governments of NSW, Victoria and Queensland on energy prices for the

construction of new smelters in the early 1980s (Fagan 1981,153). The industry was particularly adept at manipulating state governments to obtain low electricity prices (see for example Kellow 1986) and it is probable that the secret contracts made by the Wran government with the Tomago smelter consortium in 1980 resulted in annual subsidies approaching $ 100 m, from other consumers, without compensating economic benefits to NSW (Dick 1980 and 1981, Croxon 1982,85).

Aside from special deals there was a wealth of "normal" transfer mechanisms, the major one being the uniform Bulk Supply Tariff (EnANSW 1986b,90). Others included the Rural Assistance Subsidy Scheme introduced in 1946, and the Special Assistance Scheme introduced in 1967.[9] The four metropolitan county councils generally accepted the need for transfers to the rural councils, provided they were a moderate proportion of turnover and they were made in an orderly and predictable manner (ibid,89).[10] Under the Wran and Unsworth Labor governments, there was a multiplication of special transfers to fund welfare and conservation programs, energy system administration and industrial devlopment, and to prop up the deteriorating systems of the more remote county councils.

The burden of subsidy fell increasingly on consumers of the major urban county councils, and particularly the SCC. One of the government's objectives in revising the electricity legislation in 1987 was to increase its own powers to direct the SCC to make grants and loans to other councils, and to a newly established "Industrial Development Assis tance Fund". The purpose of the latter was "to enable electricity councils to more fully assist in the economic development of the State" (EnANSW 1987,20). The leader of the opposition N.Greiner commented:

> "What the Minister for Energy is doing is putting a selective tax on the million people who buy their electricity from the SCC, without parliamentary approval. He is taking that into what can only be described as a giant slush fund, and he can distribute that as he wishes" (SMH 29.7.87).

He was unconsciously echoing the sentiments of F.Maguire, formerly assistant General Manager of the SCC, chairman of its rates panel, and a member of the EANSW and ESAA tariff committees, who in 1965 wrote of the NSW electricity system:

> "...the Herbert Committee [inquiring into the UK electricity system in the early 1960s], when reporting to the House of Commons, emphasised that the electricity industry can be used as a device "for transferring income from one section of the community to another without the burden of these policies being properly weighed in Parliament or by the Minister". This is precisely the manner in which the industry is being used here and with such serious consequences" (SMH 11.12.65,2).

Apart from commencement or continuation of ad hoc subsidies and arrangements, no NSW government can be said to have had a clear or consistent policy on electricity pricing. The Unsworth Labor government implicitly recognised the costs to the economy of subsdising

domestic consumers, and in 1987 it adopted a tariff structure which, for the first time, included fractionally higher price increases for domestic consumers (7.75%) than for others (7.25%) (EnANSW 1987,19). While this signalled a change in the trend, it made no major impact on a system of transfers and subsidies so well institutionalised that it must be considered a permanent feature of the NSW electricity system.[12]

Most of the state's electricity distribution authorities benefitted from the financial and administrative support given by state governments and the consumers of the central region. At the same time they clung tenaciously to their independence and local identity. They naturally tookevery advantage of the subsidies available to connect new customers and increase assets and sales, and so maximise local benefits while generalisisng the cost of the subsidy throughout the state. In the absence of effective limits and controls on subsidies, this led to the development of uneconomic loads which became a considerable and permanent burden on other consumers.

This arrangement reduced the incentive for efficient management of both subsidised and subsidising authorities. The former were able to rely on the promise of rescue, however far they extended themselves financially or technically. For the latter, reductions in price through greater efficiency merely established lower benchmarks for all authorities, and increased the burden of subsidy they had to bear. Therefore they reduced their apparent surpluses through inflated cost structures or invested in unnecessarily high standards of system security.

Legislation and Administration

In contrast with the volatile legislative and administrative framework of NSW electricity supply between 1932 and 1950, the changes from 1950 to 1987 were largely evolutionary. The Gas and Electricity (G&E) Act 1935, which had established the SCC, the Electricity Development (ED) Act 1946, which had established the EANSW, and the Electricity Commission (EC) Act 1950 all remained in force. They were amended by Labor Governments between 1950 and 1965 to give effect to the acquisition of generating assets by the ECNSW, to resolve occasional anomalies in the consolidation of electricity distribution into county council areas, and to strengthen the co-ordination powers of the EANSW.

The most controversial legislation was the Electricity Commission (Balmain Electric Light Company Purchase) Act, originally enacted in 1950 to embody an agreement between the company and the government on the valuation of the ELPSC for its acquisition by the ECNSW.[13] Differing interpretations of the original agreement led to years of litigation, which the government finally resolved by legislative amendment, at the predictable cost of laying itself open to renewed charges of "phrenetic socialism" from the opposition (NSWPD

30.10.56, 3511). The absorption of the ELPSC represented a significant step forward in the government's electricity programme. It removed the only significant vestige of private ownership from the electricity system, and completed the separation of generation and distribution functions, by dividing up the assets of the last major integrated utility between the ECNSW and the metropolitan county councils.

The LCP governments between 1965 and 1976 continued to strengthen the ECNSW and EANSW to meet their objectives of attracting electricity-intensive industries to promote state development (an aluminium smelter was built at Kurri Furri in 1969). The Electricity Commission (State Coal Mines) Act 1973 gave the ECNSW control over the mines operated by the State Coal Mines Control Board, in addition to its own five collieries.[14] In 1965 the Askin LCP government attempted to reconstitute the SCC to reduce the influence of the then Labor-dominated Sydney City Council, which had been the springboard for Labor control of the SCC since 1952. The Labor majority in the Legislative Council succeeded in blocking the necessary changes to the G&E Act (NSWPD 1.12.65,2626) but the government eventually succeeded in its objective.[15] It sacked the City Council in 1968, changed the City boundaries, and passed legislation forcing the SCC to an election on the new boundaries (NSWPD 11.12.68,3625). The 1969 SCC elections ended 17 years of Labor control.

The Wran Labor government, elected in 1976, increased the tempo of change in electricity administration. One of its first actions was to establish an Energy Authority, a step foreshadowed by the former LCP government following the world oil crisis of 1973-4 (EANSW 1974a,43). The evolution of the EnANSW from advisory to statutory status closely paralleled that of its predecessor, the EAC, some 40 years earlier. P.D.Hills, the minister who introduced the Bill, said:

> "In New South Wales an energy advisory committee was established by the authority of the Cabinet in 1969... Its principal duty has been to keep the Government advised of new fuels and of changing patterns in the supply and use of existing ones. That body, which has no statutory powers or functions, is now inadequate to meet the weighty responsibility of energy resource planning and implementation for the State...(NSWPD 13.10.76,1755).[16].

The Wran government made considerable progress with amalgamations and tariff rationalisation. In 1979 it amended the G&E Act and passed the County Districts Reconstitution Act 1979 to achieve the first major reorganisation of electricity distribution since the 1950s. It absorbed the functions of the EANSW into the EnANSW in 1979, and then progressively strengthened its control over county council tariffs. While giving the county councils less autonomy, the Wran government initially legislated to give the ECNSW far more. Following the Liddell power station failures in 1981-2, however, it reconstituted the ECNSW to reduce the independence of its management and increase its accountability to parliament.

This process continued in 1987, when further changes to its Act obliged the ECNSW to submit to the Minister for Energy, at three yearly intervals, a 30 year "Electricity Development and Fuel Sourcing Plan", to be reviewed also by the newly created Department of Energy.

Between the interventionism of the early 1950s and the late 1970s, state governments tended to exercise control over the electricity system at one remove, through appointments to the ECNSW and the EANSW. The composition of the ECNSW remained remarkably stable throughout this period. No more than 20 men served on the five-member commission from 1950 until its reconstitution in 1982.[17] Almost all Electricity Commissioners had engineering, economic or accounting backgrounds. From 1960 it became customary for the chief engineer of the ECNSW to be its vice-chairman, and from 1975 its chairman. The management, with its predominantly engineering point of view, came to have a direct voice in policy making in a way similar to Forbes Mackay and his successors' influence on the SCC.

The composition of the Electricity Authority was slightly more changeable than that of the ECNSW, though by convention its seven members represented a balance of interests and it was chaired by an Electricity Commissioner.[18] The first members of the Energy Authority appointed in 1977 represented a wide range of interests including the ECNSW, the EANSW, petroleum, gas, coal and nuclear engineering. The ECNSW clearly remained the dominant organisation. It was excluded from the provisions of the Electricity Development and Energy Authority Acts, but its commissioners chaired both the EANSW and the EnANSW. The nexus was broken in 1979, with the abolition of the EANSW and the reconstitution of the EnANSW to exclude ECNSW representation. The EnANSW was again reconstituted by the Wran Labor government in 1982, to remove the representation of the SCC, AGL and private fuel companies. Thereafter it acted more as a policy advisory body to the Minister for Energy, and was in fact transformed into a Department of Energy (DOE) in July 1987. The DOE was in turn stripped of many of its functions by the Greiner coalition government, and in October 1988 amagamated with the Department of Mineral Resources.

Until 1972 the Minister for Local Government was responsible for all aspects of the NSW electricity and gas systems, including the operations of the ECNSW and the EANSW. The Askin coalition government created a Power portfolio in 1972, the year in which the federal government established a Department of Minerals and Energy. [19] The fact that electricity distribution councils (with the exception of the SCC) remained within the scope of the Local Government Act 1919, however, meant that the administration of the electricity system was still divided between Ministerial portfolios, and the archaic provisions of that Act became increasingly unsuited to the management of electricity utilities (EnANSW 1986b,52).

The administrative arrangements were rationalised by the Unsworth Labor government in 1987, and the Minister for Energy's priority over the Minister for local Government in relation to the utility functions of county councils was established. The Minister for Energy was also empowered to give directions to the councils on tariff structures and other matters, to approve the selection of their general managers and to appoint up to two government representatives to each of the four largest councils (EnANSW 1987,20). These changes paved the way for the government to consolidate the centralisation of control over electricity distribution which had commenced with the election of the Wran Labor government in 1976. The legislative framework so laboriously built up was not to be used for its intended purpose, at least for the time being. The succeeding Greiner government immediately signalled its intention to relax central control over the system.

Management by Amalgamation

The level of government intervention in electricity generation was remarkably low between the establishment of the ECNSW in 1950 and the Liddell power station breakdowns in 1981. No government found cause to doubt that the ECNSW's placement and design of power stations, extension of the transmission grid, or financial management were serving its policy objectives. The increasing productivity of generation was an important factor in allowing many competing consumer interests to be satisfied. The ECNSW's uniform bulk supply tariff and its assistance with sub-transmission in less densely populated county councils were the primary media for the selective distribution of the benefits between regions.

The organisation and performance of the electricity distribution authorities, however, was regularly on the public agenda. Retail tariffs were affected by factors which not even the uniform BST could fully overcome. Population, economic activity and electricity consumption became even more concentrated in the coastal region of Sydney, Newcastle and Wollongong. The distribution authorities with a low load density, or a low industrial load from which to subsidise domestic consumers, could not provide the same level of service at the same prices as their more fortunate metropolitan counterparts, without risking financial collapse.

The geography of electricity demand was determined by patterns of climate, settlement, urbanisation and technological change which were beyond the control of governments. The administrative boundaries of electricity distribution authorities, on the other hand, could be changed more readily. Labor governments after the 1940s took full advantage of this in their management of the electricity distribution system. The conservative governments of 1965-76 were more sensitive to anti-amalgamation pressure from the predominantly conservative local

government lobby, and were content to defer action and rely on the established system of cross subsidies as long as possible.

The EANSW had statutory responsibility for maintaining the viability of distribution organisations. It managed to find ways of transferring funds and expertise from the coastal nucleus of the NSW electricity system to its periphery, but it could not achieve a completely equal distribution. It was aware that differences in tariffs remained a chief cause of public dissatisfaction, especially among consumers living near the boundary of a district with lower prices than their own (EANSW 1963a,1). As long as tariff differences persisted, there remained pressure for boundary changes and hence a chronic instability in the organisation of electricity distribution.

The EANSW deliberated at considerable length on the merits of amalgamation as a means of simultaneously improving distribution efficiency and achieving tariff rationalisation. A special committee (chaired by K.O.Brown) investigating NSW electricity tariffs in 1974 found:

> "Amalgamation of areas can help [tariff] rationalisation by:
> (a) bringing into being a larger single area over which tariffs will then become uniform
> (b) improving the total load balance, so giving a more viable enterprise and always provided that this can be done without bringing into being too large or unwieldy a new area
> (c) reducing actual costs and reducing overheads per kWh sold. Apart from the general desirability of this, reduction in costs in the higher tariff electricity councils reduces the assistance that the industry generally must give to rationalise tariff rates" (EANSW 1974a,32).

The fundamental principle of amalgamation was to merge a financially strong unit with a weaker one, to achieve a balance of high and low cost load, and a uniform tariff throughout the combined area. The load patterns of urban areas generally lent themselves to amalgamation with rural areas, and industrial with residential (EANSW 1957a,9). However, areas with suitably complementary loads were not always conveniently adjacent, and amalgamated areas still had boundaries across which consumers could make unsatisfactory comparisons. The most persistent argument against amalgamation was that it resulted in the loss of local control and identity. In 1957 the EANSW paid particular attention to refuting the "objections commonly raised against county councils" (EANSW 1957a,3). Recommending another round of amalgamations in 1977, it still found it necessary to repeat:

> "Fears are sometimes expressed that the loss of the local council control in the areas added to the main load area will lead to more centralised control and less care and attention to the system and service in those areas than previously. The authority in its years of experience with county councils has no evidence to show that development and electricity service in parts of a county district have suffered neglect or restraint in this way" (EANSW 1977a,3).

The EANSW nevertheless conceded that there was a threshold number of organisations below which local character could not be preserved, and the logic of a single state wide distribution authority would become irresistible. In 1963, when there were still 52 undertakings, the EANSW considered the minimum number to be 7 (EANSW 1963a,2).[20] In 1974, when a system of 34 county councils had been in operation for a decade, the Brown committee reported that it considered this number to be close to the irreducible minimum. It rejected a proposal for 9 groupings because:

> "It loses much of the local flavour of the present system, but in doing so does not give the administrative and rationalisation advantages that a single distribution authority would give" (EANSW 1974a,38).

All proposals had ultimately to grapple with the problem of the metropolitan region. Administrative logic suggested a unified undertaking, at least for the whole of Sydney if not for the entire coastal region. Yet this would so dominate the rest of the state, which would be dependent on it for subsidies, that little justification would remain for not proceeding to full unification (EANSW 1963a,2).[21]

The phases in the post-war reorganisation of electricity distribution are indicated by the number and type of distribution authorities in NSW in each year (see Figure 6.1). The essentially uncontrolled proliferation of small supply undertakings between the wars led to the existence of 188 separate supply authorities by 1947. The EANSW's first priority was to group the smallest ones, or attach them to larger existing units, to secure the minimum level of financial and technical competence necessary for customer service. The first phase of rationalisation reduced the number of undertakings to 105, largely through ad hoc amalgamation of the smallest municipal and shire council undertakings into 11 existing and 19 newly formed county councils. In 1956 the EANSW reported:

> "There are still many electricity undertakings which are considered by the Authority to be too small by modern standards and it is contemplated that the number of supply areas will eventually be reduced to about forty" (EANSW 1956,5).

The second phase of amalgamation beginning in 1957 was intended to balance high and low cost loads in each distribution area (EANSW 1957a). This involved the absorption of a further 65 undertakings into county councils over the period of a decade. At the same time the EANSW continued to prepare studies of further amalgamations and alternative organisational structures, including area boards on the British model, for periodic presentation to the Minister for Local Government (EANSW 1965a).

As a statutory authority, the EANSW enjoyed a measure of independence in its role as the main proponent and agent of reorganisation. Announcing the EANSW's 1957 proposals its chairman, V.J.F.Brain, made the point that "This is the Authority's plan and not the Government's" (SMH 4.4.57). Nevertheless the EANSW could not implement its proposals without the support of the government of the day. It enjoyed this support throughout the life of the Labor government which established it, but its relationship with the succeeding conservative government was more tentative. In 1967 the EANSW found it necesary to review its own functions and justify its existence to the new Minister for Local Government (EANSW 1967a). It survived, but there were no amalgamations at all during the tenure of the Liberal-Country Party governments from 1965 to 1976.

The Labor opposition criticised the Askin LCP government for its inactivity on further county council amalgamations and uniform retail tariffs, and placed these on the agenda for a future Labor government (SMH 27.7.70). Soon after Labor's return to power in 1976, the Minister for Industrial Relations, Mines and Energy, P.D.Hills, announced the government's intended reorganisations and, in effect, gave the EANSW a month to produce a study which endorsed them (EANSW 1977a).[22] In 1979 the government amalgamated the 18 distribution ares in the coastal region into four county councils. There have been no major boundary changes since.

In 1956 the EANSW reported with some understatement that "...the Authority's proposals have generally met with stiff opposition from Councils..." (EANSW 1956,7). This opposition became increasingly effective with the formation of the Local Government Electricity Association (LGEA) in 1960.[23] The LGEA was able to use the affinity of rural councils with the conservative parties to ensure that it kept a close watch on the EANSW during the life of the LCP government, and that amalgamations were removed from the Authority's agenda.[24]

The Sydney region was subject to no less reorganisation than the rest of the state. In 1949 the area between the Hawkesbury and Nepean rivers, known at the time as the County of Cumberland, was served by 2 county councils (SCC and SGCC), 14 separate municipal and shire undertakings, and a private company (the ELPSC). The SCC and the ELPSC generated their own electricity and the others purchased in bulk from them or from the Railways. Within 30 years the entire region, and well beyond, had been absorbed into two county councils, both of which purchased in bulk from the ECNSW (See Fig 6.2).

The EANSW acknowledged that the Sydney region was a unified electricity market, but the reorganisation of its distribution system was as arbitrary and as subject to local political forces as in any other part of the state. In 1954, before any major adjustments had occurred (other

than the formation of the Mackellar County Council from the Manly and Warringah undertakings), the EANSW reported:

> "The County of Cumberland is a well-defined geographical area bounded mainly by the Nepean and Hawkesbury Rivers. Natural boundaries, extensive reserves and sparsely populated territory separates the county from most of the surrounding populated areas. The district thus has a geographical and economic unity which requires that it be considered as a whole and separately from surrounding areas...
>
> If a number of undertakings are to control supply in the County of Cumberland, therefore, their boundaries, to a large extent, must be artificial from an electricity supply point of view...
>
> It is considered, therefore, that, if any consolidation of areas is to be made, it should be done by an extension of the Sydney County district rather than by the formation of a number of separate county districts" (EANSW 1954a,4).

The opportunity to unify the Sydney region was missed, however, and soon disappeared altogether. In 1952 the Parramatta Council began to agitate for a new county council to take over the assets of the Parramatta Company once the ELPSC valuation case was settled, rather than have them go to the SCC (SMH 7&18.9.52).[25] It was successful, and the Prospect County Council was constituted in late 1956. The PCC's industrial load was second only to the SCC's, and the two authorities were therefore the natural nuclei for further amalgamations in the Sydney region. These eventually occurred, though not always without resistance.[26]

The EANSW took the establishment of the PCC with good grace, despite its recommendations to the contrary in 1954:

> "...it is hoped that the separate operations of the Sydney and Prospect undertakings will lead to healthy rivalry, enabling some comparison to be made of the efficacy of each"(EANSW 1957a,29).

There was indeed rivalry between the six county councils which served the region from 1957 to 1979, expressing itself mainly in domestic electricity tariffs. Whenever the SCC announced a tariff reduction the other councils were under pressure to match it, and they did not have the SCC's advantage of a large industrial and commercial load from which to subsidise domestic consumers.[27] Recommending further amalgamations in 1977, the EANSW stated:

> "Maintaining domestic tariffs at this level with their relative load situation can only be done at the expense of the industrial and commercial consumers in Mackellar and St.George whose tariffs generally are above Sydney. The poor load balance in these two undertakings compared with Sydney has been a main contributing factor to the difficulties they are facing and this is also apparent in their general financial position" (EANSW 1977a,22).

The affected councils could not refute this, but sought to delay their proposed amalgamation by calling for yet another inquiry.[28] The SCC, which stood to gain considerably in consumer numbers and area from the amalgamations, naturally favoured them (SMH 26.3.77), and it

resigned from the LGEA when that organisation geared itself up for a campaign oppose them (LGEA 1977,10).[29]

Loose associations of county councils were also canvassed as a more palatable alternative to outright amalgamation. A central electricity industry council with area boards, on the model of those established in Britain by the Electricity Acts in 1947 and 1957, was suggested in several EANSW reports, sometimes as alternatives to county councils and sometimes as a means for greater co-ordination between them without removing their separate identities. The proposal was finally taken up by the Unsworth Labor Government in 1987, with the creation of a central Electricity Council and provision for declaration by the Minister for Energy of area boards outside the metropolitan areas.[30]

While the creation of area boards could conceivably be used as a vehicle for further amalgamations of rural councils by future governments, it was difficult to foresee further boundary changes in Sydney, short of a complete restructure of the county council system. None of the remaining options for administrative realignment could overcome the problem of geography.[31] The SCC supply area was the heartland of the NSW electricity system and its load was by far the densest. In mid 1987 it had over 11 times the consumer density of the second densest council, the neighbouring PCC, and nearly 100 times the NSW average.[32] This natural advantage was coupled with a good balance of domestic, commercial and industrial consumers, and a modest but steady rate of growth. The SCC's natural advantages had been used by state governments to subsidise the cost of reticulating electricity elsewhere (in addition to identified transfers and the uniform bulk supply tariff) by administratively incorporating less advantaged areas. The last major opportunity for this was taken in 1980, with the incorporation of Brisbane Water, Mackellar and St George County Councils. The scope for amalgamations around Sydney was then effectively exhausted.[32]

After 1980, the government directed the EANSW to become more involved in increasing the financial and operating efficiency of county councils. The preoccupation with changing boundaries to secure short term improvements gave way to the more difficult task of improving the performance of all councils in the long term.

FIGURE 6.1
ELECTRICITY DISTRIBUTION AUTHORITIES
NSW 1947-86

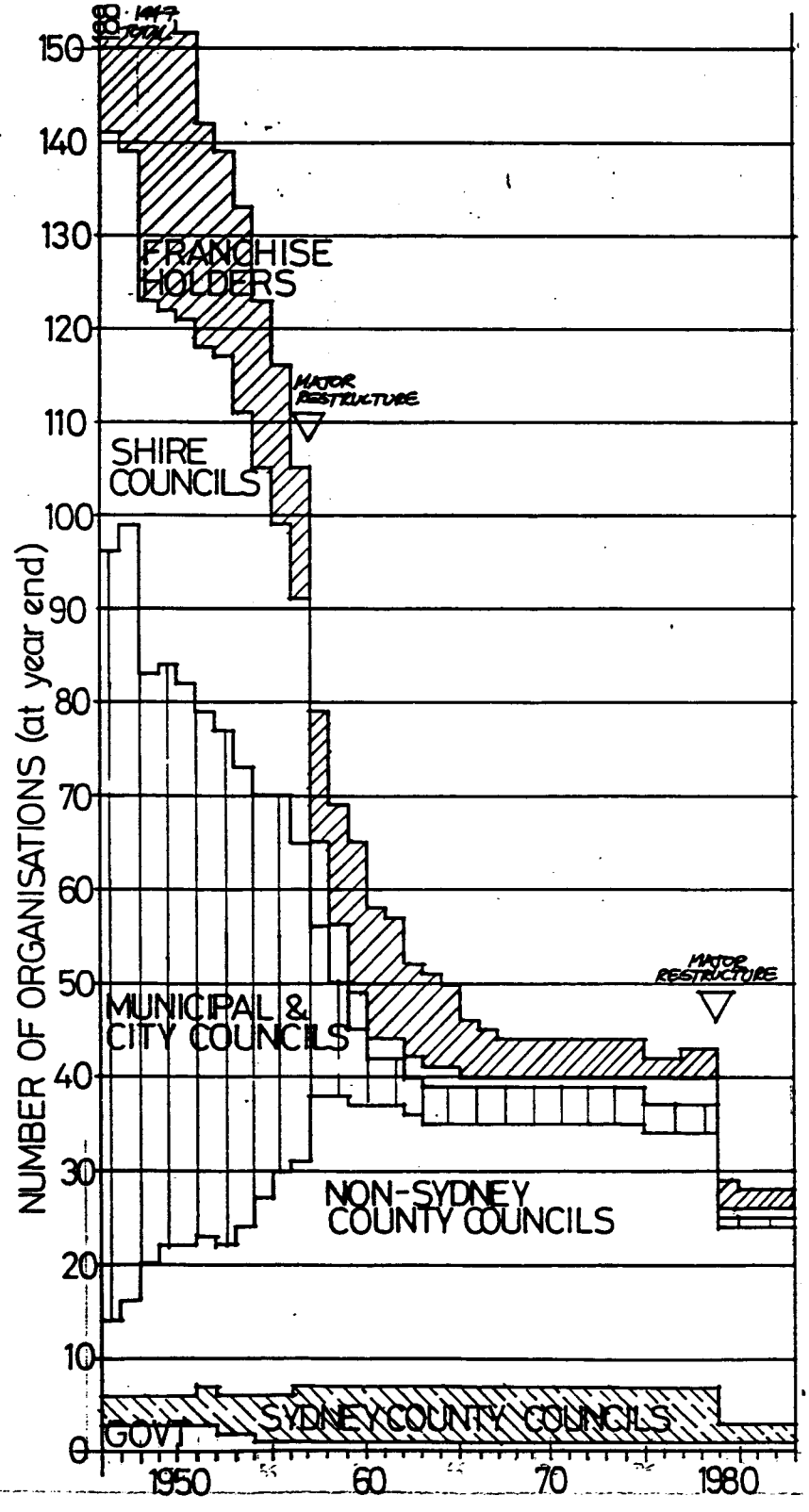
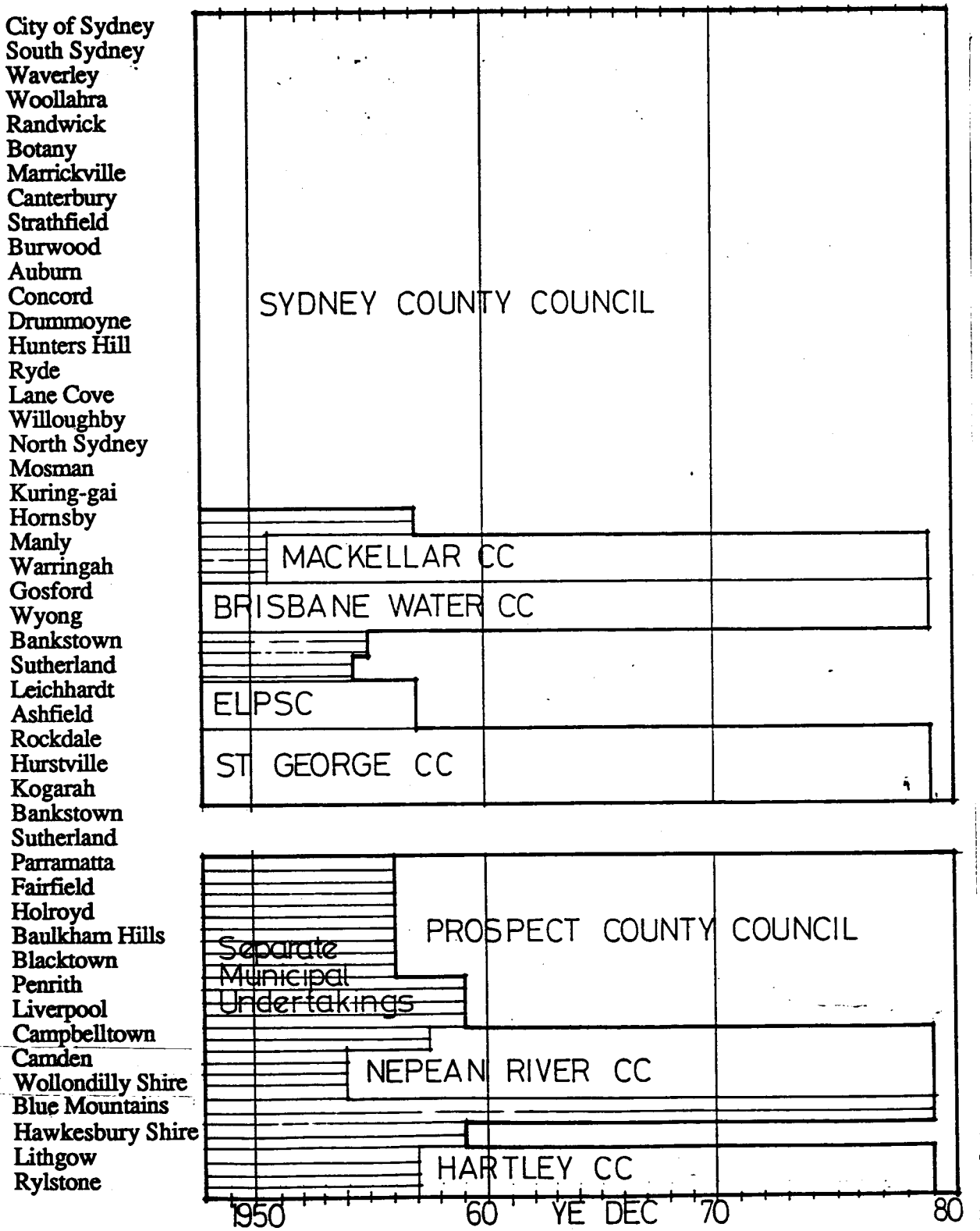


FIGURE 6.2
ELECTRICITY DISTRIBUTION AUTHORITIES
BY LOCAL GOVERNMENT AREA
SYDNEY 1949-80



Note: All LGAs as at 1949 boundaries, except South Sydney (created 1968). All LGAs within post-1976 SSD except Lithgow and Rylstone. All are municipalities unless otherwise indicated.

6.2 SYDNEY'S LEGACY

The Sydney electricity system continued to exert a profound influence over the economics of the NSW grid, and the actions of the SCC had a lasting effect on government electricity policies even after its generating assets had been transferred to the ECNSW.[34] As the SCC's pricing policies spread to other councils, the cross-subsidisation of residential consumers became institutionalised throughout the state and enshrined in government policy.

The Sydney County Council and Its Policies

The policies of the SCC evolved out of the changing tripartite relationships between state government, county councillors and utility management. The council's metropolitan location gave it a prominent base from which to criticise and even frustrate government electricity policy. Its special legislative basis in the Gas and Electricity Act 1935 made it unique among county councils. It was largely beyond the administrative reach of the Minister for Local Government, and thanks to the foresight of its pioneer general manager, Forbes Mackay, its management had a high degree of autonomy.

Governments made up for the weakness of their formal control over the SCC by attempting to capture it through party political means. The polarisation into Labor and 'Independent' (ie usually conservative) factions which had occurred during the post-war supply crisis remained. The SCC was controlled by Labor from 1952 to 1969, by Independents from 1969 to 1980, and by Labor again from 1980 to 1987. It was no accident that these periods co-incided roughly with state government political terms: each change of control was associated with reconstitution of the SCC through legislative amendment in 1948, 1968 and 1980. This was more than simple vindictiveness: it was one of the more effective means for state governments to ensure that the SCC complied with their wishes, or at least were less open in their opposition.[35]

The traces of the SCC's origins as an enterprise of the Sydney Municipal Council gradually vanished and it effectively became a local government body only in name.[36] SCC councillors were still elected by the aldermen of the councils in each constituency, but did not necessarily have to be aldermen themselves. The SCC became a microcosm of state party politics, with both Labor and conservative parties contriving to get their nominees elected.[37] Furthermore, the SCC's special legislation assured its general manager an independent role in policy-making: rather too much so, in the opinion of some councillors. Internal conflict between elected councillors and senior management continued to flare up until the 1960s.[38]

Once it transferred its generation assets to the ECNSW at the beginning of 1952, the SCC found itself in the position of a dependent client. It became a purchaser of power in bulk from a monopoly supplier at prices over which it had no control. This allowed it to blame the ECNSW for the rising prices of the early 1950s, even though these continued a trend which was well established by the SCC itself in the late 1940s (see Figures 6.2 and 7.3). The councillors and management of the SCC constantly criticised the structure and level of the BST in the 1950s (eg SMH 5.3.55, 6.12.55). In 1953 the SCC lodged a formal complaint under the Electricity Commission Act which, however, succeeded in delaying a BST increase by only two months (SMH 21.4.53, ECNSW 1953,10). These disputes opposed the Labor-controlled SCC to the policies of the Labor state government, particularly with regard to a state-wide uniform BST, which subsidised country consumers at the expense of those in Sydney (SMH 28.1.53).

The ECNSW and the government criticised the SCC in return. The former found that the boilers at Bunnerong power station were badly corroded, and implied poor technical management by the SCC (SMH 1.2.52). A major contributor to the extension of the post-war supply difficulties well into the 1950s was the long delay in rebuilding the Pyrmont power station, a project begun by the SCC during the war and handed over to the ECNSW. The SCC blamed the ECNSW for the delay. The *Sydney Morning Herald* blamed the Premier, J.J. Cahill, who blamed the contractors. SCC councillor J.O. Cramer MLA blamed communist trade union organisers (SMH 4.3.52). In fact the project was subject to the chronic shortages of labor and materials affecting all post-war construction activity.

These disputes became less heated after 1953, when electricity rationing was finally discontinued, and the ECNSW was able to report "the meeting of the unrestricted public demand for electricity for the first time since the end of World War II" (ECNSW 1953,3). Thereafter the ECNSW began to acquire a public reputation for competence while the SCC, often with bad grace and public infighting between its councillors and management, was forced to bear the odium of either raising its prices or allocating price reductions unequally.[39]

Although the SCC could do little about the BST, it still had considerable control over the other cost factors contributing to retail tariffs. It was responsible for its own distribution system costs, able to budget for surplus or deficit from year to year, and could determine the distribution of the total costs between consumers via the various tariff structures. As a consequence of its political makeup the SCC's tariff structures were largely determined not by the actual cost of supply to consumers but by the allegiances of the party dominating the council.

The post-war supply crisis drove up the average price of all electricity sold by the SCC from a low of 1.1 d/kWh in 1946 to nearly 3.0 d/kWh in 1954. High fuel and maintenance costs of its ageing, inefficient plant, the high capital costs of new plant and the general post-war inflation of wages all contributed to the rise. The SCC allocated cost increases to consumer classes on an ad hoc basis, by vote of the councillors. The *Sydney Morning Herald* commented

> "By alternating its increases in power charges between domestic and industrial users, the Sydney County Council at least ensures that protests come from only one group at a time" (SMH 13.12.56).

The overall trend, illustrated in Figure 6.3, clearly favoured residential consumers. In 1946 the average residential price was well above the average for all sales, but by 1952 it was well below. Residential prices increased 91% between 1946 and 1954, compared with 274% for commercial and 340% for LV industrial. The Labor councillors in control of the SCC from 1952 were urged to maintain this bias by the City Council and by the NSW Labor Council (SMH 16.10.56, 23.8.57). Industrial consumers had vocal support from Independent SCC councillors and the *Herald* (SMH 20.8.57). The Labor councillors were won over, ultimately, by management reports that industrial consumers were considering generating their own power. One of their number, H.F.Jensen, explained in statesmanlike terms:

> "I was fully aware that it would be more popular to increase industrial and commercial tariffs than domestic charges. But, in the long run, it would react more sharply on domestic consumers than the present increases, by driving industry to other forms of power. What we did was right, which is more meritorious than doing what was popular" (SMH 16.10.56).

The SCC halted the trend but did not entirely reverse it, so institutionalising a significant and permanent subsidy to residential consumers. As Figure 6.3 shows, residential and industrial prices converged to some extent by the late 1960s, and both remained well below the prices to commercial consumers. The differentials remained practically constant throughout the 12 years of Independent control, and then diverged again in favour of domestic consumers once Labor regained control of the council.

The Consequences of Price Distortion

It is impossible to accurately quantify the extent of price distortion, but there is no doubt that it cost the state dearly in terms of premature and under-utilised investment in energy infrastructure and reduced economic activity among non-residential electricity consumers. The pricing policies adopted by the SCC in the early 1950s set a precedent for other county councils throughout NSW. The massive price subsidy to residential consumers disguised the real economic cost of supplying them with electricity. Urged on by the advertising of county councils and the appliance industry, householders en masse purchased electrical appliances for

uses such as cooking and space heating. These contributed to peaks in demand on the system and so reduced the efficiency with which it utilised the capital resources invested.[40] The NSW electricity system was less efficient than Victoria's or Queensland's.[41] The Sydney region was the chief cause of the low state load factor.[42]

A former assistant general manager of the SCC, K.Maguire, who left in controversial circumstances, publicised the situation in some detail in the mid 1960s. He ascribed the fall in the ECNSW's load factor (from 54.2% in 1956 to 49.5% in 1963) to the

> "...disproportionate growth of peak loads of short duration in the early hours of the winter evenings when demands of domestic consumers for electricity for lighting, cooking and room heating are greatest" (Maguire 1966,10).

The influence of residential consumers on the load shape of the ECNSW was, according to Maguire, greater than in any other major electricity system in the world, and industrial and commercial tariffs were being held at "unreasonably high levels in order to support wholly uneconomic rates for domestic supplies" (ibid,12). Maguire blamed the the policy of the SCC:

> "The tariff policy of the Sydney County Council is of great importance in these matters as it distributes about 40% of the total output of the Electricity Commission. The load patterns of that Council's customers exert a dominant influence on the growth and shape of the Electricity Commission's daily and seasonal load curves and the Sydney County Council's trading policy and promotional activities have a powerful influence on the many smaller Councils which tend to follow its trading practices" (ibid,13).

Often the smaller councils pursued the SCC lemming-like to their own doom. St George and Mackellar emulated the SCC in offering a concessional rate to domestic consumers who installed electric cookers, despite the fact that such customers caused the councils to incur a greater loss than those who cooked with other fuels (ibid,19). The SCC residential tariff for all household energy use after the first 100 kWh per quarter was 1.86 c/kWh, but only 1.51 c/kWh if there was an approved electric cooker installed. Faced with a rapidly deteriorating load factor in the late 1960s, the SCC finally abolished the promotional cooking rate in 1968, increased its prices for the first time since 1961, and began to offer subsidies for the installation of off-peak water heaters (SCC 1968,10).

If the costs of electric cooking were belatedly acknowledged, the costs of electric space heating were not. Table 6.1 illustrates the mid 1980s ownership rates, in Sydney and the rest of NSW, of major electric appliances, including those contributing to residential peak load. Sydney, and the SCC area in particular, had a slightly lower penetration of electric cooking and peak water heating than the rest of NSW, but a far greater proportion of households which used electricity as their main form of room heating. This was the main cause of the persistently low load factor in Sydney and, in turn, the rest of NSW: maximum demands on the ECNSW system in the

1980s still correlated strongly with Sydney air temperatures at the time of the evening peaks (Coulter 1988).

The SCC had a relatively high ratio of commercial and industrial consumers from which to make up the higher bulk supply charges incurred through peaky residential consumption. The other councils did not, and therefore had to charge business consumers considerably higher prices than the SCC to maintain similar residential prices (see Figure 6.4). One of the reasons the 1974 Brown inquiry gave for recommending the amalgamation of the SGCC and MCC with the SCC (which eventually took place in 1980) was the fear that their prices would otherwise have to rise unacceptably (EANSW 1974a,52). Thus the issue was not the reasonableness of the SCC's pricing, but the inability of other councils to emulate it, and the solution was not to make pricing more rational but to hide the subsidy within a larger pool of consumers.

In Maguire's opinion the irresponsibility of the county councils was made possible by the lack of central co-ordination and control:

> "Although responsible to the same Minister, but in fact operating in administrative isolation, neither the Electricity Commission, The Electricity Authority of New South Wales or the numerous Electricity County Councils have the obligation nor the opportunity to assess the benefits to the overall economy of the supply industry which could be obtained by co-operative action in the application of more rational tariffs and the promotion of loads which would result in better economic use of capital equipment" (Maguire 1966,17).

The ECNSW showed little sign of concern with the characteristics of the electricity demand it was serving. It simply assumed that the rates of increase in maximum demand and energy evident in the 1950s would continue indefinitely (Sykes 1960,138). The Commission's planners were well aware not only of the long term deterioration of load factor, but also of the strong links between short term peak demand and the winter evening temperature in Sydney (Aston and Wilson 1964). It seems remarkable that they accepted these facts without comment, and questioned neither the trends in electricity demand which underlay them (which were due in large to Sydney demand and the policies of the SCC) nor the wisdom of allowing those trends to continue.

Kolsen (1966) gave some credit to the ECNSW for attempting to introduce cost reflective features, however crude, into the bulk supply tariff, but concluded that these could not result in more rational allocation of resources unless the electricity councils reflected the features in their own retail tariffs:

> "...as long as the retailers apply pricing criteria which include considerations of equity (as they see it), other semi-political motives, and their own version of what ends pricing policies are to achieve, they are able to use their ability for internal cross-subsidization to present consumers with relative prices which have little

connection with relative costs. The major problem is therefore the existence of institutional arrangements which make it possible for the pricing policies of the Commission and of the retailers to be determined on the basis of different criteria" (Kolsen 1966,568).

The persistence of the institutional barriers to more rational pricing were amply illustrated by the 1986 McDonell inquiry. The SCC and the LGEA, representing the other county councils, both submitted that they were getting insufficient indication of the actual economics of generation from the ECNSW, and that they strongly suspected that such signals as they were getting from the bulk supply tariff were incorrect (McDonell 1986,I,229). The inquiry found:

> "The present lack of information on current and projected costs of supply severly inhibits the development of a rational approach to tariffs..."(McDonell 1986,III,60).

and concluded that the ECNSW

> "...would need to undertake a study of the way in which its costs are likely to vary over time and share this knowledge with the distribution industry and consumers generally" (ibid,69).

There was little evolution in pricing and pricing policy from the mid 1960s to the mid 1980s, and Figures 6.3 and 6.4 show that the relativities between consumer class prices hardly changed.[43] After 1984, however, there were some signs of stabilisation in the extent of the cross-subsidy to the residential sector. The EnANSW was able to report in 1987 that the increase in business tariffs in recent years had been "consistently kept below the increase in domestic tariffs" (EnANSW 1987,22).

During the 1960s and 1970s the ability of other consumer groups to subsidise residential consumers seemed almost inexhaustible. A 1975 economic study of the demand for electricity in NSW and the ACT concluded that

> "There is little evidence that commercial and industrial demands for electricity are sensitive to the price of electricity and of other fuels ...this same price inelasticity of demand would make it possible for electricity retail authorities to engage profitably in price discrimination" (Hawkins 1974).

The decline in economic growth in the early 1980s, however, brought industrial electricity prices to the attention of state governments attempting to attract or retain a proportion of dwindling national growth in manufacturing.[44] At the beginning of 1986 the NSW government introduced an "Industrial Development Tariff" resulting in an average price reduction of 14% for the state's largest 500 industrial consumers (EnANSW 1986,28). In 1987 the Victorian government launched a campaign to attract electricity-intensive manufacturing on the basis that Victoria had the "cheapest rates of electricity for industrial users in the Western world", and that manufacturers in Sydney paid 22-38% more than their counterparts in Melbourne (Australian, 25.3.87). In 1987 the NSW government announced a

special fund to "help small businesses to be more competitive in international markets by reducing [energy] costs" (DT 19.5.87).

As they acquired greater control over tariff setting, NSW governments elevated the practices of the SCC to the state level instead of formulating reasoned and co-ordinated long term policies on electricity pricing. They attempted to preserve the historical advantage of residential consumers: in the early 1980s, the Wran Labor government, with former SCC councillor P.D.Hills as Minister for Energy, began to make regular boasts that Sydney's residential electricity tariffs were the lowest of the mainland capital cities. Governments responded, ad hoc, to the needs of other consumers only when made necessary by the public insistence of their demands (especially when they invoked the loss or creation of employment) and by their threats to relocate in other states.

The SCC remained influential in other ways as well. Three major inquiries into NSW electricity distribution in the 1970s all recommended that administration by general manager, of which the SCC was the sole example, should be adopted for all county councils, in preference to the Local Government Act model of management by elected councillors via a county clerk and a chief engineer (EANSW 1972a,7&1974,a5, EnANSW 1986b,67). In 1987 the Unsworth Labor government amended the Electricity Development Act to give effect to these recommendations, and at the same time consolidated its control over all county councils. The government changed in March 1988, before the impact of the new arrangements could become apparent. However, the intent may well have been to strengthen the role of government and electricity system management against that of elected local councillors - a historic shift in the tripartite balance which is the legacy of the Sydney Municipal Council and of the 1890's.

FIGURE 6.3
AVERAGE ELECTRICITY PRICES BY CONSUMER CLASS
SCC 1950-86

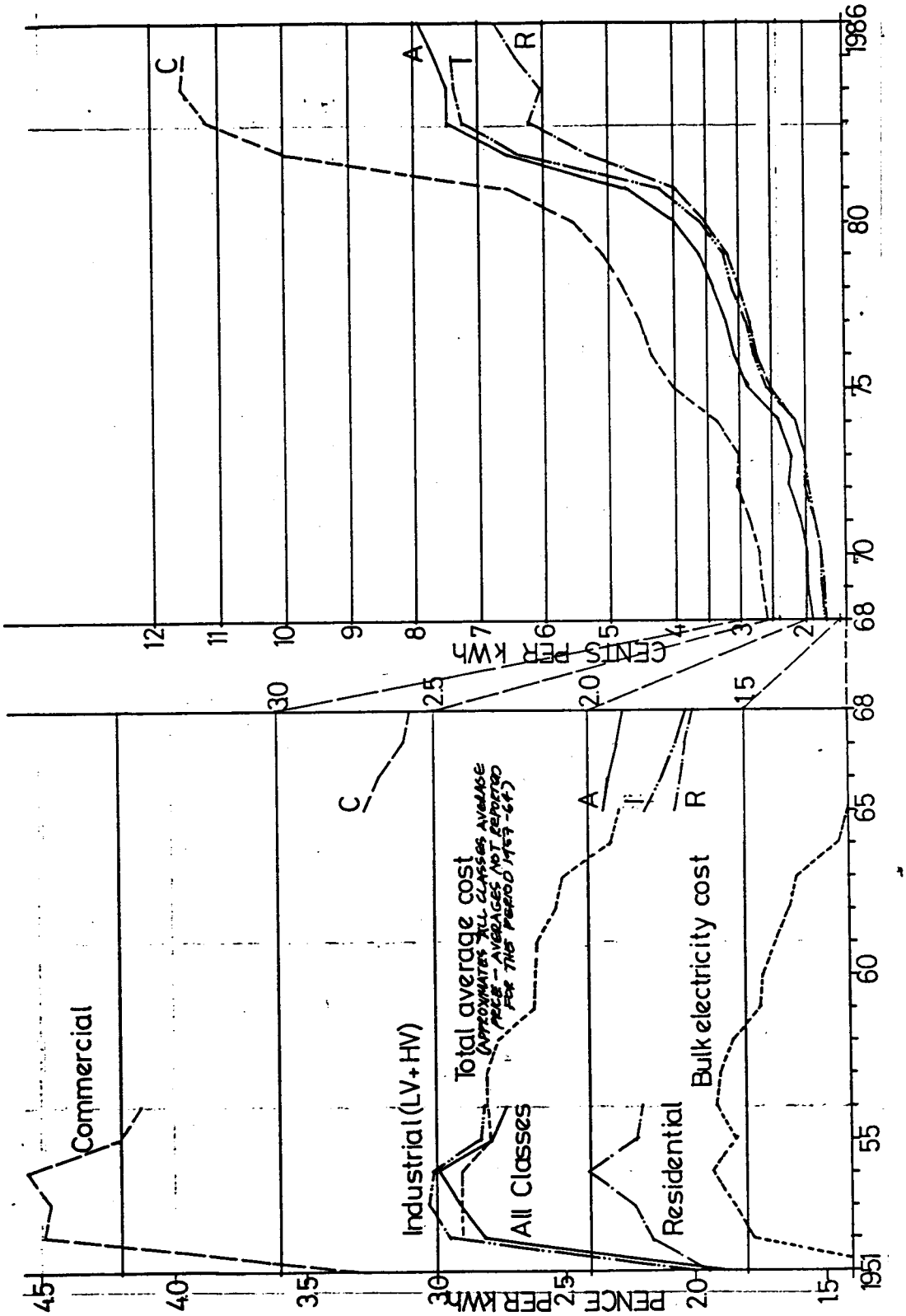
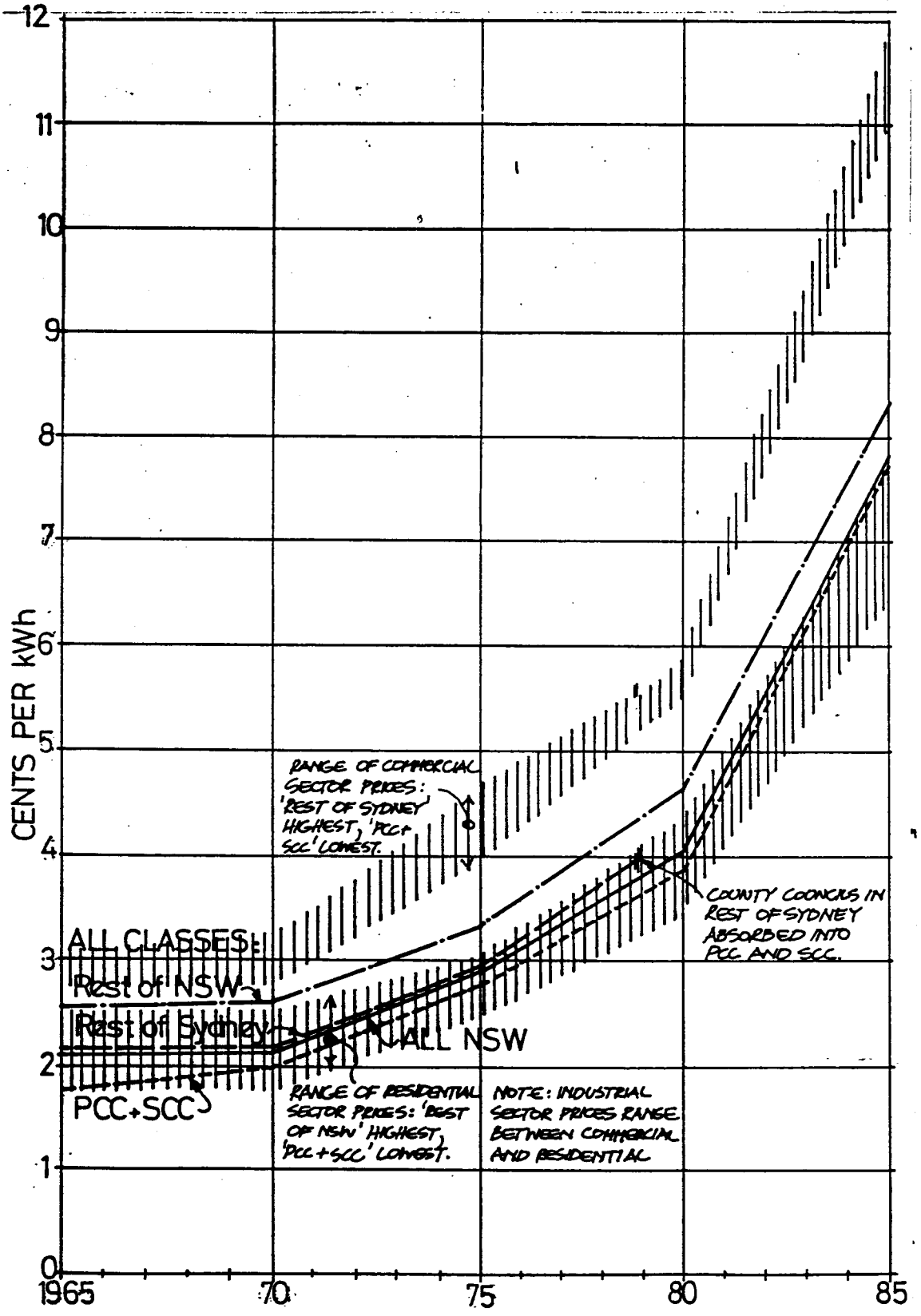


FIGURE 6.4
AVERAGE ELECTRICITY PRICES BY CONSUMER CLASS
SYDNEY AND REST OF NSW
1965-85



6.3 THE SYDNEY AND NSW ENERGY SYSTEM, 1950 - 1986

Energy consumption in Sydney and NSW increased steadily from the war until the late 1970s. Petroleum transport fuels accounted for most of the increase, but demand for reticulated energy - electricity and gas - also grew strongly. Table 6.2 shows that from 1977/8 to 1985/6 demand growth became less predictable, with as many years of decline as of increase. The first phase of Sydney's electrification had been completed by the late 1940s, with the near universal availability of supply throughout the city. The rest of NSW also reached this stage by the late 1960s (see Table 6.3). The next phase was marked by a rapid rise in consumption per capita, as electricity competed successfully in thermal energy markets and met the growing demand for powered and electronic equipment. At the same time the Sydney electricity system became integrated into a state wide network of large power stations located at the coal fields, connected to load centres by a high voltage transmission grid. By 1980 there were signs that this second phase of electrification was also nearing completion. Natural gas, introduced into Sydney in 1976, put pressure on electricity in the thermal energy market. The ownership of the most energy-intensive household appliances had saturated, and the energy-efficiency of all electrical equipment began to increase.

The trends in technology immediately after the war tended to substitute electricity for fuel and for human muscular effort. By the 1980s, information (in the form of more innovative equipment design, better communications and finer control of operations) began to substitute for electricity, fuel and intellectual effort. If the typical electrical device of the 1940s was the electric motor, in the 1980s it was the integrated circuit, which consumed a fraction of the energy and produced a higher value service.

On the supply side the Sydney electricity system remained almost as firmly based on coal in 1986 as it had been in 1904. Coal-fired stations supplied nearly 93% of the energy sent out by the ECNSW in 1985/6, hydro-electric stations 7% and oil-fired gas turbines barely 0.03%.[45] One reason for coal's dominance was the lack of a viable alternative for base load generation. The ECNSW showed a brief interest in nuclear power in the 1950s, but this dissipated as coal-based technology continued to advance.

The position of coal in other sectors was less secure, however. It rapidly disappeared from railway use: in 1955/56 steam locomotives fired mainly by coal supplied nearly 87% of non-electric locomotive mileage in NSW, and diesel locomotives the balance, but by 1967/68 the ratios had reversed.[46] Within Sydney, the patronage of the electrified suburban railway declined from the mid 1950s to the mid 1970s (Spearritt and Wells 1984,70) and then gradually

recovered in the 1980s (SRA 1985/6,38). The decline of tramway usage in the face of bus competition was even more rapid, and the network closed down entirely by 1961 (Spearritt 1978,155). The relative importance of electrified transport declined even faster than the reductions in passenger numbers suggests. The phenomenal growth of motor vehicle ownership and use meant that the great majority of transport services came to be supplied by non-public, non electric modes.[47]

Table 6.5 summarises electricity sales by consumer classes and per capita in Sydney and the rest of NSW at ten year intervals from 1936 to 1986, and the percentage of consumption by each class.[48] Railway and tramway traction, which had accounted for over a third of Sydney electricity use in the 1930s, declined to about 3% in the 1970s. It recovered slightly in the 1980s with greater suburban passenger numbers and the extension of electrification to Pt Kembla (SRA 1986/86,38). The proportion of electricity used for public lighting, which had been the other main factor in the early growth of the Sydney electricity system, also declined steadily, although the actual energy used increased six-fold.

The proportion of industrial electricity use remained remarkably steady around 35% for the entire 50 year period. The most spectacular growth was in residential and commercial electricity demand, which together took up the share relinquished by traction up to 1966. The sectoral distribution then remained fairly stable to 1986. Electricity consumption in the rest of NSW increased faster than in Sydney throughout the period. Some of this was due to the progressive connection of farms and rural households in the 1950s and 1960s, as illustrated in Figure 6.7. Most was due to the growth in industrial demand in Newcastle and Wollongong after 1970.

From the 1970s there was an unprecedented integration of the Sydney reticulated energy system with the rest of NSW. Ever since the 1870s the most energy-intensive industries in the state had been established outside the city, in places where their demand for coal, natural resources, port facilities and land could be more easily satisified. Their energy systems had been largely separate from Sydney's. These industries took increasing amounts of electricity and (after 1976) natural gas from the state-wide grid, for new energy-intensive processes, and as substitutes for non-grid forms of energy such as coal, petroleum and self- generated electricity. Thus their energy systems merged with Sydney's, and other formerly independent regional systems, into unified state-wide gas and electricity reticulation grids.

The New Generation

The 25 years from the late 1950s to the early 1980s saw the ascendancy of a new phase of electricity generation in NSW. With the extension of the transmission system throughout the state and beyond, and increasing transmission voltages, it became possible to build power stations at the locations which best suited their fuel and operating requirements, and not necesarily at the main urban load centres. The installed capacity of the system doubled about every 7 years, so giving opportunity to build ever larger and more efficient plant.

It is not only in retrospect that this process appears inexorable. All of the key efficiency factors - location, load growth and technological change - were foreseen with remarkable clarity in the mid 1950s by the first chairman of the ECNSW, H.G.Conde and set out in detail by its vice-chairman and chief engineer F.Sykes (see for example SMH 19.6.57, Sykes 1960). They set a clear agenda for the ECNSW, which was able to occupy itself for over three decades with planning, building and operating power stations and transmission lines in conformity with Conde's vision. The ECNSW was subject to relatively little external interference, save for occasional pressure from various governments to accommodate development priorities such as aluminium smelters in its expansion programme, and the disruptions of the unions' 35 hour week campaign in the 1970s.

After the Liddell power station failures of 1981-2, accompanied as they were by relatively brief and minor rationing, there was a sharp renewal of public and government interest in the ECNSW's activities. In 1982 the government restructured the Commission and required it to prepare a statutory report on its operations and future direction. The ECNSW duly reported in 1983 that the trends which had contributed to the steady decline in the real costs of power since the 1950s had in fact reversed in the mid 1970s (ECNSW 1983a,27). At the same time load growth had stalled, leaving the state with considerable and expensive excess generating capacity. The government initiated major inquiries into the planning and pricing of the ECNSW in 1985 and 1986, and in 1987 legislated to again restructure the Commission and make it more publicly accountable for its planning and operations.

The question of electricity generation for Sydney, which had created such controversy in the 1940s, was subsumed into more general issues of electricity supply economics affecting the entire state. These state issues have become the focus of most of the analyses of electricity supply in NSW, such as McColl (1976) and Clarke (1986), and the critical influence of Sydney electricity demand on the development of the state system has not received sufficient attention. The SCC's pricing and promotion practices contributed to the rapid growth of the entire system, and it was in Sydney that growth faltered most in 1982.[49] Sydney remained the key factor in

the management of the entire system, even though the amount of electricity generated there was negligible.

The last new power station to be built in Sydney was Pyrmont B, completed its fourth 50 MW unit was commissioned in 1955. In 1956 a 25 MW unit previously ordered by the ELPSC and a 50 MW unit ordered by the RD were installed at Balmain and White Bay power stations respectively. Thereafter the ECNSW installed no additional generating capacity in Sydney until 1982, when two emergency gas turbines were installed at Bunnerong.Most of the state's additional thermal power requirements up to 1962 were obtained from Wangi, Tallawarra and Wallerawang power stations on the northern, southern and western coalfields respectively, all of which were planned by the Railways Department in the 1940s and completed by the ECNSW in the 1950s (Sykes 1960,138). More hydro-electric power also became available. In 1959 the Tumut 1 power station of the Snowy Mountains Scheme was connected to both the NSW and Victorian grids, and in 1960 the two state Electricity Commissions formally agreed to exchange power across the interconnection to their mutual economic advantage (ibid,140).

Sydney was last self-sufficient in electricity in 1954. In 1958 it was still generating 75% of its requirements, but by 1962 only 32%, and by 1965 only 10%. The combined output of the seven Sydney power stations in that year was barely one fifth that of Vales Point A, the newest and largest power station and the first actually planned by ECNSW engineers. With the progressive completion of four more coalfields power stations by 1987, the contribution of the metropolitan stations to the system became insignificant, although they were retained as emergency plant until retired. Once Pyrmont and White Bay were decommissioned in 1983/84, it became unlikely that the ECNSW would ever again generate electricity in the Sydney metropolitan area.[50]

After the comparatively brief supply dificulties of 1981/2 were resolved, it became apparent that the state was facing the far less tractable problem of massive over-supply. The steady 6% annual load growth on which the ECNSW had come to depend had evaporated, yet the ECNSW's main concern still appeared to be to secure sites for more power stations. In 1985 the government initiated an inquiry into electricity generation planning, and more particularly into the ECNSW's request for the early allocation of a new site for the next power station after the completion of its already committed construction programme. The ECNSW nominated three prospective sites (see Figure 6.5) and favoured Mardi near Wyong, then already under objection on grounds of land-use conflict. Olney, a little further north, was also identified as "prospective" (ECNSW 1985a,13-18). The inquiry commissioner, G.J.McDonnell, was severely critical of the ECNSW's planning in general, and found its case for reserving Mardi and Olney unsupportable. He concluded:

"...that there are very substantial social, economic and environmental difficulties and costs likely to be associated with the development of power stations on the Mardi and Olney sites, in comparison with the development of other nominated and existing sites, and [the inquiry] cannot recommend that they be proceeded with at this time.

...In consequence, the Commission of Inquiry recommends that serious consideration be given now to releasing these two sites for other purposes" (McDonell 1986 I,18).

The government agreed, and in November announced that the Mardi site would be sold (AFR 13.11.87), essentially because the northward expansion of the Sydney metropolitan area had put unsustainable land use pressures on it.[51]

The two dominating factors in the ECNSW's selection of base load thermal power station sites had always been the availability of suitable steaming coal and cooling water at low cost (Aston and Wilson 1964,300). Initially the ECNSW had unquestioned priority of access to coal, water and land resources in NSW, and was able to plan an orderly pattern of development based on its assessment of the economics of evolving generating plant and coal mining technology:

"It appears that the general pattern of development of power generation, for an indefinitely long period of time in the future, will comprise the construction of new four- or six- unit power stations, with successively larger generating units and with their coal supplies being obtained from adjacent collieries established for this purpose. Economically combining with these thermal developments will be increasing amounts of power at low capacity factor from the Snowy Mountains Scheme" (Sykes 1960,139).

Improvements in coal mining techniques were expected to make the greatest contribution to reducing generating costs, followed by the increasing scale and operating efficiency of boilers and generating sets (ibid,146). Coal mining efficiency peaked in the mid 1970s: the open-cut mines which supplied Liddell produced coal at barely half the cost of the Commission's underground mines (ECNSW 1983a,23). Figure 6.6 illustrates the exponential rate of increase in the size of generator sets in NSW between 1899, when Ultimo power station commenced operation with three engine-driven 0.85 MW units, and 1978, when the first 660 MW turbo-alternator set at Vales Point B was commissioned. The economies projected by Sykes in 1960 were more or less realised over the following 15 years, although the expected reductions in power station manning levels were never fully achieved.[52] No further increases in scale from 660 MW have been planned. Indeed, the 1985 inquiry found that reductions in scale may lead to greater economy and reduced risk under conditions of low load growth (McDonell 1986,I,15).

Apart from coal-fired base-load stations the system also needed peaking plant to deliver relatively small amounts of energy during periods of high demand, particularly by residential consumers in Sydney. The ECNSW was fortunate in being able to rely for its peaking capacity

on the Commonwealth's development of the Snowy Mountains.[53] Oil retained a foothold in the fuel mix in remote isolated systems, and for emergency and peaking power, and some natural gas was also used in the early 1980s. Nuclear generation aroused some interest in the 1950s, but was never a serious possibility.[54]

Electricity purchases from other states emerged as the most likely complement to coal. In April 1980 the Commonwealth government established a committee of inquiry into electricity generation and the sharing of power resources in south-east Australia. Subsequent agreements between the NSW, Victorian and SA governments laid the foundations for the integration of the Sydney energy system into a southeast Australian electricity grid embracing over three quarters of the national population, and extending from the northern border of NSW to the western border of SA.[55]

The Residential Sector: Electrified At Last

From the 1950s to the 1970s, Sydney households were consistently more electricity-intensive than those in the rest of NSW. The margin disappeared by the mid 1980s, coinciding with the increasing penetration of the Sydney energy market by natural gas. Figure 6.8 illustrates trends in energy consumption per household from 1936 to 1986. It is notable that the steady annual increase in average household electricity consumption practically ceased in the 1980s.

A sustained growth in population, economic activity, income, house building and appliance ownership during most of this period increased the general demand for all residential energy services. Special factors combined to increase electricity's share of this growing market.[56] In the first instance, the post war economic boom combined with near-universal electricity connection expanded the market for powered appliances such as washing machines and vacuum cleaners, which had been readily available since the first world war but restricted to higher income households. Figure 6.9 shows that the ownership of washing machines increased from barely 2% of Australian households in 1946 to 71% in 1962, and stabilised around the 91% level by the early 1980s. By 1960, 79% of Sydney households owned an electric vacuum cleaner (AWW 1963,52), and it may be safely assumed that ownership was saturated by the 1970s. Dishwashers, which were introduced much later than washing machines or vacuum cleaners, showed strong growth during the late 1970s, but their NSW penetration rate stabilised at less than 20% in the mid 1980s.

These developments continued earlier trends towards the mechanisation of common household tasks, but it is misleading to conclude that electricity replaced human labour in the home. It certainly assisted domestic workers, still predominantly female, to be more productive in their

tasks.[57] Furthermore, the contribution of these labour-saving appliances to electricity demand should not be overestimated: they consumed only moderate amounts of energy, were not in continuous use and so accounted for a relatively small share of the growth in energy demand.

The second trend was the phenomenal growth of household refrigeration, where electricity had a natural technological advantage over its competitors. After an intense but brief period of post-war competition, the electric compressor refrigerator effectively drove gas absorption units out of the urban market by the 1950s. In 1946 only 15% of Australian households possessed a refrigerator, even though electric models had been available in Sydney for over two decades (see Figure 6.9). In another two decades refrigerator ownership had saturated at over 98% of households, and by 1983 there were about 5 units to each 4 households. Freezer ownership grew more slowly, to 45% in 1986, by which time there were signs that it had saturated and householders were purchasing refrigerators with freezing compartments in preference.[58] Household refrigeration was an energy-intensive service, and in 1986 accounted for about 21% of NSW residential electricity consumption.

The third trend was the success of electricity in capturing expanding thermal energy markets from other fuels. It had no major technological advantage over gas in supplying thermal energy for cooking, space heating and water heating, yet it gradually dominated those markets as well. The reasons included the declining relative price of electricity for most of this period, the higher purchase and installation cost of equivalent gas appliances, and effective promotion and advertising by the electricity councils. In due course the decreasing ratio of gas-connected households left electricity without challenge in most of the Sydney residential energy market.

The strategic importance of the cooking market, in which gas was firmly entrenched at the end of the war, had been recognised by the SCC in 1933, when it introduced its promotional 'cooking tariff'. This was maintained until 1968, and no doubt contributed to the complete reversal between 1947 and 1984 in the proportion of Sydney households using electricity and gas as their main cooking energy, as illustrated by Figure 6.10.[59] Water heating and space heating fuels were not surveyed by ABS before 1976, but the available data confirm that electricity captured an even greater proportion of water heating than cooking. Less than half of Australian households had central hot water systems in 1960, as distinct from sink or bath heaters serving a single outlet (AWW 1963,60). Most of the growth in the market therefore took place in the two decades to 1980, when gas was not well placed to compete for it. By 1976 electricity was also the most widespread form of space heating energy, as well as dominating the growing market for clothes dryers.[60]

Households greatly increased their stock of smaller electrical appliances, in addition to the irons, kettles and toasters which were almost universal even before the war. Perhaps the greatest proliferation of small appliances occurred in the kitchen. A great variety of small powered devices for food preparation (grinders, mincers, juicers and mixers) and small thermal cookers (frypans, vertical grills and crockpots) became available. These developments continued at the household level historic technological trends to greater control and flexibility. On the open cooking range common in the Sydney of the 1850s, fine control of cooking heat could only be achieved by physically moving utensils across heat zones. By the 1950s the utensil was stationary and attached to its own, highly controllable and specialised source of heat. Powered devices also followed the trend: instead of a large and heavy central motor transmitting power to auxiliaries (the typical mixer of the 1950s, with attachments for juicing and mincing), most functions acquired their own small, light motors.

Small cooking appliances were generally insignificant in their electricity consumption because they consumed little energy or were used infrequently.[61] Indeed, many appliances had the potential to actually reduce cooking energy by replacing the use of ovens, which are generally more energy-intensive for similar cooking tasks. This was particularly so with the microwave oven, which had been used in commercial food processing since the 1940s and was introduced to the Australian household market in the late 1970s. Figure 6.9 shows that microwave oven penetration in the 1980s rose at a rate equal to that of refrigerators in the 1950s.

The only other products which matched these rates of penetration were not appliances, in the sense of machines which mechanised or electrified traditional household functions, but electronic information devices which in fact consumed very little energy. Radio, television and their accompanying sound and video recorders were the most technologically advanced equipment in the home at the times of their respective introduction, and probably made more rapid social impact than any of the major appliances.

'Wireless' broadcasting was introduced in Australia in 1923 (AYB 1937,806). The proportion of Australian households possessing a broadcast listener's licence increased from about 20% in 1931 to 65% in 1938.[62] Battery-powered radios were readily available, so radio ownership was largely independent of electricity connection. The geographic distribution of ownership was influenced more by the quality of reception from the available stations and by the desire of households for radio-disseminated information.[63] By 1960, 95% of Australian households owned at least one radio, and in Sydney the average ownership rate was two per household (AWW 1963,42-3).

Regular television (TV) broadcasting commenced in Sydney and Melbourne in late 1956. Penetration grew phenomenally in the Sydney metropolitan area: 56% of households by mid-1959 and 83% by mid-1962 (AWW 1963,32). At the 1971 census, the last in which TV ownership was surveyed, over 90% of all NSW households owned a set. Broadcasting in colour commenced in March 1975 and the penetration of colour sets was almost as rapid as for black and white.[64] Home video-cassette recorders (VCR) were introduced in the late 1970s, and their penetration increased rapidly from 11% of Australian households in 1982 to 50% by 1986 (SMH 29.3.86).

Part of the social impact of home electronics was its effect on the physical disposition of family life. The reticulation of gas and later electric lighting throughout the dwelling in the nineteenth century had allowed families to disperse their night-time activities more widely than before, when light sources were relatively few, inconvenient and costly. This pattern was repeated with each innovation in information electronics. In the 1930s, the radio "might vie with the fireplace as focal point of family relaxation" (Johnson 1987, 370). The multiplication of cheap and increasingly portable second and third radios and record players, coupled with wider distribution of power points, helped disperse activities again until the television set briefly brought families back together in their living room in the 1960s. Colour television (CTV) and the VCR had similar, if less pronounced effects: by the 1980s a wider range of alternative entertainment was readily available to family members both within and beyond the home. Radios, recorded music players, computer games, the old black and white TV or even a second colour set were available, could be used in any room, and so undermined the attraction of the central CTV/VCR combination.[65]

The proliferation of home electronics was a major factor in the slowing of growth in residential electricity demand in the 1980s. As the penetration of energy-intensive traditional appliances saturated, households diverted discretionary expenditure to information services which cost as much or more, but which were far less energy-intensive. Electronic controls also began to appear in traditional appliances such as heaters, refrigerators and washing machines, generally increasing their flexibility and efficiency, and so reducing the energy-intensiveness of the total appliance stock. By 1986, space heating and air conditioning were probably the only energy-intensive residential energy services yet to reach the limits of demand, and in Sydney at least, gas was well positioned to compete with electricity for the heating market.

During the Liddell power station failure in 1982, the government ran a publicity campaign to make householders more aware of the costs of operating electrical appliances and of ways to reduce their energy consumption. This was similar to the publicity campaigns of the postwar supply crises, but on this occasion they were continued after the crisis had passed. In 1987 the

EnANSW was still systematically promoting cost- and energy-efficient appliance choice by means such as appliance labelling and incentive schemes to encourage off-peak water heating (EnANSW 1987,13). It is difficult to assess the impact of these programmes on residential electricity demand, but it is probable that they were yet another factor permanently reducing growth.

Figure 6.11 illustrates the annual growth rates in electricity consumption per Sydney residential consumer from 1947 to 1986, as three year moving averages to smooth the effects of short term fluctuations such as weather. The long term trend was clearly downwards, and fluctuated around zero growth by the mid 1980s. The trend to smaller households was probably a contributing factor, but the more important one was that the process of household electrification, which had assured a growing household electricity demand after the war, had mostly run its course.

Industrial Electricity Demand: The Long Boom Ends

The industrial sector was the only one in which less electricity was used in Sydney than in the rest of NSW in 1986. This was due primarily to the location of the state's most electricity-intensive industries: steelworks in Newcastle and Pt Kembla, and aluminium smelters in the Hunter Valley. It is estimated that these industries consumed over 6000 GWh in 1985/6, so accounting for nearly a third of all electricity used outside Sydney.[66] Industrial electricity consumption within Sydney increased 12 fold from 1951 to 1986, compared with a 20 fold increase in residential consumption. Unlike Sydney dwellings, Sydney factories had been well provided with electric equipment even before the war, so electrification was less of a factor in demand growth. There were of course new industrial processes which favoured or required the use of electricity (eg aluminium smelting) but the most energy-intensive of these were located outside Sydney.

Substitution for other fuels was also less of a factor. Partly due to the pricing policies of the SCC, electricity was less cost-competitive with coal, petroleum and gas for industrial-scale thermal applications than it was in the residential sector. This is confirmed by the fact that the rapid increase in industrial natural gas use in the late 1970s was due to substitution for fuel oil and, to a lesser extent, coal, and had hardly any impact on the rate of growth in industrial electricity consumption. Recent econometric analyses by the EnANSW found that only coal, oil and gas had significant inter-substitution potential (EnANSW 1985a,45).

One important factor in the growth of post-war demand for grid-generated electricity was a reduction in the proportion of electricity generated privately. During the post-war period of

supply difficulties, NSW industrial electricity users had been subject to rationing and restrictions, the last of which, on the use of electric arc furnaces for steel-making, was not lifted until August 1953 (Anderson 1955,217). Recorded industrial demand then increased sharply as industries shut down their own costly and inefficient generators and took more of their requirements from the grid. Even so, self-generated electricity still accounted for almost a quarter of NSW industrial electricity use in 1960/61. The amount of energy produced by private generators remained nearly constant thereafter, but it met only 6% of a greatly increased industrial consumption in 1984/85.[67] In the immediate post-war period private generation had sometimes been necessary to enable production to continue at all, and was used across the entire manufactirung spectrum. By the 1980s it was restricted mainly to large scale plant where waste fuel was available as a process byproduct, or there was a use for waste heat from the generation process. There were relatively few such opportunities in Sydney, and their full exploitation was deliberately discouraged by the SCC (EnANSW 1985d,III).

The predominant factor in the growth of industrial electricity demand in Sydney was the general increase in population, economic activity and manufacturing. When economic growth stalled, so did NSW industrial electricity demand: in 1982/3 it fell more than 5% from the previous year.[68] One of the factors to which the ECNSW ascribed this interruption in otherwise constant growth was the most severe economic downturn since the early 1960s (ECNSW 1983a,36). The downturn was part of a longer term decline in the relative importance of manufacturing in the economy, from 22% of Australian GDP in 1970 to 19% in 1985 (Ewer et al 1987,28). The impacts of recession and "deindustrialisation" were particularly severe in the suburbs of Sydney (Fagan,forthcoming,11). The most electricity-intensive industries in NSW, all located outside Sydney, were related to mineral extraction and processing: coal mining, aluminium smelting and iron and steel (EnANSW 1985a,45-69). These industries were vulnerable to export demand for commodities as well as to the uncertainties of the domestic Australian economy. The factors behind the postwar growth in NSW industrial energy demand were therefore at risk or actually in decline, in Sydney as well as the rest of the state.

Electricity's share of industrial energy demand, however, was fairly secure.[69] It provided almost all industrial power, and by the 1980s new process technologies began to favour electricity over lower priced fuels for specialised heating applications, such as materials reprocessing in urban areas. In 1986 BHP announced its intention to replace two ageing steel mills at Pt Kembla with a "mini-mill" in the west of Sydney, using electric arc furnaces to convert scrap metal to rod and bar (SMH 1.9.86).

While the introduction of new electric technologies added to industrial electricity demand, other factors tended to reduce it. Energy management and conservation became established in fuel-

intensive industries during the 1970s, when rapid rises in the price of petroleum products forced manufacturers to review their energy use. When electricity prices also rose sharply in the early 1980s the same review and management techniques were again applied, with the encouragement of state and federal governments and the assistance of a growing body of professional energy managers. While the urgency of these activities eased as electricity prices stabilised in the mid 1980s, the introduction of new equipment and operating practices led to an irreversible reduction in the electricity-intensiveness of many industrial processes.

Natural Gas: The Coming Fuel

The Sydney gas industry was in a slow decline from the war until the late 1970s. AGL tried to compensate for the escalating price of coal and labour during the 1950s by modernising its plant and expanding its capacity to make gas from oil (Broomham 1987, 177).[70] It was assisted by the growth of Sydney's oil refining capacity, which made available propane, naphtha and refinery waste gases (ibid,189). AGL's access to capital was more limited than that of the electricity industry, however, and its rate of expansion could not keep pace with the city's growth. While the number of Sydney households connected to gas actually increased until the mid 1960s, the gas-connected proportion fell from over 80% of the Sydney housing stock in 1947 to less than 30% in 1983 (see Figure 6.7). The gas system was not extended quickly enough to take advantage of the new housing being built at the city's periphery, and also lost existing consumers from its traditional markets nearer the centre.

AGL management publicly stated in 1961 that the use of oil was only a stage in the transition away from from coal, and that the only feedstock which would ensure its long term viability was natural gas, even if it had to be imported from overseas (Broomham 1987,188).[71] In December 1970 AGL signed a 30 year natural gas supply contract with a consortium of companies who had found gas in northeastern South Australia. At the end of 1971 coal carbonisation finally ceased at Mortlake, and gas was made entirely from petroleum products until the completion of the pipeline from SA, which was then expected in 1973 (ibid). In the event the completion of the pipeline was delayed by nearly three years.[72] Natural gas from Moomba in SA finally reached Sydney at the end of 1976 (ibid,199). The city's major industrial fuel users rapidly switched to natural gas, and AGL then commenced a programme of converting all residential appliances, which was projected to be completed in 1991 (AGL 1987,11).

Natural gas was a completely new fuel in its cost structure and chemical properties, and it restored the competiteveness of the gas industry. The price of gas had risen with the cost of petroleum feedstocks in the mid 1970s, but with natural gas it declined in real terms, at about

the same time as the real price of electricity began to rise, for the first time since the 1950s. The first impact of the new fuel was on the state's industrial sector, where it displaced coal and petroleum in the most fuel-intensive industries, most of which were located in Newcastle and Pt Kembla. The geography of gas use in NSW changed radically: while annual electricity consumption outside Sydney doubled in the decade to 1986, gas consumption increased 27 fold (see Tables 6.5 and 6.7).

Having made a clean sweep of the fuel-intensive industries, gas began to displace both fuel and electricity in less energy-intensive industries, in the commercial sector and then in the residential sector, which as always was the last to change its energy preferences. The loss of domestic consumers from the gas system reversed in 1980 (Broomham 1987,207) and was replaced with strong growth in consumer numbers. At the same time average gas use increased by nearly 30% between its 1976 low point and 1986 (see Table 6.8).

The extension of the natural gas pipeline system across NSW and across state borders reinforced the interconnection of the Sydney energy system with the rest of southeastern Australia, which the electricity grid had already achieved. By the 1980s, the entire settled areas of NSW, Victoria and SA were covered with two superimposed energy grids, each one technologically capable of supplying a wide range of energy services at any point along it. Each of the grids represented a further step in the centralisation of energy supply, yet the fundamental purpose of much of the energy demand they served had barely changed. The major household uses of gas remained cooking, space heating and water heating, as they had been since the 1920s, throughout all the major transitions in primary fuel and production technology from the 1950s to the 1970s.

The Sydney gas system was in some ways the antithesis of the electricity system. It employed a number of hydro-carbon feedstocks, imported from overseas and interstate, to supply essentially a single energy service: heat. Conversely, the electricity system had relied on a single resource, NSW black coal, to supply an ever expanding range of end uses. The lack of efective competition from coal and petroleum gas had been one of the factors behind the growth in electricity demand up to the late 1970s. The emergence of the new fuel, natural gas, was a reminder that there were limits to electrification.

FIGURE 6.5
ACTUAL AND PROPOSED POWER STATION SITES
NSW 1985

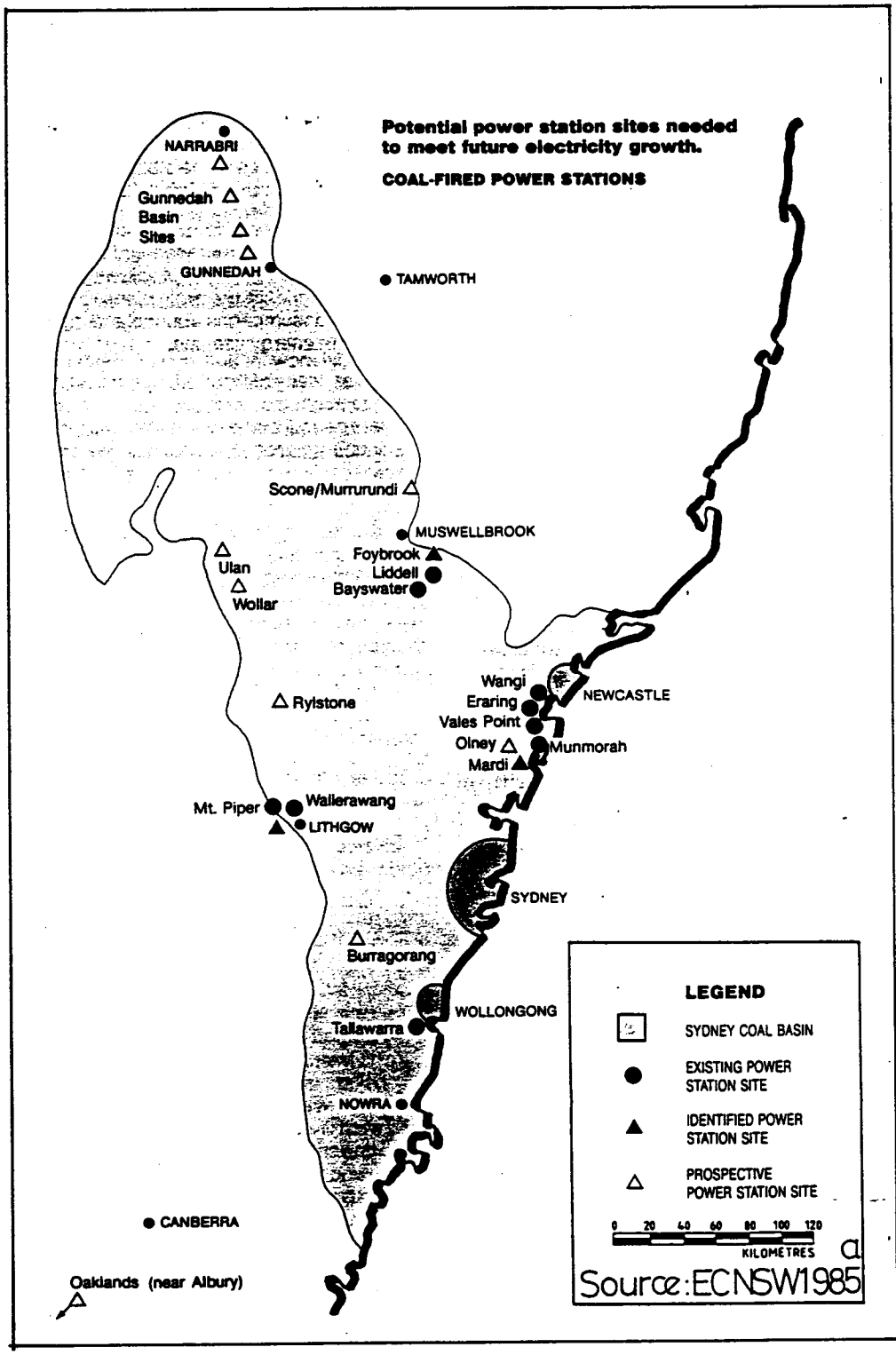


FIGURE 6.6
SIZE OF LARGEST THERMAL GENERATING PLANT
NSW 1899-1980

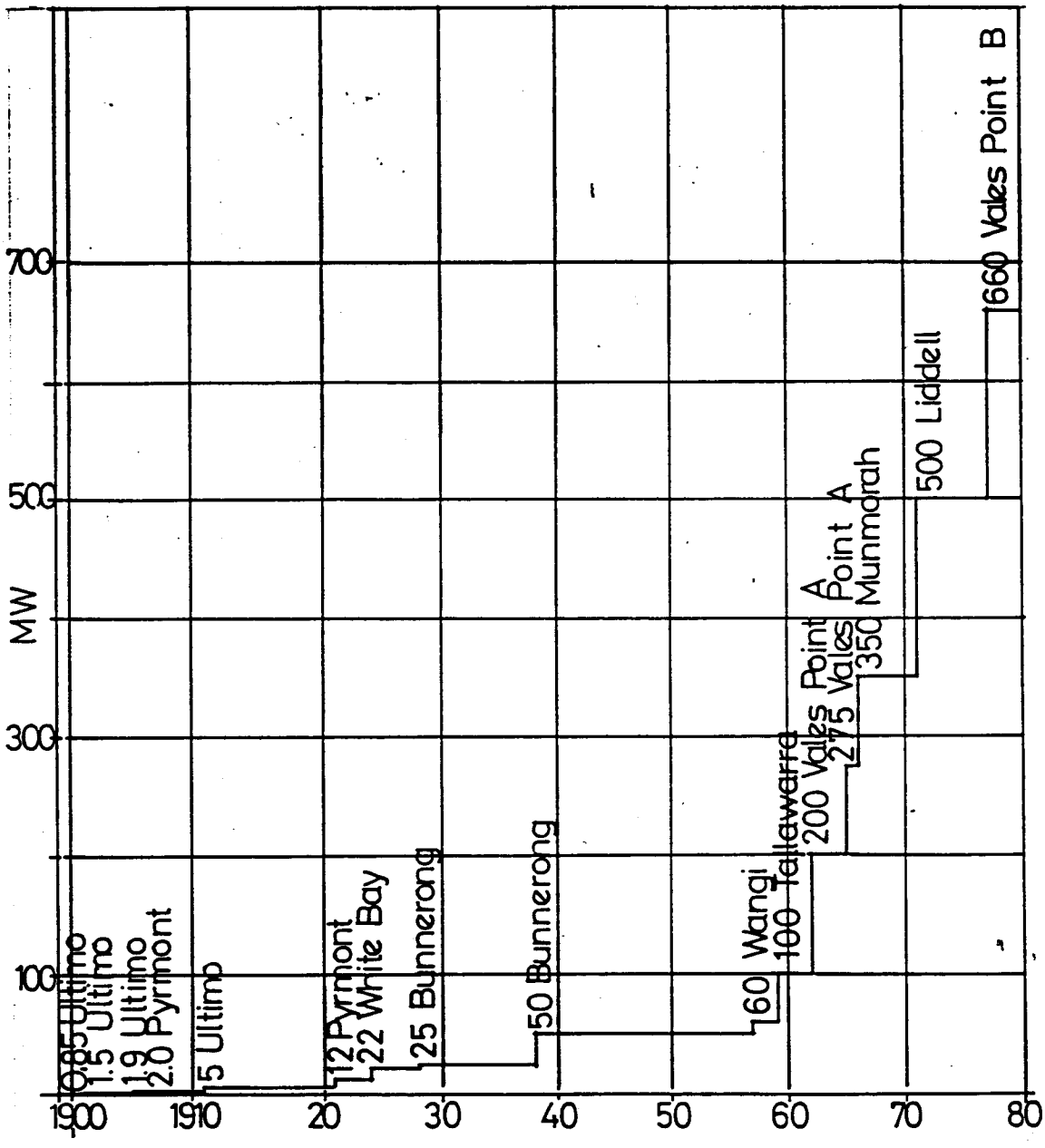


FIGURE 6.7
PERCENTAGE OF HOUSEHOLDS CONNECTED TO GAS AND ELECTRICITY, SYDNEY AND REST OF NSW 1947-85

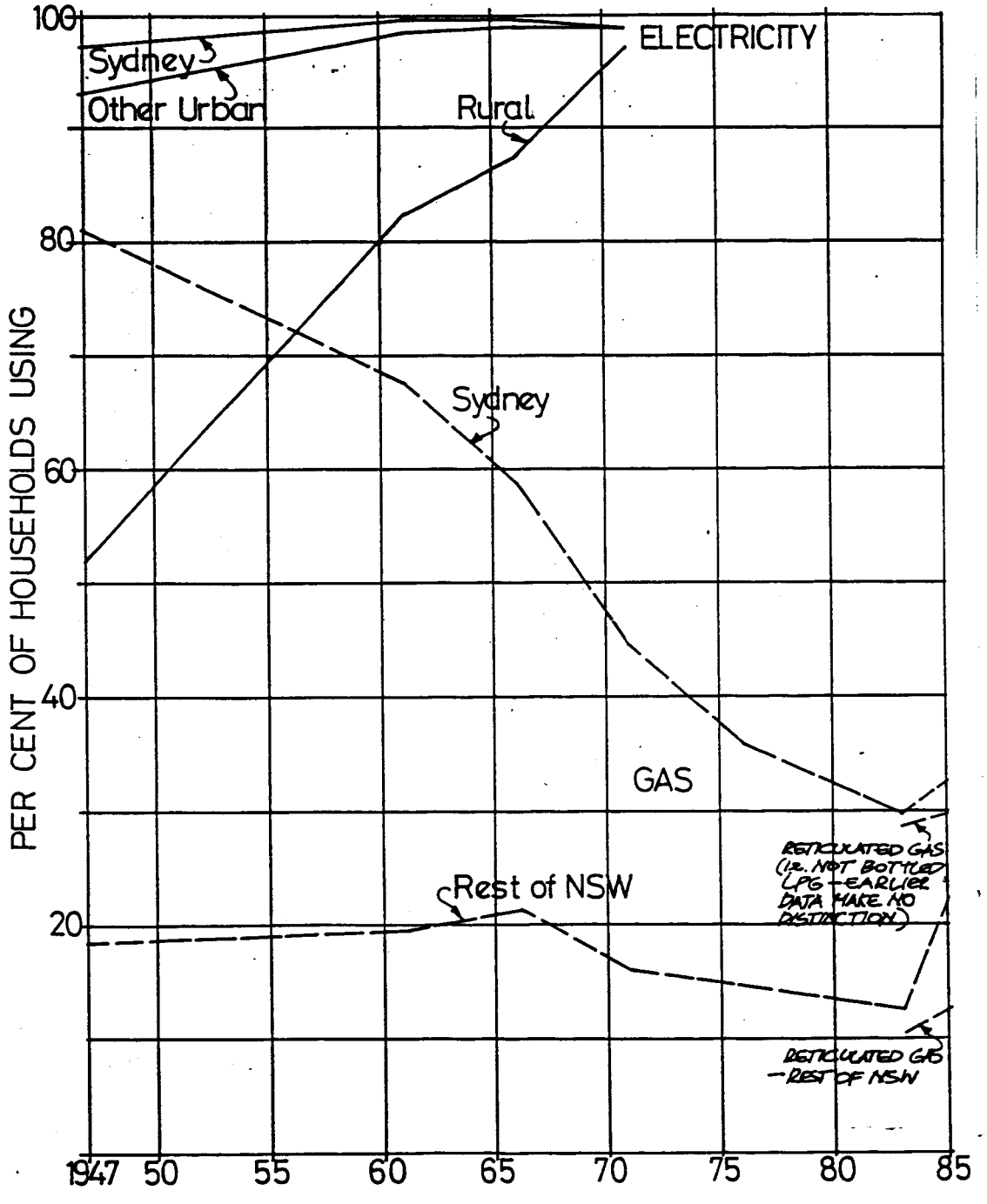


FIGURE 6.8
AVERAGE ELECTRICITY AND GAS CONSUMPTION PER HOUSEHOLD AND PER CAPITA
SYDNEY AND NSW, 1950-86

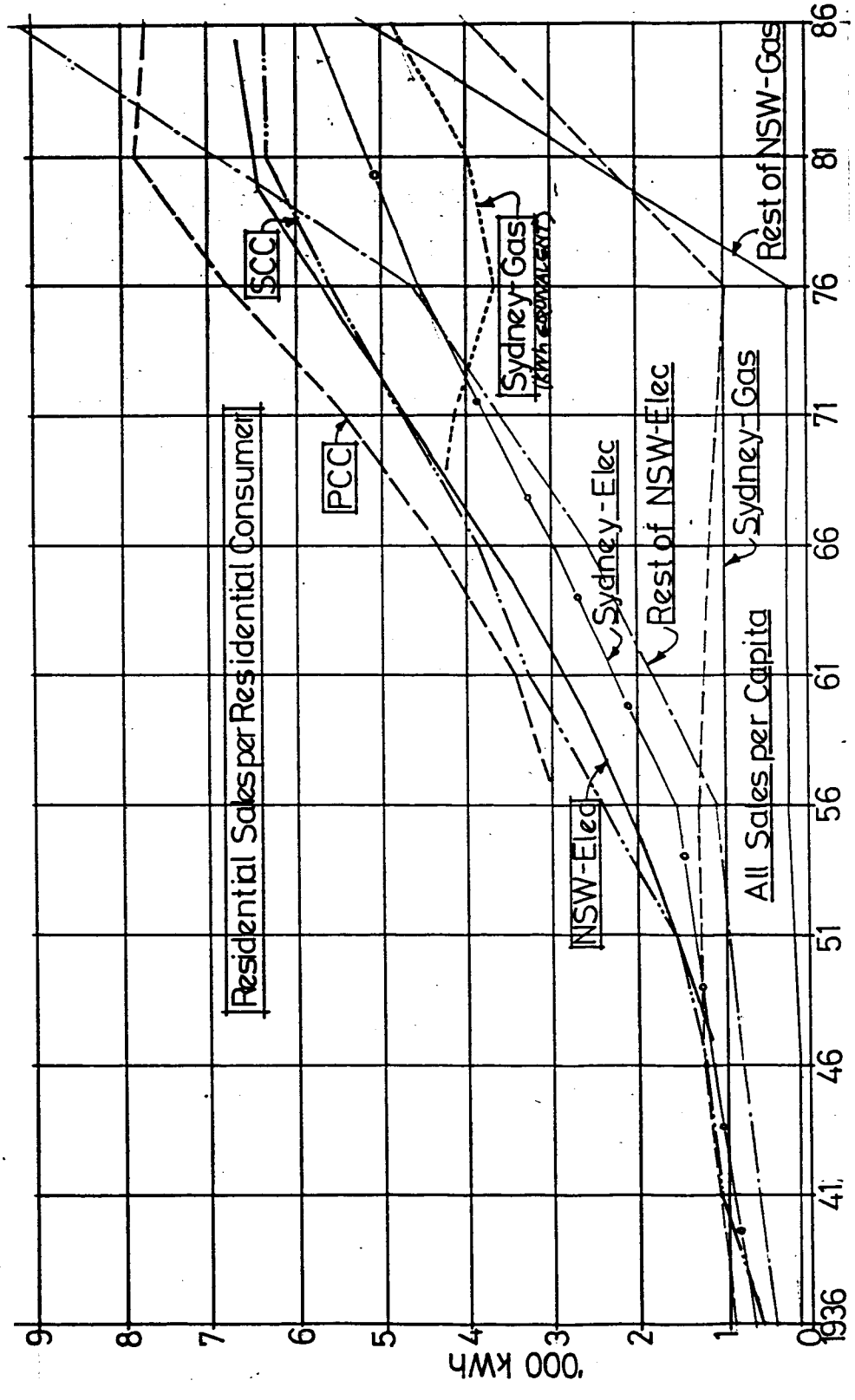


FIGURE 6.9
PENETRATION RATES, ELECTRIC-ONLY APPLIANCES
NSW 1947-85

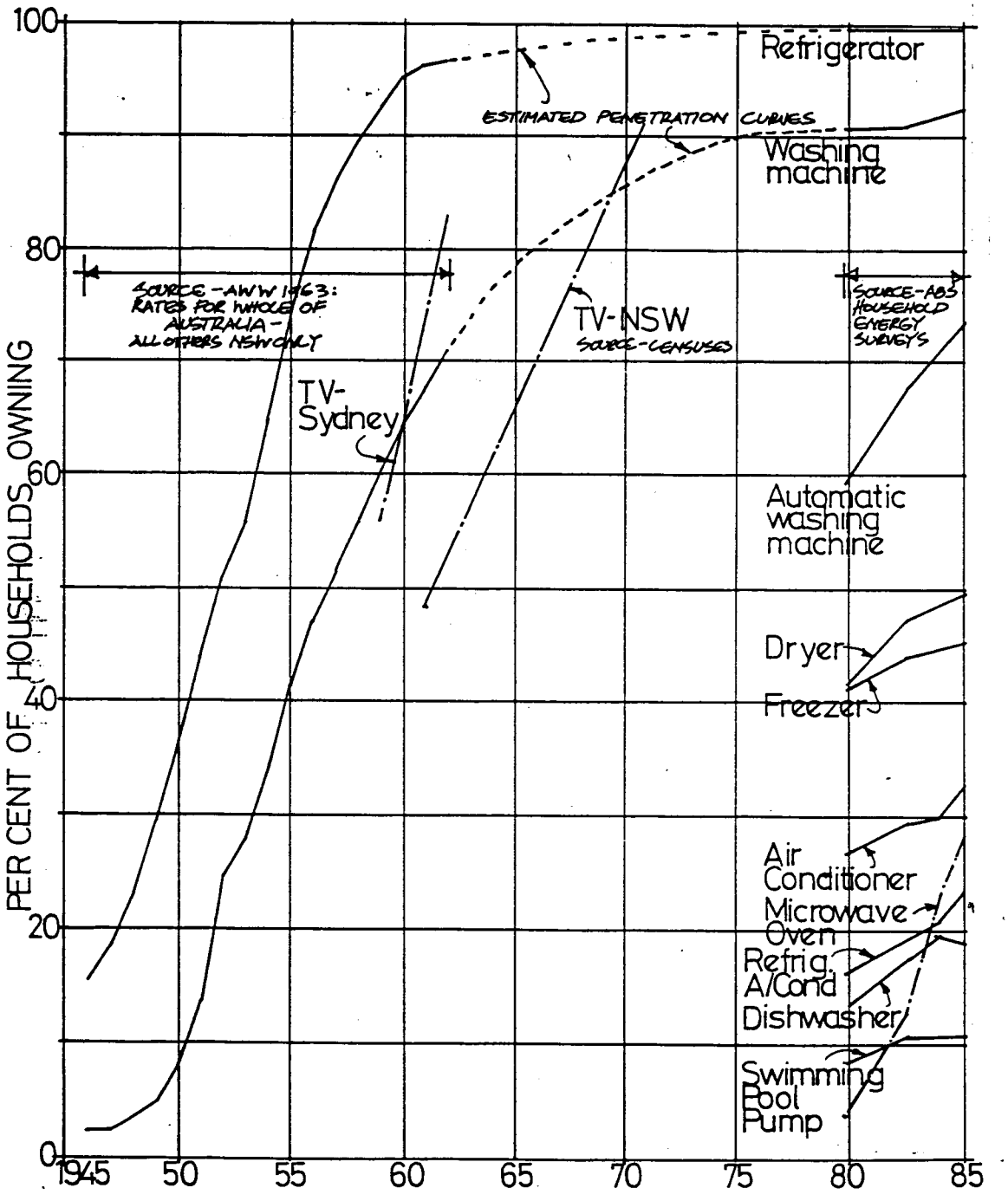


FIGURE 6.10
PENETRATION RATES, SUBSTITUTABLE APPLIANCES
SYDNEY AND NSW 1947-85

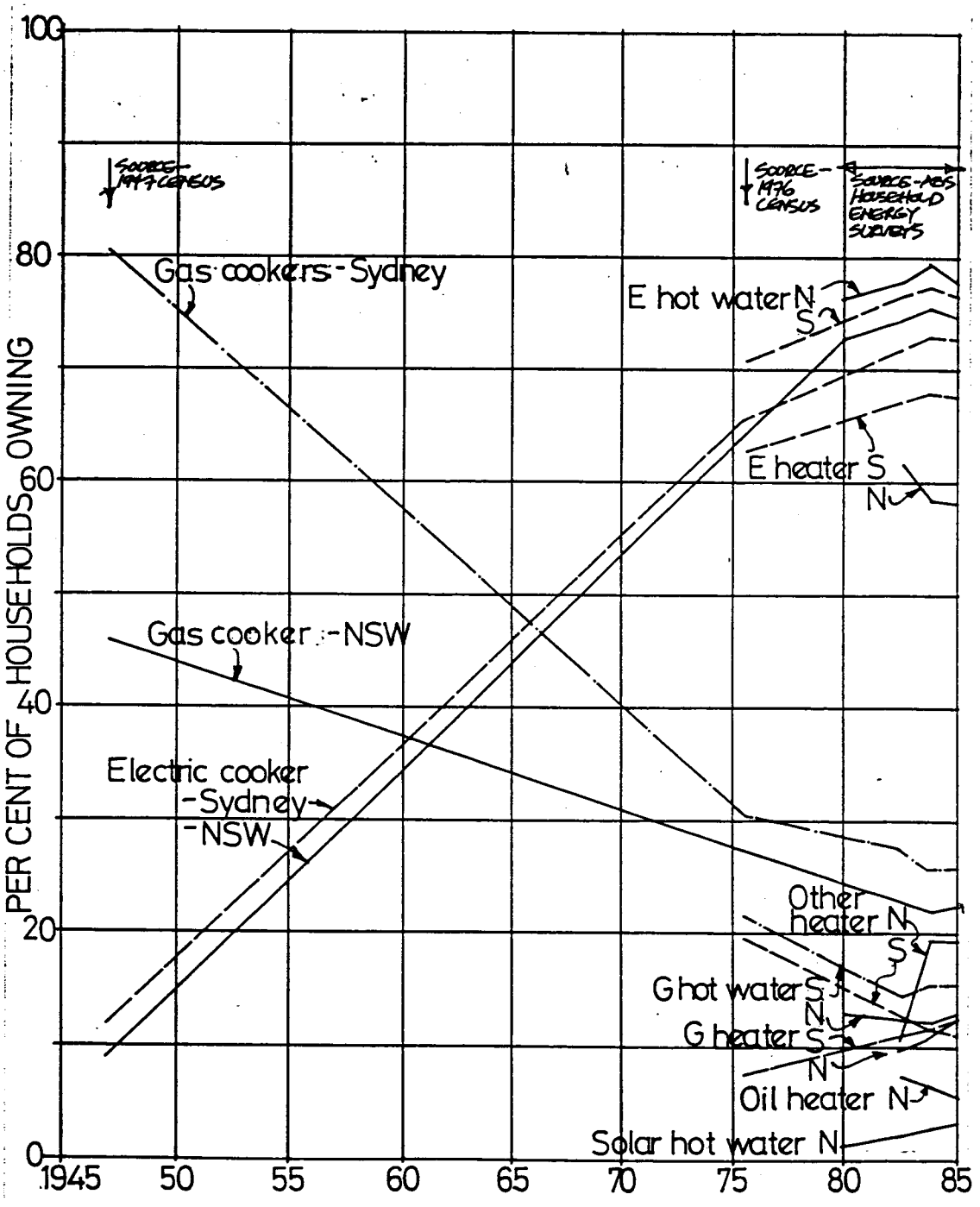


FIGURE 6.11
THREE YEAR MOVING AVERAGE RATES OF INCREASE IN ELECTRICITY CONSUMPTION PER RESIDENTIAL CONSUMER SCC AND PCC 1950-86

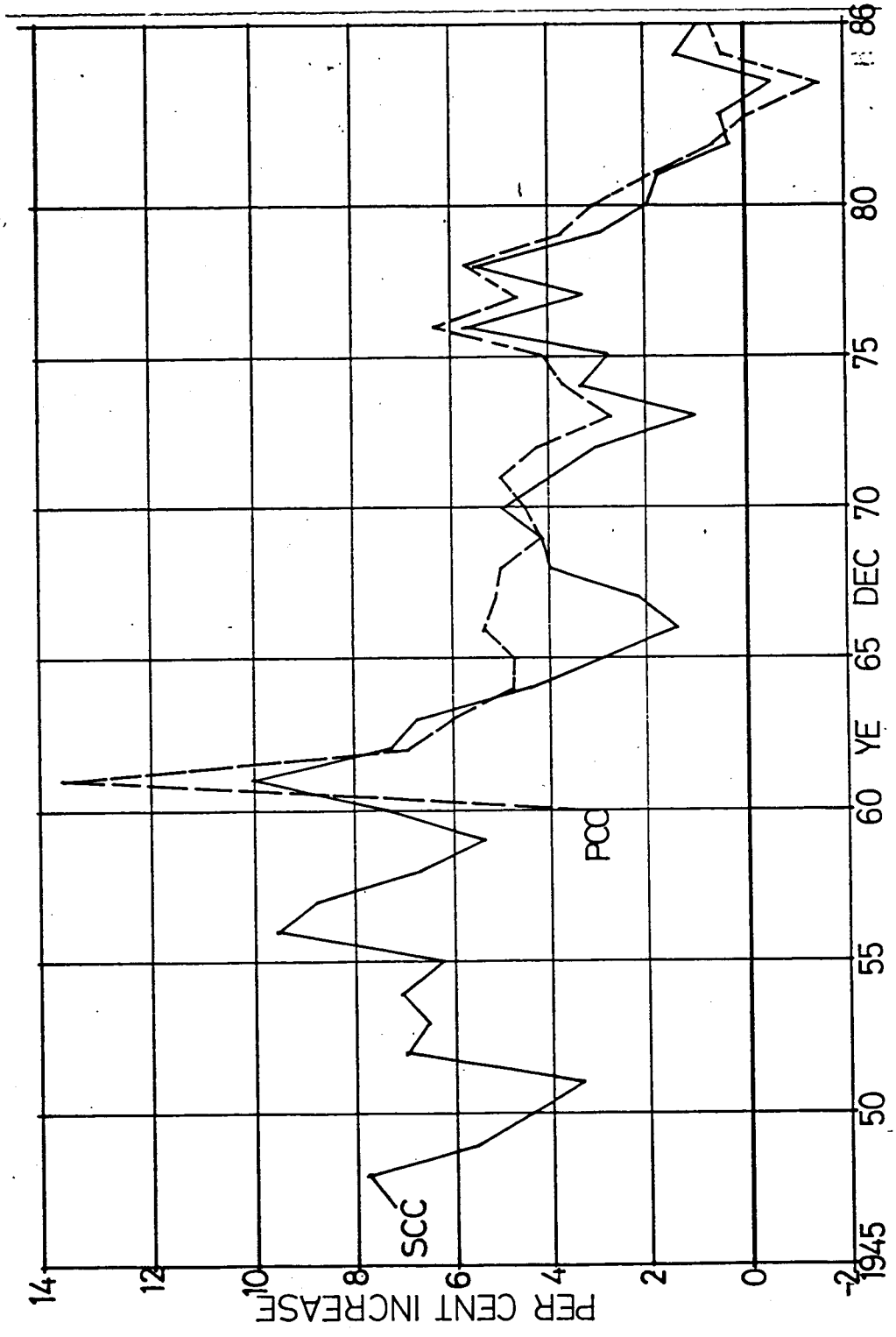


TABLE 6.1
PENETRATION RATES OF MAJOR HOUSEHOLD APPLIANCES
SYDNEY AND NSW
1980 - 86

(% of households owning) APPLIANCE	1980 NSW	1983 SYD	1983 REST NSW	1983 TOT NSW	1984 SYD	1984 REST NSW	1984 TOT NSW	85/6 SYD	85/6 REST NSW	86/6 TOT NSW
REFRIGERATOR	99.0	99.5	99.5	99.5				99.5	99.1	99.4
1 Door	43.2	47.2	44.6					38.1	39.8	38.7
2 Door	43.2	39.0	41.7					48.5	44.0	46.9
Combination(a)	13.0	13.2	13.1					12.8	15.2	13.6
FREEZER	41.1			44.0				35.2	63.1	45.2
Top opening				30.5				21.5	46.8	30.6
Front opening				13.4				13.6	16.2	14.6
MICROWAVE OVEN	4.2			12.9	23.0	22.8	22.9	31.7	36.5	33.4
DISHWASHER	13.5			17.4	21.9	15.2	19.4	20.0	16.2	18.7
WASHING MACHINE	90.7	89.0	94.4	90.9				91.0	94.8	92.3
Automatic	59.3	72.3	59.7	67.8				76.8	66.7	73.2
Other	31.3	16.6	34.6	23.0				14.2	28.0	19.1
CLOTHES DRYER	41.8	48.5	45.0	47.2	52.4	49.5	51.3	50.2	49.2	49.9
ELECTRIC HOTPLATE	57.1	71.9	78.4	74.2	73.0d	79.8	75.6	72.9	77.9	74.7
GAS BURNER	23.3	27.4	16.0	22.8	25.9	15.4	22.0	25.9	16.5	22.5
MAIN HEATING(b)										
Electric				61.5	67.9e	42.7	58.5	67.6	41.1	58.1
Gas				9.8	11.7	9.8	11.0	12.3	13.4	12.7
Oil				7.2	4.5	10.1	6.5	4.1	7.9	5.5
Solid Fuel/Other				10.9	11.5	32.9	19.4	11.0	33.8	19.2
WATER HEATING										
Electric(c)	76.2	76.6	80.1	77.9	77.5	82.1	79.2	76.4	79.9	77.6
continuous					34.5f	25.9	31.3			
off-peak					39.2	53.4	44.5	26.9	15.1	22.6
Solar (elec boost)	1.2	1.8	3.1	2.3	2.6	3.1	2.8	2.7	4.2	3.2
Gas	13.0	14.5	7.8	12.2	15.5	6.4	12.1	15.7	8.5	13.1
Solid Fuel/Other	2.0	0.0	5.1	2.5	0.1	4.3	1.7	0.0	4.7	1.7
AIR CONDITIONING	26.9			29.3	27.2	34.3	29.9	29.2	39.5	32.8
Evaporative	10.6			8.4						9.5
Refrigerated	16.3			20.9						23.3
POOL FILTER	8.4			11.2	13.1	6.6	10.7	12.9	6.7	10.7

(Source: ABS 1981,1984a,1985b,1987a)
Note that each household may own more than one of each appliance.
a. Own at least one 1 door and one 2 door.
b. Most households also had electric secondary heating
c. Includes cases where not known whether continuous or off-peak.
Sydney disaggregated into east and west regions by Bartels (1988):

	SYDNEY EAST	SYDNEY WEST
d. Electric cooking	70.0	83.1
e. Electric main heating	69.1	69.1
f. Continuous electric water heating	35.1	49.8

TABLE 6.2
ENERGY DEMAND BY CONSUMER CLASS
NSW
1968 - 86

YEAR ENDED JUNE	ENERGY DELIVERED (PJ) RESID	COMM		INDUST	TRANSPORT	TOTAL
1978	58	na	406	na	319	783
1979	65	35		382	275	757
1980	61	40		394	271	766
1981	60	39		408	284	791
1982	72	40		389	286	787
1983(a)	70	33		305	275	683
1984	71	38		321	290	720
1985	74	41		356	294	765
1986	74	40		337	299	750
1987	76	41		343	298	758

(Source: EnANSW, DOE annual reports)
a. Year of electricity rationing and economic recession

TABLE 6.3
PERCENTAGE OF DWELLINGS CONNECTED TO ELECTRICITY
SYDNEY AND NSW
1947 - 71

CENSUS YEAR	METROPOLITAN	OTHER URBAN	RURAL	TOTAL NSW
1947	97.2	66.1(a)		81.6
1961	99.7	98.5	83.8	97.2
1966	99.8	99.3	93.7	98.9
1971	99.9	99.8	98.0	99.7

(Source: Commonwealth censuses; electricity connection was asked in 1954 but state disaggregations were not published).
a. 51.5% of dwellings in Shires and the unincorporated area of NSW had electricity.

TABLE 6.4
SALES OF ELECTRICITY BY CONSUMER CLASS
SYDNEY
1956

(GWh)	RESIDENT	COMMERC &INSTIT	INDUST	STREET LIGHT	TRACT	TOTAL	%
SCC RETAIL	836.0	225.0	828.0	26.0		1915.0	62.2
SCC OTHER(a)	59.0	15.8	58.4	1.8		135.0	4.3
SGCC	111.0	15.0	20.0	3.0	0.0	150.0	4.8
MCC+BWCC	94.7	12.7	17.0	2.5		128.0	4.1
PCC AREA(b)	118.6	11.0	38.6	1.8		170.0	5.5
ELPSC AREA(c)	61.1	16.4	60.6	1.9		140.0	4.5
ECNSW					440.0	440.0	14.2
TOTAL	1280.4	296.1	1022.6	37.0	440.0	3078.0	
%	41.5	9.6	33.2	1.2	14.2	100.0	

(Sources: County Council and EANSW annual reports)
a. Municipalities formerly supplied in bulk by the SCC, though all bulk electricity noe supplied by the ECNSW
b. PCC constituted 12 October 1956, commenced operation 1 January 1957.
c. Managed by ECNSW until handover to SCC, 1 January 1958.

TABLE 6.5
ELECTRICITY CONSUMPTION BY SECTOR AND PER CAPITA
SYDNEY AND REST OF NSW
1936 - 86

SYDNEY

YEAR TO DEC	GWh USED (% of Total) RES	COMM	IND	LIGHT	TRACT	TOTAL	POP ('000)	kWh/cap RES	TOT
1936	164	86	297	23	293	863	1275	128	677
	19.0	10.0	34.4	2.6	34.0				
1946	498	139	597	30	381	1645	1458	341	1128
	30.2	8.4	36.3	1.8	23.1				
1956	1280	296	1023	37	440	3078	1932	662	1520
	41.6	9.6	33.2	1.2	14.3				
1966	3103	1149	2637	67	398	7338	2447	1268	2998
	42.3	15.7	35.9	0.9	5.4				
1976	6163	2222	4808	113	420	13728	3022	2039	4542
	44.9	16.2	35.0	0.8	3.1				
1986	8533	3324	7050	140	664	19711	3431	2487	5741
	43.3	16.9	35.8	0.7	3.4				

REST OF NSW

YEAR TO DEC	GWh USED (% of Total) RES	COMM	IND	LIGHT	TRACT	TOTAL	POP ('000)	kWh/cap RES	TOT
1936	na	na	na	na	na	602	1382	na	435
1946	na	na	na	na	na	1187	1487	na	798
1956	648	329	731	21	0	1727	1593	406	1084
	37.5	19.1	42.3	1.2					
1966	1573	569	2361	40	0	4559	1759	894	2591
	34.5	12.5	51.8	0.9					
1976	3207	1212	4493	46	0	8956	1925	1665	4652
	35.8	13.5	50.2	0.5					
1986	5468	2370	11319	55	0	19212	2113	2587	9092
	28.5	12.3	58.9	0.3					

TOTAL NSW

YEAR TO DEC	GWh USED (% of Total) RES	COMM	IND	LIGHT	TRACT	TOTAL	POP ('000)	kWh/cap RES	TOT
1936	na	na	na	na	na	1465	2657	na	551
1946	na	na	na	na	na	2832	2945	na	961
1956	1928	625	1754	58	440	4805	3525	546	1363
	40.1	13.0	36.5	1.2	9.2				
1966	4676	1718	4998	107	398	11897	4206	1111	2828
	39.3	14.4	42.0	0.9	3.3				
1976	9370	3434	9301	159	420	22684	4947	1894	4585
	41.3	15.1	41.0	0.7	1.9				
1986	14001	5694	18369	195	664	38923	5544	2525	7020
	36.0	14.6	47.2	0.5	1.7				

(Sources: EANSW annual reports, EnANSW/EFS, NSWYBs, ABS 1987c).

TABLE 6.6
GAS-CONNECTION RATES
SYDNEY AND REST OF NSW
1947 - 86

(% of households using gas)

YEAR	SYDNEY			REST OF NSW			NSW TOTAL		
	RETIC(a)	LPG(b)	TOT	RETIC	LPG	TOT	RETIC	LPG	TOT
1947(c)			80.9			18.5			50.9
1961(c)			67.5			19.6			47.1
1966(c)			58.7			21.2			43.7
1971(c)			44.6			16.0			36.1
1976(c)			35.9(d)						
1983(e)	28.8	0.9	29.8	10.2	7.4	17.6	22.2	3.3	25.5
1984(f)			31.9			23.8			28.9
1986(e)	29.6	3.2	32.8	12.4	15.0	27.4	23.4	7.4	30.9

(Sources listed below)

a. Reticulated gas connection (if separately enumerated)
b. Bottled LPG gas users (if separately enumerated); small number of households where type of gas not known are distributed in the proportion of known retic/LPG users.
c. Census.
d. Only cooking fuel reported; assumed that ratio of gas-connected households known to be cooking with gas was the same as in 1983, ie 35.9%.
e. Household Energy Surveys (ABS 1984a, 1987a).

TABLE 6.7
GAS CONSUMPTION BY CONSUMER CLASS AND PER CAPITA
SYDNEY AND REST OF NSW
1936 - 86

SYDNEY

YE DEC	TJ CONSUMED (% of Total) RESID	COMM	INDUS	TOTAL	POP ('000)	MJ/CONS RESID	MJ/CAP TOTAL	kWh/CAP EQUIV
1936	na	na	na	4105	1275	na	3219	894
1946	na	na	na	6570	1458	na	4506	1251
1956	na	na	na	9003	1932	na	4659	1294
1966	na	na	na	9975	2447	na	4076	1132
1976	4845	2278	3156	10279	3022	13465	3520	977
	47.1	22.2	30.7					
1986	6554	5976	35684	48214	3431	17332	14052	3903
	13.6	12.4	74.0					

REST OF NSW

YE DEC	TJ CONSUMED (% of Total) RESID	COMM	INDUS	TOTAL	POP ('000)	MJ/CONS RESID	MJ/CAP TOTAL	kWh/CAP EQUIV
1936	na	na	na	971	1382	na	702	195
1946	na	na	na	845	1487	na	568	157
1956	na	na	na	1344	1583	na	843	234
1966	na	na	na	1760	1759	na	1000	277
1976	984	393	458	1408	1925	na	731	203
	69.9	27.9	32.5					
1986	826	685	36669	38179	2113	na	18068	5019
	2.2	1.8	96.0					

NSW TOTAL

YE DEC	TJ CONSUMED (% of Total) RESID	COMM	INDUS	TOTAL	POP ('000)	MJ/CONS RESID	MJ/CAP TOTAL	kWh/CAP EQUIV
1936	na	na	na	5076	2657	na	1910	530
1946	na	na	na	7415	2945	na	2517	699
1956	na	na	na	10347	3525	na	2935	815
1966	na	na	na	11735	4206	na	2790	775
1976	5829	2671	3614	12047	4947	na	2435	676
	48.4	22.2	30.0					
1986	7380	6661	72353	86393	5544	na	15583	4328
	8.5	7.7	83.7					

(Sources: EnANSW 1986f, NSWYBs, unpublished DOE data, ABS 1987c)