THE ELECTRIFICATION OF THE SYDNEY ENERGY SYSTEM

1881 - 1986

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SYNOPSIS

All technological systems require energy. The concentration of human population and economic activity in cities has relied on the development of urban energy systems, which bring energy to the city and distribute it to points of end use within it. Over the past century, electro-technology has come to dominate urban energy systems throughout the developed world. This process has been imperfectly documented and analysed, because the relationships between electricity and the energy service markets and local political frameworks within which each instance of urban electrification has taken place have generally been neglected.

This thesis presents electrification as an historical change in the urban energy system. It identifies the most important influences on urban energy demand and on the organisation of energy supply, and traces their interaction before the introduction of electro-technology, then from the beginning of electrification in the 1880s to its completion in the 1980s.

Urban electrification is best observed and understood by following its course within a single city. Sydney is well suited to such an analysis, since it is highly electrified and encompasses within its two hundred year history all the major energy technologies of the past millenium. During the first century of its existence, it developed distinctively urban markets for transportation, street lighting, commercial, industrial and residential energy services. These were revolutionised by steam and by gas, the first specifically urban energy technology.

The thesis examines how each energy form in turn gained a foothold in the Sydney energy system, diffused through it and spread beyond it to the rest of the state of New South Wales. It analyses long term trends in each of the various urban energy markets, and draws parallels in the pattern of succession of supply technologies. It demonstrates that these patterns were repeated with the introduction of electricity and, in the 1970s, by its emerging successors.

During Sydney's second century each of its energy markets was electrified in turn, while its separate electricity supply systems coalesced into a unified grid serving the entire metropolis, and extending later into the rest of the state. Largely as a result of political circumstances in the 1880s, when electric lighting was first introduced, the municipal electricity supply organisations acquired considerable influence and autonomy, and resisted the later attempts of state governments to co-ordinate their development.

The electrification of the Sydney and NSW energy systems had largely run its course by the late 1970s. Electricity supply had exhausted the economies of scale and technological development which had given it an advantage over other fuels. It had saturated the urban energy markets, and was facing new competitors in the form of natural gas and more efficient utilisation technologies. These changes in the energy system exacerbated the inherent problems in the organisation of electricity supply, which was predicated on unlimited growth and slow to adapt to the end of electrification.

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My two academic supervisors at Macquarie University helped me focus my interest in the energy system on the key technology of electricity, and guided me into the broader contexts of Australian urban, political, and economic history. Bob Fagan, of the School of Earth Sciences, was always helpful in precisely the right ways at the right times. I am grateful also to my main supervisor, Peter Spearitt of the School of History, Philosophy and Politics, for his expertise, the light and sure touch of his supervision, his patience, his unfailing good humour and much else besides.

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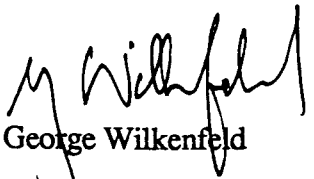
This thesis is my own work, and has not been submitted for a higher degree at any other university or institution.



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MAPS, DIAGRAMS AND TABLES

MAPS AND DIAGRAMS

TABLES

ABBREVIATIONS, UNITS AND DATES

ABBREVIATIONS

(An additional list of abbreviations used only in references and in the Bibliography precedes the Bibliography)

AAC	Australian Agricultural Company
ABS	Australian Bureau of Statistics
AC	Alternating current
ACT	Australian Capital Territory
AET	*Australasian Electrical Times*
AGL	Australian Gas Light Company
AGL/DM	AGL Directors' Minutes
AGLS	AGL Sydney
ALP	Australian Labor Party
ASIC	Australian Standard Industrial Classification
AYB	*Yearbook of Australia*
BRE	Bureau of Resource Economics
BST	Bulk suply tariff
BWCC	Brisbane Water County Council
CGE	Commissioner for Gas and Electricity
CWG	Carburetted water gas
DC	Direct current
DT	*Daily Telegraph*
EAC	Electricity Advisory Committee
EANSW	Electricity Authority of NSW
ECELB	Electrical Contractors' and Electricians' Licensing Board
ECNSW	Electricity Commission of NSW
EFS	*Engineering and Financial Statistics* (of electricity supply authorities in NSW)
ELPSC	Electric Light and Power Supply Corporation (Balmain)
EnANSW	Energy Authority of NSW
ESAA	Electricity Supply Association of Australia
ETSA	Electricity Trust of South Australia
ETU	Electrical Trades Union

GFCV	Gas and Fuel Corporation of Victoria
GPO	General Post Office
HEC	Hydro-Electric Commission of Tasmania
HRA	*Historic Records of Australia*
HV	High voltage
JCB	Joint Coal Board
LA	Legislative Assembly
LC	Legislative Council
LCP	Liberal - Country Party
LGA	Local Government Area
LGEA	Local Government Electricity Association
LNP	Liberal-National Party
LPG	Liquefied petroleum gas
LV	Low voltage
MCC	Mackellar County Council
m	million
MGC	Manly Gas Company
MLA	Member of the Legislative Assembly
MLC	Member of the Legislative Council
NG	Natural gas
NSG	North Shore Gas Company
NSW	New South Wales
NSWPD	*NSW Parliamentary Debates*
NSWPP	*NSW Parliamentary Papers* (ie presented to parliament)
NSWYB	*Yearbook of NSW*
PCC	Prospect County Council
PWD	Public Works Department
QEC	Queensland Electricity Commission
RC	*Returns of the colony* (statistical)
RCCI	Royal Commission into the Coal Industry
RD	Railways Department

RPT	Rendel, Palmer and Tritton (authors of special report)
SA	South Australia
SAGASCO	South Australian Gas Company
SATS	Sydney Area Travel Survey
SCC	Sydney County Council
SECV	State Electricity Commission of Victoria
SECWA	State Energy Commission of Western Australia
SES	Southern Electricity Supply
SG	*Sydney Gazette*
SGCC	St George County Council
SMC	Sydney Municipal Council
SMC/CC	Sydney City Commissioners
SMC/CS	SMC City Surveyor
SMC/ELC	SMC Electric Lighting Committee
SMC/ELD	SMC Electric Lighting Department
SMC/FC	SMC Finance Committee
SMC/LC	SMC Lighting Committee
SMC/TC	SMC Town Clerk
SMH	*Sydney Morning Herald*
SMHEA	Snowy Mountains Hydro-Electricity Authority
SRA	State Rail Authority of NSW
SSD	Sydney Statistical Division (as defined by ABS)
TED	*Tait's Electrical Directory*
TV	Television
VCR	Video cassette recorder
V&P	*Votes and Proceedings* (of the NSW Parliament)
WA	Western Australia
YE	Year ended

UNITS

BTU	British Thermal Units
C	degree Centigrade

cp	candlepower
cu ft	cubic feet
d	penny
GJ	gigajoule (1,000 MJ)
GWh	gigawatt-hour (1,000,000 kWh)
hp	horsepower
Hz	Hertz (cycles per second)
km k	ilometre
kV	kilovolt (1,000 V)
kW	kilowatt
kWh	kilowatt-hour (= 3.6 MJ)
L	pound (unit of Australian currency prior to 14 February 1966; = 20s or $2)
lb	pound (unit of weight)
MJ	megajoule
MW	megawatt (1,000 kW)
MWh	megawatt-hour (1,000 kWh)
PJ	petajoule (1,000,000,000 MJ)
s	shilling (=12d)
sq km	square kilometre
TJ	terajoule (1,000,000 MJ)
V	volt
W	watt

DATES AND YEARS

Abbreviations for names of organisations followed by a year and a page number refer to the annual report of that organisation: eg (SCC 1983,68). Where the abbreviation is followed by a date, the reference is to the minutes of meetings on those dates: eg (SMC 22.1.1889).Where followed by a year and letter, the reference is to a publication of that organisation, listed in the bibliography: eg (EnANSW 1987c,21).

Financial year periods (indicated as, eg, 1976/7 or 1979/80) are defined as the beginning of July to the end of the following June, unless otherwise indicated in the text. Periods of elapsed time are indicated with a dash, eg 1890-95.

The contracted form is sometimes used for 20th century dates: eg 10.7.82 denotes 10 July 1982. For earlier dates the year is given in full: eg 25.3.1865.