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.
ACKNOWLEDGEMENTS

Many people and organisations have been involved in one way or another over the six and a half years that I have been working on this thesis, and there are many to thank. The thesis could not have been completed without concentrated periods of full time work. In this I was fortunate to have the support of my employer for the last seven years, the Department of Energy (formerly the Energy Authority of New South Wales). Under the leadership of the General Manager of the Authority, John Dembecki, and then the Director of the Department, John Webb, the organisation provided me with the necessary time and financial assistance. I must also thank my managers, especially Graeme Couch, who not only took my occasional long absences with good grace but actively encouraged me to get the project finished.

Additional financial support was provided by the Faculty of Architecture at the University of Adelaide, in the form of a Clive Boyce Fellowship which enabled me to buy a personal computer, and by a Commonwealth Postgraduate Research Award. The Centre for Environmental and Urban Studies at Macquarie University, under its Director Alistair Gilmour, was of course my academic home base and also provided me with valuable logistic support.

I spoke to many people and worked in many libraries during the course of research. Bob Irving and Emery Balint at the University of New South Wales and Roger Sharp at the Museum of Applied Arts and Sciences were particularly helpful. I am also grateful for the unfailing assistance of the librarians at the incomparable Mitchell Library, the Energy Authority library and the Sydney City Council archives.

I received helpful comments on individual chapter drafts from John Dembecki, John Webb, Graeme Couch and John Brain. Many of my colleagues at the Department also contributed (unwittingly, I should hasten to add) to the development of my main themes. It should come as no surprise that these are generally consistent with the aims, approaches and corporate culture which evolved between the establishment of the Energy Authority by the Wran government in 1976 and the abolition of the Department of Energy by the Greiner government in October 1988. If all human endeavour is marked by two steps forward and one step back, then the Department represented two firm steps forward for the NSW energy system.

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 Spearritt 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.

My greatest debt is to my wife Sandy, who gave her time unstintingly to help me with research, commented on my drafts, listened and reacted to my ideas, and above all put up with all this for what often seemed like an interminable period.

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

George Wilkenfeld

Sydney
February 1989
Synopsis

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ABBREVIATIONS, UNITS AND DATES

ABBREVIATIONS

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

<table>
<thead>
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<th>Symbol</th>
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<tbody>
<tr>
<td>cp</td>
<td>candlepower</td>
</tr>
<tr>
<td>cu ft</td>
<td>cubic feet</td>
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<tr>
<td>d</td>
<td>penny</td>
</tr>
<tr>
<td>GJ</td>
<td>gigajoule (1,000 MJ)</td>
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<tr>
<td>GWh</td>
<td>gigawatt-hour (1,000,000 kWh)</td>
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<tr>
<td>hp</td>
<td>horsepower</td>
</tr>
<tr>
<td>Hz</td>
<td>Hertz (cycles per second)</td>
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<tr>
<td>km</td>
<td>kilometre</td>
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<tr>
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<td>kilovolt (1,000 V)</td>
</tr>
<tr>
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<td>kilowatt</td>
</tr>
<tr>
<td>kWh</td>
<td>kilowatt-hour (= 3.6 MJ)</td>
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<tr>
<td>L</td>
<td>pound (unit of Australian currency prior to 14 February 1966; = 20s or $2)</td>
</tr>
<tr>
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<td>pound (unit of weight)</td>
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<td>megajoule</td>
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<tr>
<td>MWh</td>
<td>megawatt-hour (1,000 kWh)</td>
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<tr>
<td>PJ</td>
<td>petajoule (1,000,000,000 MJ)</td>
</tr>
<tr>
<td>s</td>
<td>shilling (=12d)</td>
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<tr>
<td>sq km</td>
<td>square kilometre</td>
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<tr>
<td>TJ</td>
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<tr>
<td>V</td>
<td>volt</td>
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<tr>
<td>W</td>
<td>watt</td>
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### 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.