SWITCHING ON:

DARWIN'S HISTORY OF ELECTRICITY SUPPLY

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The thesis is dedicated to those people who have played a role in Darwin's history of electricity supply and marks the beginning of Darwin's feeble power scheme to its quantum leap into solar and tidal power.

Bev Phelts
Darwin, October 1997.
ABSTRACT

As recent as a hundred years ago, electricity was starting to be incorporated into industry and into the home. It is now used extensively and has become part of our everyday lives. Nowadays, people take electricity for granted when they turn on a light, the airconditioner or their computer.

Just how much society is dependent upon electricity is not realised until the power goes out. Nor would they be aware of how electricity is generated, transmitted, and carried to their homes or businesses. Before Darwin acquired this miracle, electrical inventions were amazing people around the world and in Australia.

Darwin was the last capital city in Australia to receive a power supply in 1912 but it would not be until after the Second World War when many residents could enjoy the benefits of lighting, fans and refrigeration.

This thesis will argue that a reliable power supply for Darwin did not eventuate until the advent of the Second World War due to the Commonwealth's indifference. No purposeful commitment was made to Darwin either in development or funding, and this point is reflected throughout Darwin's history of electricity supply. Amends to improve the electricity supply and other important utilities only eventuated because of the need to accommodate thousands of defence personnel during the Second World War.
Postwar Darwin was left again to struggle on with the power plant that had been overworked and poorly maintained during the war years. With the population increasing during the 1950s, it became necessary to build Stokes Hill Power Station. For the first time, an electricity scheme for Darwin was carefully planned and funded.

Living standards improved with Stokes Hill Power Station because a larger power supply now allowed the possibility of airconditioning in businesses and homes. Needless to say, Stokes Hill Power Station became renowned for its many breakdowns and consequent blackouts and power supply was not to become more reliable until the opening of Channel Island Power Station in 1987.
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ABBREVIATIONS

AA
ACT
CIPS
CRS
DRC
ESU
ETSA
NSW
NT
NTAS
NTEC
NTRS
PAWA
RAAF
RAN
SA
SEQEB
SHPS
TREB
QLD

Measurements

Electricity Units
1 horse power = 1.3 kilowatt
1000 kilowatts = 1 megawatt

Imperial Currency

d = pence
/- = shilling
INTRODUCTION

Electricity supply began in Darwin in 1912, relatively late in comparison to other Australian capitals and comparable regional centres. Even then, there were serious problems for many decades in obtaining an adequate and reliable supply. This thesis traces the development of electricity supply in Darwin from its inception in 1912 to the opening of the Channel Island Power Station in 1987, when a reliable supply was finally achieved 75 years later. While taking a narrative approach, the central argument is that the process of acquiring an adequate supply of electricity for Darwin was retarded principally as a result of neglect and indifference on the part of the Commonwealth Government.

The international history of electricity began with the invention of the filament lamp in 1878 when Thomas Edison and Joseph Swan simultaneously produced such lamps in the United States and Britain. The lamps provided light when electricity was passed via a conductor which became hot and was then heated to a specific temperature to produce a glow. Although arc lights had been used in lighthouses and for street lighting long before, the filament lamp provided a better quality light for indoor use. Edison's and Swan's method was quickly adopted in other parts of the world, including Australia. The early systems of electrical supply produced power mainly for lighting.

Around the world, many private entrepreneurs and governments grasped the opportunity to commercially develop and produce electricity for public supply. Arthur Wright provided the first
public electric light system in Brighton, England in 1882, and in the same year in New York, the United States' first power station began operation. Following closely behind were the Australian capital cities of Perth and Brisbane in 1888, Melbourne in 1894, Hobart and Adelaide in 1898, and Sydney in 1904. The last capital city of all, was Darwin in 1912. By the end of the nineteenth century, comparative provincial towns such as Rockhampton and Charters Towers had already acquired electricity.

The full impact of how the introduction of electricity would change the lifestyles of "Darwinians" was obviously not comprehendible in 1912. When Ernest Felix Holmes commissioned his new plant at his cold storage and ice making store in June 1912, what should have been headline news only rated a small article behind the wedding announcements and advertisements in the Northern Territory Times and Gazette. In stark contrast to this was the gathering of hundreds of people in Adelaide in 1909 to watch another miracle made possible by electricity, the operation of an electric tram.

Similarly, there is no mention of the occasion in the Administrator's Report but the topic of electricity was regularly raised in South Australian political debates well before the technology was used in Darwin. As early as 1882, John Stirling proclaimed "the vast strides which had been made in the use of electricity for lighting and other purposes within recent times...in a very short time it might be accessible to all". Although Darwin residents had already experienced the advantages of the electromagnetic telegraph and were aware of the increasing use of electricity in other capital
cities, it is surprising then, that the event did not receive the public interest that it deserved.

Despite Darwin being the last capital city to obtain electricity, it still managed to keep abreast of the latest power technology. This was because Darwin, along with the rest of Australia had to import the specialised plant and equipment from countries such as Britain, Germany, Switzerland, United States, Canada, Japan and Sweden. Not until the past twenty years, has Australia begun to manufacture its own plant and equipment. The type of power system and its fuel have always been dictated by the location, population size and regional circumstances and economics. For instance, because of accessibility to large volumes of water, hydroelectric schemes are in operation in the Snowy Mountains, the Gordon River in Tasmania and at Dartmouth in North-Eastern Victoria. Likewise, the Yallourn Power Station in Victoria utilises coal from the nearby Latrobe Valley coal fields. Depending upon the circumstances, other community power stations may operate on oil, diesel, natural gas, wind power or solar. In Darwin's case, its power stations remained confined to diesel and oil fuels until it became possible in the 1980s to tap local reserves of natural gas.

As Christine Doran rightly points out in her book Partner in Progress: A History of Electricity Supply in North Queensland from 1897 to 1987, energy generation is a unique industry in that it cannot be stored to use at a later date. From the moment a power using appliance is turned on, electricity must be generated and transmitted to operate it. In the formative years, this was a difficult task to achieve because the small power plants had a
limited generating capacity. Satisfying the community's needs for energy is a continuous process and requires a long term business commitment to fund the necessary plant and equipment. Additional generating plant and its associated equipment must always be installed ahead of time to meet the demands of the present and of the future. As demand for electricity increases, larger generating plant can be installed which improves the economics of electricity supply and in turn, becomes more affordable to the population.

Early Australian electrical utilities initially produced power for lighting but by the beginning of this century, electricity was being incorporated in manufacturing, factories, foundries and in railway workshops. Electric trams were one immediate advance in transport technology. Electricity provided a major step into modern technology during the Second World War, and worldwide, postwar demand for electricity in industry and commerce doubled that of prewar. The irony here is that Darwin never benefited to the extent of other capital cities. It has never had a manufacturing industry or a transport system consisting of electric trams or trains. Admittedly, Darwin's small population size and isolation would have hindered progress to a certain degree.

The only immediate advantages for those Darwin residents who could afford electricity were lighting, refrigeration and fans. On the other hand, in Adelaide, 196 electrical stoves and 207 water heaters had been sold by 1929 and post Second World War, the numbers had grown to thousands. In rural Queensland, Darwin's counterpart, it was reported in 1936 that families were enjoying
"the lights, the refrigerators, the vacuum cleaner, the jug, the toaster, the iron, and "the five-valve wireless set"."^{17} Even Townsville residents in 1945, were utilising 5369 irons, 1143 refrigerators, 2945 jugs, 1087 stoves and 1168 fans.^{18} Needless to say, the wide use of so many electrical appliances was not mirrored in Darwin until well after the Second World War. This was due to the unavailability of electricity and its exorbitant cost.

Aside from this, entertainment in Darwin did improve when electricity allowed silent movies to be shown at the Don Picture Theatre during the 1920s.^{19} Functions held at the Memorial Hall were now lit by electricity rather than by unpredictable acetylene gas and dances could be held well into the night.^{20}

One industry that did benefit from electricity was the Northern Territory's largest transport system, the North Australian Railway. The railway had been prominent in the development of the Territory since the 1880s. Its trains traversed some 500 kilometres and played a major part in the transportation of people, stock, metals and freight when Territory roads were basically dirt tracks. The railway utilised electricity at many of its Territory depots for lighting, water pumping and refrigeration well before it became available in Darwin. No doubt, electricity would have made life for railway staff in remote areas more bearable.

Mining, the Territory's current major industry, was also an early user of electricity with the installation of power plant at some mining sites. Mining even played a role in the history of electricity supply when Peko Mines in 1954, built its own power house at
Tennant Creek and became the first company to supply electricity to the township. Tourism, the Territory's second largest growth area has also developed immensely through the construction of airconditioned hotels providing a more tolerable environment for tourists.

In the initial years of Darwin's electricity development, the population comprised "739 adult males, 166 adult females, 125 Japanese and 107 'others' (mainly Chinese)". Darwin was described as "strange...tough,...bare, barren, and uninviting" whose inhabitants consisted of "pearlers, buffalo-hunters, prospectors, trepangers, sandalwood-getters, and a miscellaneous mixture of cattlemen and overlanders". The main government buildings were the police station and court house, customs house, town hall, post office, the hospital, railway workshops and station, Government House and Fannie Bay Gaol. Private businesses ranged from an assortment of Chinese merchants, to general stores and hotels.

When Darwin became the focus of Australia's defence in 1938, the non-Aboriginal population had risen to 3653. People were still living in tents or huts and Chinatown continued to be depicted as a "unique evil-smelling haunt of vice and iniquity". The roads were considered "poor", the footpaths were "unmade", and the drains were "evil-smelling". "The only news that came from the Northern Territory was strikes, unemployment demonstrations, the shooting of natives and the closing down of the railways".
Technology changed from diesel engine generators to oil fired steam turbines with the construction of the Stokes Hill Power Station in 1962, and paralleling this, was an improvement in living standards. An increased power supply allowed electrical appliances to be used with confidence and airconditioned buildings and homes became more common. When Cyclone Tracy devastated Darwin on Christmas Eve 1974, Darwin had grown considerably during the postwar years. Its population had reached 47,000 and its suburbs had extended to include Nakara, Wulagi and Wagaman. Nevertheless, it was considered a frontier town located on the "hippie trail" which attracted people who wanted a "free and easy" lifestyle. Despite Darwin's prominence during the Second World War, it still remained Australia's forgotten capital. That is, until it was obliterated by Cyclone Tracy.

Since electricity was first generated in Darwin, technology in the power industry has advanced considerably. Power plant capacity has developed from 19 horse power engine (25 kilowatts) to a capacity of 200 megawatts (200,000 kilowatts), and fuel options have changed from charcoal to natural gas, solar and tidal power.

An adequate electricity supply was never a simple matter for "Darwinites". Until self government in 1978, Territory finances were heavily reliant on the Commonwealth and lack of funding assistance for major projects had a resounding impact on Northern Territory development.

This thesis will show that a public electricity supply for Darwin had always been a low Commonwealth priority until Darwin became
Australia's "frontdoor" during the Second World War. Darwin's past electrical schemes were always fragmented, the result of ad hoc decision making. The electricity supply industry in Australia was and still is, a major component of development, and the lack of an adequate electricity supply for Darwin adversely impacted on its economic growth. Darwin's electricity supply up until the commissioning of Channel Island Power Station in 1987, was characterised by electricity supply shortages and unreliability.

One of the most glaring issues that is highlighted throughout this thesis was the negative attitude absentee officials had towards Darwin on funding decisions and administration matters. Limited funds and the slow response to Darwin's electricity needs were the subject of considerable government correspondence until the construction of Stokes Hill Power Station. It is also worth mentioning that water, another important utility, was not developed until the Second World War. Water reticulation from Manton Dam and hence, a sewerage scheme were not fully available to residents until the end of the War. It is obvious then, that Darwin was denied the opportunity for economic growth compared to other Australian capital cities. Until it became a crucial matter in Australia's defence, Darwin's utilities could easily have been described as "primitive".

The most outstanding advocate for a better "deal" for Darwin was Charles Abbott who was Administrator from 1937 to 1946. Not only did Abbott have to contend with Commonwealth politicians, but also Department of Defence officials when Darwin was placed under national security during the Second World War. At all times,
Abbott defended the interests of "Territorians" against these pressures and under difficult circumstances. As Frank Alcorta said of Abbott: "The Northern Territory was not kind to him, but history should be". In later years, Abbott wrote: "Commonwealth Governments must be condemned for having done so little towards constructive development in the Territory".

As a result of the Commonwealth Government's reluctance to provide an electrical scheme for Darwin, it was left up to private enterprise to initiate it. The Commonwealth only took an active interest in the electricity system when Darwin became a strategic defence base. The need to cater for the growing numbers of defence personnel necessitated an upgrade of both electricity and water utilities. After the War, Darwin was again left to struggle with its haphazard degenerated plant. It does not come as any great surprise then, to learn that residents had to wait until the 1950s before they could expect to install modern electrical appliances in their homes, many years after the populations of other capital cities. A further indication of the Commonwealth's disregard towards the Northern Territory was that Alice Springs was the only other centre to have reticulated electricity by the end of the Second World War. It is against this background that the argument of my thesis will develop.

I have developed an interest in the topic over the past ten years, first sparked off whilst a Power and Water Authority (P.A.W.A.) employee. I was astounded that while the history of electricity has been well documented in other states, it had not been written about either by the P.A.W.A. or by any other company or
individual. I began to collect material and conduct interviews on the industry before its history became "lost", expecting that one day Darwin's history of electricity supply would finally be written.

Being a relatively unexplored field of study, the bulk of information has been extracted from primary sources. Primary material was retrieved from government documents at Australian Archives in Darwin, Melbourne and Canberra. Files located at the War Museum in Canberra provided further information on the military control of utilities but unfortunately, this was scant. More recent information was obtained from numerous government reports and files located in the P.A.W.A. Library. Newspapers and Government Resident/Administrator Reports were another important source of information that is held in the Northern Territory Library.

Interviews contributed to the available data and revealed emotions and memories that cannot be obtained from documents. Most notably, those interviews from local and interstate men who restored the electricity supply after Cyclone Tracy have been invaluable. For the compilation of this thesis, I undertook 12 interviews and utilised more from the N.T. Archives Service.

Secondary sources are limited and those consulted were written by Helen Wilson, George Redmond, Peter Dermoudy and Douglas Lockwood.

Helen Wilson's 1986 Master of Arts Qualifying thesis, "The Quality of Life or A Study on Municipal Functions in the Town of Darwin
1930-1946 and the Effect of the Military Build-up Therein" provided valuable information on the history of electricity during the years of Darwin Town Council control - 1930 to 1937. Throughout her thesis, Wilson has highlighted the Commonwealth Government's lack of concern, both financial and emotional, for Darwin and its citizens. While supporting Wilson's argument, I continue this theme until the Territory acquired self government. Besides her thesis content, I found Wilson's bibliography an excellent source for further references.

Other very useful information was derived from George Redmond who was the Director of Works from 1962 to 1977. As Director of Works, he was one of the prime leaders in the development of Stokes Hill Power Station and the reconstruction of Darwin after Cyclone Tracy. In 1981, he produced a draft on the history of electricity to 1945, but unfortunately, did not complete it. However, communication with Mr Redmond has been fruitful, leading to additional information held in his personal library.

The subject has also been very briefly written about by Peter Dermoudy in his eight page "A Northern Territory History of Essential Services" which he wrote for the Power and Water Authority. However, Dermoudy fails to acknowledge the existence of Holmes until the signing of the Electrical Energy Agreement Ordinance (1923).

Differences of opinion exist between Douglas Lockwood in his book, The Front Door, Dermoudy, Wilson and Redmond. Of major concern, is that there is disagreement on what year electricity reticulation
began in Darwin and who was responsible. As Wilson's manuscript is the only one referenced and therefore able to be verified, I have only ascribed to her work and that of Redmond. Under the circumstances, the material written by the other two authors would not be credible references so I have not sourced them.

Publications on the history of electricity in other Australian states, have been compared with Darwin's circumstances. Christine Doran's *Partner in Progress: A History of Electricity Supply in North Queensland from 1897 to 1987* is a thorough and intensive study into the electricity schemes of the north, north west and northern coastal communities of Queensland. Doran looks at the broad issues, from privatisation to government control, and the politics surrounding public utilities to regional comparisons of electrical schemes. Although an earlier publication than Doran's, Malcolm Thomis in his two volumed publication, *A History of the Electricity Supply Industry in Queensland: 1888-1988* runs along familiar lines but leans more towards the policies and politics affecting electricity generation. Similarly, Peter Read's book *The Organisation of Electricity Supply in Tasmania* also discusses the wide issues in relation to Tasmania's power scheme but not in any great depth unlike Doran and Thomis. An even more constitutional view derives from Gordon Anderson's *Fifty Years of Electricity Supply: The Story of Sydney's Electricity Undertaking*. Anderson's book is divided into two parts with both parts entirely devoted to the histories of agencies responsible for electricity generation, their relevant legislation and the politics of Sydney's electricity supply. While still covering the vital ingredients, the authors of the books *ETSA: The Story of Electricity in South Australia* by Rob Linn and
Power for the People: A History of Gas and Electricity in Western Australia edited by David Gladwell are in complete contrast to the above. Both historians have taken an entirely social view by incorporating the experiences of past and current employees.

Another perspective was seen in Invisible Networks: Exploring the History of Local Utilities and Public Works by Ann Keating who provides a very brief discussion of electricity generation in various regions throughout the United States. Although using a narrative approach, it was interesting to discover that the foundation of most electricity schemes had been initiated by private enterprise. This was also the situation in Britain and in many townships throughout Australia. Obviously, entrepreneurs rather than government recognised the benefit of electricity for development and society and how it could be a profitable business.

Although there are marked differences between authors in the interpretation of their relevant utilities, the capital cities discussed all bore a similar theme, in that, they received electricity generation simultaneously, or not far behind their international counterparts in Britain and the United States. This was not the case for Darwin which had to wait a further 25 years.

This thesis constitutes a five part chronological sequence examining in turn, the formative years from 1912 to 1934 when Holmes operated his private power supply from a corrugated iron and stone building on the corner of Smith and Knuckey Streets. Paralleled with Holmes was the Northern Territory Administration power plant which supplied power to some government buildings.
Privatisation of electricity was officially acknowledged when the *Electrical Energy Agreement Ordinance 1923* was signed between Holmes and the Minister for Home and Territories.

Chapter 2 deals with electricity supply when it became the Darwin Town Council's responsibility in 1934 until 1937. Darwin's power supply did not improve under Council ownership and still remained plagued with problems.

Chapter 3 covers the changes in administration when it was handed to Commonwealth Works and Services Branch in 1937 to when it became a military responsibility in 1942. Postwar Darwin was blessed with the bonus of two power stations but dilapidated power equipment because of its intensive use during the war years. After unrelenting agitation and pressure by Administrator Abbott, it was to be four years before the Commonwealth Government replaced the plant.

Chapter 4 describes how the growing population and the expanding suburbs necessitated the commissioning of the Stokes Hill Power Station in 1962. Only then, was some foresight put into Darwin's future power needs.

Chapter 5, covering from 1962 to the present, discusses the continuing problems of power generation and how Stokes Hill Power Station became notorious for its many blackouts. While it could meet electricity demand, it experienced many breakdowns. A more economical and reliable service was not to arrive until the commissioning of Channel Island Power Station. Technology in
electricity generation had now gone from diesel, oil to natural gas. This chapter also explains how Darwin's power scheme was destroyed by Cyclone Tracy but the dedication of local and interstate utility crews had the electricity system functioning within a short time. Determined that such devastation would not occur again, plans were made to install underground powerlines. Due to the procrastination and hindrance of the Commonwealth Darwin Reconstruction Committee, this was not to eventuate for some time.

While addressing the problems that Darwin faced to obtain, operate and develop this amenity, I have aimed to provide a readable account and have therefore, deliberately avoided technical detail and becoming embroiled in the politics and legislation surrounding the augmenting of power schemes. A comparison between state and territory electricity legislation would be one method of debating this topic. But obviously this would be a fundamental addition to this thesis and consequently detract somewhat from the account of Darwin's electricity supply.

Even though "Darwinites" had entered a new age in 1912, the reality was however, that it would be many more years before most residents would experience the advantages of electricity. Before closing the introduction, the following comment made in the South Australian House of Assembly in 1882, could very well apply to Darwin's case. "There was something in the romance of electricity which held out a promise of things to come".33
CHAPTER 1

Private Ownership : 1912-1934:
Charcoal, Gas & Oil

Imagining daily life without electricity is difficult. Nowadays, people have reticulated power that will operate kitchen appliances, refrigeration, televisions, computers and airconditioning. Life with electricity and life without electricity are vastly different scenarios.

Prior to electricity reticulation in Darwin, people managed their own energy requirements for lighting and refrigeration using candles, kerosene lamps, crude oil and kerosene fueled engines or from acetylene gas.\(^1\) Needless to say, these methods were not always effective.

Acetylene gas for instance, was used in Darwin's hotels and the Memorial Hall before electricity for lighting. Gas was created when water was gently dripped over calcium carbide, and this in turn could then be ducted through a series of pipes to lanterns. The inconvenience of using acetylene gas was that the process had to begin at least an hour before it was needed and the calcium carbide had to be kept continually damp to maintain lighting. It was not uncommon for the light to dim or to suddenly cease altogether.\(^2\)

Bill Wong who spent his childhood in Darwin and who has a long association with the Chinese community, remembers as a child in
the 1920s, relying on kerosene lamps or candles at night to read and write. On a daily basis the Wong family made sure that the lamps were serviced and filled before nightfall. Without fans, it was much cooler to sleep outside on the verandah and the wood fueled stove inside would have made the house intolerably hot. Bill's family could not afford the luxury of a kerosene fridge and relied on a meat safe until after the Second World War. On special occasions, such as Chinese New Year, the family would buy an ice block at a cost of 1/- from Holmes' Butchery. If the family was lucky, the ice would last for a few days, at least until the festivities were over. Understandably, the absence of refrigeration restricted the amount of food that could be preserved, so fresh items, such as meat and vegetables were purchased every second day.³

Ray Foske who was employed as an electrician with the Commonwealth Allied Works Council during the Second World War and was later involved in the reconnection of power after Cyclone Tracy, recalls the difficulties of washing laundry. Wash day involved boiling "the copper...put plenty of Persil in it, and hang it out, and then they'd iron it".⁴ "In those days whites were the...order of the day...anyone that worked...in the bank, the government offices and offices in general, it was the accepted practice to wear long white sox, white shorts, and shirts, and of course they didn't stay white too long". It was a problem getting white shirts clean.⁵

Darwin's history of electricity reticulation has an interesting beginning because both the government and a businessman, Ernest Felix Holmes began producing their own power in 1912. Holmes first arrived in Darwin in 1900 and for many years operated his
own pearling fleet before selling it and investing his money in a cold storage and ice making plant on the corner of Knuckey and Smith Streets (Darwin Plaza site).6 Holmes opened a bakery, sold aerated and mineral waters, a variety of frozen foods and offered an ice delivery service.7 He later branched out in 1915 to sell flavoured mineral waters.8

The power for Holmes' plant was obtained from a 19 horse power (25 kilowatts) Tangye oil engine. On the first day of the engine's operation in June 1912, it was remarked by the Northern Territory Times and Gazette that: "the resulting racket seemed typical of the virile influences being brought to bear up on this sleepy and stagnant Territory under the new regime".9

In the same year, the Northern Territory Administration also launched its own power supply from the railway yards. Both plants generated power for their respective refrigeration and freezing works that supplied Darwin residents with ice, butter and frozen meat.10 Aside from the N.T. Administration and Holmes' power plants in Darwin, were the Commonwealth Railway plants which were installed throughout the Northern Territory for water pumping, refrigeration and lighting.11

In 1914, Vestey Brothers of London signed an agreement with the Minister of External Affairs to construct and operate a meat processing works at Bullocky Point. The new industry, which was to become one of the largest in Darwin, was contracted to kill stock, freeze, store and export meat, and a power plant was installed for
these purposes. Later, in 1915-16, the railways incorporated plant and machinery for its own meat processing industry.

By 1920, the government plant provided power to some government offices, the Residency and the Terminus Hotel in Cavenagh Street (Civic Centre site). The Terminus Hotel had its own power plant before the luxury of reticulated electricity, but this was removed and added to the government plant. The Club Hotel (Hotel Darwin site) and the Victoria Hotel still obtained lighting from acetylene gas but it was considered an unsatisfactory method, and plans were made to connect the two hotels to electricity.

The Darwin hospital also benefited during this period with the installation of a "Delco" electric lighting plant which replaced its hurricane lamps. The Acting Administrator, Staniforth Smith proclaimed in his report that electric lighting would be a great benefit to the hospital especially when "serious and urgent operations had to be performed during the night". Despite the advantages that the "Delco" would have provided, it would not be until 1935 that reticulated electricity reached the hospital, and only then did it become possible to use modern medical equipment.

Holmes was contracted by the Commonwealth Government in 1920 to supply power to Darwin, which included the erection of power poles for reticulation. Although there does not appear to be any available documentation, it is presumed that Holmes was selling electricity many years before then. As well as supplying power to some government offices, the Memorial Hall (Returned Soldiers
League) which was located across the road from Holmes' power plant also took advantage of reticulated power. Bell's Tea Rooms (N.T. House site) connected to Holmes' power and became the first establishment to operate an electric fan. The Town Hall's power lines were extended to the Victoria and Club Hotels in 1923 and over time, those who could afford it gained from the convenience of reticulated power.

After many plant failures, the government's freezer and cold store machinery ceased to operate on 26 September 1922. Numerous attempts were made to rectify the problem without success and the plant was permanently closed down on 23 April 1923. It was reported that "the Administration has been relieved of a source of constant trouble and considerable financial loss". However well before then, electricity had become officially privatised on 22 November 1922, when a formal five year agreement, the Electrical Energy Agreement Ordinance 1923 was signed between Holmes and the Minister for Home and Territories, F.G. Pearce. Ironically at this time, the Queensland Labor Party was finalising its control over the Brisbane electricity system because it believed that "private enterprise...had failed to give the people of Australia cheap energy, and it was therefore the duty of governments to correct the deficiency".

Obviously, the potential of electricity was beginning to be recognised in Darwin, as the privatisation agreement was opposed by some residents who believed that one person should not have sole control over such an important resource.
Figure 1 - Ernest Felix Holmes with his suction gas engines [1924?]. Photograph courtesy of the Power and Water Authority Library.

Figure 2 - Holmes' power house on the corner of Smith and Knuckey Streets. [1924?]. Photograph courtesy of the Power and Water Authority Library.
In 1923, a case was brought against Holmes in which he was charged with "obstructing the King's highway" by erecting electricity poles in Smith Street. It was claimed that the poles were "an obstruction when three persons are walking abreast [and]...you have to watch you don't run into them".25

In 1924, Holmes' power house generator was driven by suction gas engines with the use of charcoal as fuel. His plant consisted of one 85 horse power (110.5 kilowatts) Hornsby gas engine driving a 66 kilowatt 230 Volt generator, one 40 horse power (52 kilowatts) National gas engine driving a 26 kilowatt 250 Volt generator, and one 20 horse power (26 kilowatts) Fielding and Platt gas engine. After using power for his own businesses, Holmes had a surplus of 20 to 30 horse power (26 to 39 kilowatts) to sell to customers.26

Besides the use of charcoal, Holmes' suction gas system could be adapted to use any type of combustible fuel such as firewood, coal, kerosene or coke.27 "These engines had an enormous flywheel perhaps two metres in diameter with a starting handle on its perimeter. One opened the compression relief valve, two men got that big heavy flywheel turning and once the decompression lever was dropped, the engine would start...The mechanism was simple and very effective and would run without a speed variation from full load to no load".28 The heat from the combustion of fuel was used to operate the machinery.29

Later, to meet increasing demand, Holmes installed a new and larger engine. Nevertheless, electricity still remained available for a
limited period - from 6pm to midnight, and at the high cost of 1/6d per kilowatt hour, it could only be afforded by a few residents. In an attempt to improve power generation, in January 1927, a group of businessmen applied to the North Australia Commission for a loan to establish another electricity scheme. But the Commission did not consider it a viable operation and refused the request.

On the Agreement's expiry on 22 November 1927, the contract was not renewed but Holmes continued to supply electricity unofficially. The availability of electricity had not progressed very far under Holmes' ownership. Power still continued to be limited to six hours per day, and because of possible power outages, new electrical wonders such as stoves, fans, irons or refrigerators could not be used with confidence. Candles, kerosene lamps and wood stoves remained the "modern" conveniences of the day.

Holmes died on 1 August 1929, but his Trustees continued to supply power until the Darwin Town Council became responsible for it in October 1934. An obituary in the Northern Territory Times and the Northern Standard portrayed Holmes as a "remarkable" man who conducted his businesses "with indomitable spirit and energy". "[He] had a remarkable career in the North, being the most successful business man". In another report, it was commented that although Holmes' power supply was unreliable and expensive, nonetheless "due to his courage and far sighted enterprise" the Darwin population was provided with the "civilized blessings" of electricity.
Holmes did not initially set out to produce power and it appears to be an area of business that he simply "fell into". The opportunity was there, and he took it. Being noted for his shrewdness in business, obviously it was a profitable and not a charitable act in providing residents with the "civilized blessing of electricity". Holmes took the risk of investing in an enterprise that was new to Darwin which was generally considered an unprofitable venture and a financial risk. As the next chapter will show, the Holmes Trustees were not keen to lose it, and so began a vigorous wrangle for the control of electricity.
Complaints about the dire straits of Holmes' power supply pressured the Town Council to act in the community's best interests and so, the Council advised Administrator Abbott in early 1934 that it would be taking over the management of Darwin's electricity scheme.¹

This trend was not unique to Australia. The move from private electricity supply to government control also happened in South Australia,² Western Australia,³ New South Wales,⁴ Victoria and Queensland.⁵ Christine Doran in her book Partner in Progress says that governments believed it was in the nation's interests to take this approach. Government ownership was considered "the best means of achieving an efficient, planned system".⁶

In 1936, the Queensland Labor Government held a Royal Commission into its electricity supply. The Commission addressed the issues of advanced technology and the extension of electricity into the rural districts. Swayed by government policies in other parts of Australia and the world, the Commission recommended that "that the ultimate public ownership of electricity supply is the proper objective to adopt".⁷ It was considered that to maintain technological advance, electricity supply must become centralised and under the control of governments. Doran believes that this
argument is flawed because private power companies in the United States continued to incorporate modern technology. On the other hand, government motivation was probably to harness and control a powerful energy source that would eventually transform society and industry. This was especially obvious during the lead up to the Second World War. No doubt, the Darwin Town Council was influenced by interstate moves, for its justification for government monopoly was that it would modernise and supply a cheaper scheme to the town and introduce a 24 hour service.

The Council borrowed 3,500 pounds at 5% interest to build a new power house and constructed new reticulation along Cavenagh, Smith, Mitchell, Knuckey and Bennett Streets. Not surprisingly, this option was not favoured by all ratepayers because of the large amount of money involved for such a "risky" enterprise.

A disgruntled Mr J. Burton wrote to the Administrator complaining about the project. "The Town Council proposes to build a power house etc. at a cost of 3,500 [pounds]. Very nice of the Town Council, but who is going to pay[?] If the scheme is a failure the Council merely resigns and leaves somebody else to carry the baby. Seeing that the government is responsible for the appointment of these men will it also be responsible for their actions, and guarantee that the ratepayers will not be committed to a costly failure, as this Electric Light scheme if allowed to go on will be". Discontent arose from other ratepayers, who eventually forced the Council to hold a referendum in February 1934. The outcome resulted in 149 in favour of the project and 33 against a new electrical scheme.
Meanwhile the Holmes Trustees were not prepared to lose such a viable business and applied to the Supreme Court for an injunction to prevent the Council from borrowing the funds. The injunction failed and the Council succeeded in constructing Power Station No.1 in Cavenagh Square (Mirambeena Tourist Resort site).\textsuperscript{13} Undeterred by the Council's success in establishing a new electrical scheme, Holmes' Trustees continued to lobby for the right to sell electricity until 1937.\textsuperscript{14}

After several rejected applications made to the Council, the Holmes Trustees tried one desperate and bold attempt by claiming that it would supply power for 24 hours, for 25 years. Incredibly, the bid was supported by the Permanent Trustee Company of N.S.W. Limited, which had supplied and delivered the diesel power plant for the Council's new power house. The reason was that the Trustees were offering "a full 24 hour service thus providing a continuity of supply that [would] enable refrigerators, electric fans and other appliances to be used and be of inestimable benefit to consumers". The company also added that the Trustees should be given preference because they had previously provided a satisfactory service.\textsuperscript{15} Why the Permanent Trustee Company favoured Holmes' Trustees rather than the Council is not clear. Ulterior motives may have been behind it, or a 24 hour service may have provided further income for the company.

The Town Council resented the suggestion that Holmes had provided an efficient service and instead, claimed that he had failed to maintain and upgrade the power plant equipment. The
distribution system was faulty and endangered consumers' lives with electric shocks from power poles, tanks and fences. The Council went on to accuse Holmes Trustees of using blackmail tactics by offering hotel proprietors a cheaper rate of electricity if they ordered all meat and ice from them. Those businesses which did not, were forced to pay the higher power rate.\textsuperscript{16}

It is worth noting here, that during this period the Council's other municipal functions were rate collection, parks, cemeteries, sporting facilities and road works. Income was limited and the Council was "desperate to find ways and means of implementing and funding municipal services".\textsuperscript{17} Previously, the Council had applied for the responsibility of land allocation, town planning and sanitary services, but this had been denied. According to Helen Wilson: "[a] viable local government was more a dream than a reality...[and] it could be said that no real local government existed in Darwin from 1930".\textsuperscript{18}

Requisitioning the town's electricity scheme must have appeared to be an El Dorado but instead, contributed to the Council's downfall. Although the cost of power was reduced to 1/- per kilowatt hour\textsuperscript{19} compared to Holmes' 1/6d per kilowatt hour,\textsuperscript{20} the plant equipment could not meet high power demands. Generating sets badly needed overhauls or replacement, and as a consequence of inadequate equipment, consumers regularly lost their electricity supply.\textsuperscript{21} The Council's finances had plunged from a credit of 254.6.7. pounds in July 1930 to a debit of 433.7.2 pounds by January 1935, and the loan of 3,500 pounds was still outstanding.\textsuperscript{22}
Regardless of this, expectations were high when in November 1935, the Council lodged an application "to supply electricity for public and private purposes within the Town of Darwin for a period of 25 years". There does not appear to be any further action on the lodgement as the same request was resubmitted again in December 1936.

When the issue of transferring the management of the power scheme to the Administrator was raised in December 1935, the Holmes Trustees made a bid for the scheme, and once again, failed. No doubt, the large investment of 200,000 pounds of ratepayers money injected into the scheme was the decisive factor as to why it should remain under government control. However, the Council's reason was that "a public utility...should not be handed over to private ownership unless it be clearly shown that such a course would benefit the people considerably". Undaunted, the Trustees applied again stating that they were able to operate a profitable utility. This time, the application was rejected because it was believed that the Trustees would not supply power to their business competitors.

The perseverance of the Trustees throughout 1935, may have caused the debate on privatisation and government ownership of the power supply to rage again in 1936. Concerned citizens submitted a petition to the Council requesting that they be consulted on the matter, but this was to no avail. Meanwhile, the difficulties of generating electricity continued and the power plant was unable to meet demand on the morning of 6 January 1937. Electricity could not be supplied to the two most important
consumers, the wireless station and the Ice and Cold Storage. The manager of the Ice and Cold Storage sought assurance from the Administrator that the situation would not be repeated because he considered himself lucky not to have lost his entire ice and frozen food supply.30

On 16 January 1937, the Acting Administrator placed an order with the Department of the Interior for a third generating set and at the same time wrote: "I have had complaints from business people who use electric power that they have been asked to shut off at inconvenient times".31 This predicament was later emphasised by M.G. Holtze, the Engineer in Charge: "Our daily loads are of such an erratic nature that for four days of the week parallel running should be resorted to. Our high loads are also such that we parallel every evening at 7 p.m. running so until perhaps 11 p.m. or until the load drops sufficiently for one machine to handle".32 Holtze was also concerned that the only time he could conduct an overhaul on the engines was between 1am and 6am when power loads were minimal.33

Darwin's electricity supply was to suffer another blow when a cyclone struck on 10 March 1937. The Northern Standard reported that "every electric light main in town was down, either through the violence of the gale or through being damaged by falling trees, and at 1 a.m. the town was plunged into darkness".34 Sixty pounds was spent on repairing power poles, mains and service cables and within the week the service had been restored.35
Causing even more alarm, was the Council seeking its own nullification citing several reasons. Even with an increase in consumers, the Council was clearly having great difficulty surviving and providing anything resembling an efficient service. The Council's main problem was its limited ability to generate income so that public assets such as roads and footpaths could be improved and maintained. Another area of concern was "acquiring people of good character to become councillors".36

On 1 April 1937, the responsibility for electricity supply was transferred to the Commonwealth Works and Services Branch. The Branch became responsible for the operation and maintenance of plant, mains and equipment, inspection and testing of installation and meters, meter readings, applications, licences and all technical matters. The Administrator retained the administration of the Electric Light and Power Ordinance, revenue collection and finance ledgers. The newly formed branch commenced operations with five staff: the Manager of Electricity Supply, the Engineer in Charge, an electrical engineer, a linesman and an apprentice.37

In the Council's last report, R. Leydin, Manager of the Darwin Town Council Electric Supply, praised the Council's achievements in supplying electricity.38 The Council had built a new power house, successfully replaced the unsafe private reticulation system with the nationally accredited wiring standard and produced a profit of 513 pounds during its final six months in office. Commercial consumers had increased and now consisted of the Northern Standard Newspaper, Ice and Cold Storage, E.W. Hansen Welding, Darwin Hospital, Health Laboratory, Public Works Department, J.W.
Young Battery Charging, the wireless station, the Kyriakos Zero Cafe and the Don Hotel. Considering the difficulties still being encountered in supplying a reliable service, the Council managed to sell 26 electric Kelvinator refrigerators during its brief control of electricity supply.

When the Territory's position appeared to be at a low ebb, "a very complete stock-taking of the Northern Territory" was undertaken by the Northern Territory Investigation Committee in 1937, which concluded that the Territory was an asset and had a future. This compelled Abbott to remark in his annual report that he hoped that "the last vestige of criticism against Darwin will disappear and it will take its proper place as a modern, convenient and pretty town ... I sincerely suggest that the practice of regarding the Territory as a freak country ceases ... [it should] be regarded as a normal portion of Australia". Abbott went on to demand that the Commonwealth Government stop referring to the Northern Territory as a "white elephant".

With war looming in Europe and the reality that it would soon affect Australia, it is doubtful that Abbott's criticisms were taken into account. By this time state governments were already taking "tighter control of all utilities for the purposes of national defence and planned industrial growth". Ultimately, the Council would have lost its utility, with or without its demise. But the transfer of the electricity scheme to Commonwealth control would not be to the benefit of Darwin residents. Instead citizens would be struggling to have their power needs recognised.
Under the Commonwealth Works and Services Branch, electricity for the first time was supplied for 24 hours a day, but not without great difficulty. In one of his initial reports on the power station, Engineer Holtze noted that the daily demand outstripped the capacity of the plant. On one occasion, the engineer reported that the demand was so great that the owner of Hansen's Welding had to request permission every time he wanted to use a welder.\(^1\)

It seemed that Holtze was continually juggling the power supply. When on 25 May 1937, he wrote in his log book that "I was suddenly interrupted in my reconditioning of the brush gear of No.1 generating set through the load suddenly increasing from 45 kilowatts to 65 kilowatts and then to 80 kilowatts all in the space of a few minutes....We were able to cope by throwing the second set in hurriedly, but, should this have happened during a valve recondition, the service would have been interrupted until the source of that heavy increase had been located. In this instance the extra load was found to be coming from Kyriakos Zero Cafe which just had a large freezer installed".\(^2\)

While attempting to cope with power fluctuations, the engineer was forced to service machinery during the low demand period, the hours between midnight and 8am to minimise interruption to
consumers' electricity supplies. Not only was the engineer responsible for the running of the power station but he was also the agent for the Kelvinator electric refrigerators which had been sold by the Council.

Holtze's plight was addressed by Abbott to the Secretary, Department of the Interior. Abbott wrote: "I enclose reports regarding the necessity for installing a third engine in the Darwin Town Light Plant and would stress the urgency of this matter. Not only is the capacity of the plant overloaded to a very dangerous degree, with great risk of breakdown, but it is impossible to extend any lighting facilities. I fear I will have to consider very seriously the curtailment of present lighting and power". At this stage, the plant could only comfortably cope with 80 kilowatts from its two diesel engines.

The problem of an inadequate power plant was demonstrated three weeks later on the evening of 30 June 1937. An engine had failed which left the other to cope with supplying power. Rather than suffer the wrath of patrons attending the picture theatre, Holtze disconnected power from all street lighting, the large freezer in the Zero Cafe and the wireless station. However he still managed to retain power to the Ice and Cold Storage Plant much to the manager's relief. The Northern Standard remarked "had the single unit conked out there would be great losses in refrigerated goods".

By December 1937, there were 250 consumers and 50 of these were rated as commercial users. Forty Kelvinator electric refrigerators were being used at this time, but the majority of
residents were still purchasing block ice at the cost of 1/-.$^{8}$ The Electrolux kerosene fueled refrigerator - "the flame that freezes", was advertised as "free from any doubt or suspicion as to their purity","$^{9}$ or another alternative was the "meat safe".$^{10}$ Most residents were still using wood stoves but some electric stoves had been installed. Domestic fans were still non existent.$^{11}$

Domestic power was now reduced to 4d per kilowatt hour and Commonwealth Electrical Engineer Gray was concerned that it was still much cheaper for a householder to operate a wood stove rather than an electric one. Gray calculated that the cost of operating an electric stove would be 17 pounds yearly compared to 6 pounds for fire wood. Even if it was more economical to operate an electric stove, Gray noted that the power plant would not be able to generate enough electricity to supply stoves.$^{12}$ "With the present plant it is not possible to connect any further industrial consumers with motors who would require power between the hours of 6am and midnight without [having]...stand by plant".$^{13}$ Incredibly, Gray pursued the idea of increasing power usage and suggested that a showroom be established to promote the benefits of electric fans, refrigerators and electric cooking.$^{14}$

In April 1938, a new 80 kilowatt diesel generating set arrived eight months after being ordered. Darwin's power plant now had a capacity of 160 kilowatts and consideration was given to providing additional power to the Ice and Cold Storage and the North Australian Railways.$^{15}$ However, the Works Director believed that "the addition of a new generating set at the power house [was]
meant largely to relieve the load on the existing plant and [the new sets would] not give a greatly increased supply".16

The inadequacy of the electricity supply was highlighted again when it was proposed in May 1938 to construct and expand defence facilities in Darwin. The proposal to build a Royal Australian Air Force (R.A.A.F.) station and to increase defence personnel to 800 alarmed Abbott who immediately raised the matter with the Department of the Interior. Abbott was also concerned about local enterprises. "I have had interviews with business people who want some assurance that if they purchase motors etc., and enlarge their freezers, power will be available. I have now to face the position that I should really refuse all applications from private consumers for increased power and reject all applications for fresh services".17

On 16 June 1938, L.W. Stoddart, Works Director, recommended to the Department of the Interior that a sub-station be built on Section 545 Mitchell Street, to service consumers in Peel, Bennett and Cavenagh Streets, and the Esplanade. The new sub-station was desperately needed to cope with the increase of business in the area, and that the Ice and Cold Storage Plant wanted to install a 10 ton refrigeration plant. The prospect of this eventuating, lamented Stoddart, was "dependent to a very large extent on the decisions of the Defence Department".18

Electricity charges were reduced on 1 March 1939, to 3d per domestic kilowatt hour and for commercial use, charges ranged
from 5d to 1/4d per kilowatt hour depending upon the amount of electricity used.19

Such niceties did not end power supply complaints. In August 1939, a deputation from the Darwin Chamber of Commerce to the Minister for the Interior, addressed a number of power problems. "Proposing subscribers are advised that their wants or requirements cannot be supplied. Large subscribers are frequently requested to close down their plants to enable other subscribers to use power units already installed, and large consumers have to advise the power house before starting their motors, so that provision of power can be arranged. There is at present no possibility of consumers being supplied in the event of even a partial break down".20

In response to the deputation, the Administrator announced that plans to build another power station were underway and that, in the meantime residents would have to wait for the delivery of two new 250 kilowatt English electric sets which had been on order for some time.21 For the time being said Abbott: "it [is not] possible to comply with the deputation's wishes".22

With the electricity system in a perilous state and still no indication when the new plant equipment would arrive, J.A. Carrodus, Secretary, Department of the Interior, emphasised in a letter to the Prime Minister's Department, that "the whole of the Darwin Air, Military and Naval establishments [will] depend on those generators for light and power supply".23
Concerned that no information pertaining to the new plant had been received by 29 December 1939, Abbott made his own inquiries. Having discovered that one set had arrived in Darwin and the other was to be delivered by the next West Australian steamer, Abbott wrote a scathing letter to the Secretary of the Department of the Interior. The Department's laxity towards Darwin's electricity crisis was bitterly criticised by Abbott. It was agreed that only 20 to 25 kilowatts could be allocated for defence purposes and that already, more than 50 residents had been refused new connections or an extension of power. "It is regrettable that this crisis should have arisen... but as no reply has been received to the... memorandum of 18th November 1939, which asked urgently for your views on the matter... I must conclude that the Electricity Section of your Department does not yet fully appreciate the seriousness of the situation and the urgent need for action to relieve it. I am sure that you, with your experience of Darwin, realise what an appalling situation would be created if the existing plant broke down under its present burden and the amount of criticism which would devolve upon the Government".24

The turmoil of generating power became urgent again in February 1940 and the Darwin Defences Co-ordination Committee demanded a report on the situation.25 The Committee supported the commissioning of a new power station which was to be built by Snell Construction Company at the Railway Workshops, Armidale Street site. Land for an access road to the station was requisitioned from the old Chinese cemetery.26 On 7 June 1940, Armidale Street Power Station No.2 was commissioned and on the same day the old power station (No.1) closed down permanently.27
Figure 3 - Armidale Street Power Station [1950?].
Photograph courtesy of the Power and Water Authority Library.

Figure 4 - Armidale Street Power Station [1950?]. Installing the new Crossley set. Photograph courtesy of the Power and Water Authority Library.
The old power station's 160 kilowatt generating set was combined with the two new English electric 250 kilowatt sets and the plant now had a total capacity of 660 kilowatts.\textsuperscript{28} Defence installations supplied by the new power station were Larrakeyah Barracks, R.A.A.F. Aerodrome, Royal Australian Navy (R.A.N.) Receiver and Transmitter, the Civil Aerodrome, Railway Workshops, East Point R.A.A.F., Fort Hill (Boom Defence) and the Victualling Stores.\textsuperscript{29}

Protecting utilities from the effects of war became paramount in 1940, and Defence officials developed a policy based on attacks encountered on Britain's power stations. In Britain, "damage to property from [bomb] splinters has been slight, except in one important case where electrical machinery inside a transformer room was put out of action by splinters penetrating the 3/8" steel door". The Department of the Interior saw the need to protect the Northern Territory's utilities from such attacks, and "detailed plans were...prepared for each establishment indicating clearly the proposed method, treatment, materials required, where and how same are to be obtained at short notice". \textsuperscript{30}

The Administrator suggested that an eight foot concrete wall be built around the power house or another, cheaper option was to use sandbags containing a mixture of concrete and sand.\textsuperscript{31} The Department of the Interior rejected Abbott's proposals and, in an astonishing plan, said it would camouflage it as a coal dump. Worried about the effect that coal dust would have on electrical equipment, Abbott protested, and it was finally decided to erect a barbed wire fence around the building and to station guards.\textsuperscript{32} The power house was to remain unscathed until the last air raid, No.64,
which was made on Darwin on 12 November 1943. Even then, the station only received bomb splinters.33

On 30 August 1940, the Minister for the Interior approved the supply of electricity to the Darwin Port War Signal and Loop Stations,34 but six months later, the power system faced another crisis. The load on the new generating equipment had almost peaked at 500 kilowatts, and this concerned Abbott, especially when he was notified by Brigadier Steele that Army establishments were going to continue to expand.35

In an effort to reduce power shortages, the R.A.A.F. and the Naval Wireless Station began to operate their standby generators in addition to receiving their normal supply.36 Despite these precautions, power shortages became so acute, that on 19 March 1941 a notice was issued urging all customers to drastically reduce electricity consumption. Consumers were requested to refrain from using fans, stoves and to use fuel based appliances for lighting and cooking.37 Growing resentment towards defence policy was obviously increasing judging by a civilian's comment in the Northern Standard: "people don't use fans...This is because our electricity is being filched by the Army".38 Similar attitudes towards the military pilfering the power supply were reflected in Townsville, which also experienced a large defence presence.39

An urgent telegram sent to the Department of the Interior read: "Regret advise serious breakdown electric light and power threatened...existing plant over loaded...despatch Gray [Chief Engineer] to Darwin".40 "The demand on the generating plant has
been so heavy and constant that both sets have been running continuously and the Engineer in Charge has had no opportunity of carrying out the necessary maintenance work. The Department was also informed that it had "been impossible to obtain spare parts and an order placed some months ago with makers is still unsatisfied".

Throughout April 1941, power restrictions continued and residents were warned that if consumption did not decrease, electricity limiting devices would be installed at consumers' premises. Failure to stay under the allotted supply would automatically result in disconnection, and above all, no electrical appliances could be used without approval from the Administrator. The status of civilians was demeaned further when they were informed that in the case of a power shortage, they would be the first to lose their electricity supply. This indeed happened in Alice Springs in 1943, when switchboard fuses were removed from all civilian homes leaving them without power.

It is a small wonder that residents were still able to have their power maintained as transport was scarce and only one truck was available to carry out electrical work. To alleviate the transport shortage, Ray Foske hired his bicycle out to the department for 1/3d per week so that electrical work could continue.

As power lines and posts increased to meet defence requirements, so did the white ant problem. The first underground cable laid in the early 1940s, suffered a fatal white ant attack within its first week of operation. White ants also favoured the wooden power
posts, and a combination of arsenic and caustic was injected into the poles to deter the ants. The poison reduced the problem to some degree, but success did not come until much later with the installation of steel posts and polyvinyl insulated cable (PVC).\

After the bombing of Pearl Harbour in December 1941 and the effects of war lapping Australian shores, most women and children were evacuated. "Brown outs" were introduced and "blackouts" were considered. As part of the "brownout" procedures, unnecessary external lights were banned and street light bulbs were painted over except for the bottom of the globe.

In 1942, the Army increased the plant capacity to 1580 kilowatts comprising two 250 kilowatt English electric sets, two 500 kilowatt and one 80 kilowatt Ruston Hornsby sets. However, it is doubtful whether a power supply would have been foremost in the minds of the remaining civilians. For "Darwin, the town that suffered the most from direct enemy attacks and wore the principal brunt of the war" would have had more pressing concerns. By the end of February 1942, the military was in full control of the "Top End" and its utilities.

Even with the approach of the difficult time ahead, Darwin could look back with pride at its short history of electricity supply: the achievement of Holmes to the initial optimism of the Council. Government monopoly had been tormented by opposition, limited responsibilities and income. Aside from this, was the indifference of the Commonwealth. Amazingly, through the horrors of war and the suspension of other public works, electricity generation
continued to grow, and with it, the problems of power generation. Residents still could not enjoy the full advantages that electricity allowed their southern counterparts.
The Second World War had been a difficult time for those residents left behind. Their power usage was restricted and their needs in general were considered secondary to that of the military. In the long term, postwar Darwin had sealed roads, an improved airport, reticulated water, an increased electricity supply and a larger hospital. Two banks, the Hotel Darwin and new housing had been established. Gavin Long, a war correspondent in Darwin favoured the changes: "much has been done in the past few years towards converting Darwin from the particularly dingy tropical township it was four years ago into a town it should be".

A jubilant Abbott announced that: "the Territory emerged from the war with assets far outweighing the debits. [The Territory] has aerodromes which rank with the best in Australia and it has hundreds of miles of broad highways". Contrary to Abbott and Long's convictions that Darwin's services had improved, Frank Alcorta described postwar Darwin as "much of a shambles as ever" and a "nightmare". The endless procrastination of the Labor government retarded the rebuilding of the town for the following five years. In regards to Darwin's power system, there is substantiation to support Alcorta's claim.
Throughout the war, various departments had been responsible for the supply of electricity: the Public Works Department, the Civil Construction Corps and Allied Works Council (Department of Works and Housing). During the absence of the Administrator, Stoddart was left to endure the problems of the electricity system and the clashes with Defence officials.\(^5\)

Postwar Darwin had two power stations: Armidale Street (No.2), and Bishop Street (No.3) which had been commissioned in February 1945.\(^6\) The combined power supply amounted to 2,050 kilowatts\(^7\) and defence services were utilising 1,200 kilowatts of this. Civilians were returning to Darwin and consideration was now given to their needs. It was estimated that potential residents would occupy 200 houses within six months, and that the majority of these homes, unlike prewar, would have electric stoves and refrigeration. To service these homes, an additional capacity of 300 kilowatts needed to be included in future power generation requirements.\(^8\) This was greatly underestimated and postwar demand would soon trebled that of prewar. By February 1946, 150 electricity applications had already been received. It was expected that all consumers would be metered by March and new tariff charges were set at 7d for light and 2d for power.\(^9\)

What first appeared to be a postwar bonus of electricity generating plant for Darwin became a problem. The plant had been overworked and poorly maintained, resulting in power failures and unreliable supply. Although authorisation was granted to replace all Territory power plant in early 1946,\(^10\) it was a further four years before the new plant was delivered. This could have been
due to the disinterest the Commonwealth had shown so far in Darwin, or the disruption to the transport system caused by the Second World War.

Although Darwin had two power stations operating, the electricity supply remained unreliable. As civilians returned and businesses reopened the system could not keep abreast of demand.\textsuperscript{11} Darwin's peak demand period could only be met by operating the R.A.A.F.'s standby generators for three to four hours every evening. When the three 850 kilowatt generating sets arrived in 1950, there was a dilemma where to house the new sets. It was decided to acquire more land from the North Australian Railways and extend No.2 Power Station for the installation of the new equipment.\textsuperscript{12}

Bishop Street Power House (No.3) was decommissioned and later converted into an electrical workshop,\textsuperscript{13} and the Commonwealth Disposals Commission sold its three generating sets as army surplus.\textsuperscript{14} Darwin's generating capacity was 3,450 kilowatts which consisted of three 850 kilowatt sets, two 250 kilowatt sets and one 500 kilowatt Crossley set. Electricity reticulation was extended to the new Nightcliff area and to a section of Bagot Road. The number of consumers now reached 2,500.\textsuperscript{15}

Administrator Driver was optimistic when he announced that: "Darwin [had] the necessary capacity for all undertakings, including developmental ones, for sometime to come"\textsuperscript{16} for in 1949, Darwin's burdensome electricity supply was raised by Leydin in a submission to Driver. Leydin, who was the Manager of the Darwin Town Council and now the Government Secretary, discussed
management, tariffs, present and future development and general policy. One aspect emphasised was that the management and development of electricity supply had since the beginning, been a haphazard affair. "Practically no attention has been given to the planning or the development of the undertakings, either before the war or since". Leydin went on to question whether the "Electricity Supply Undertakings" should be a profitable business or take a developmental role providing cheap power to encourage primary and secondary industries and to attract people to Darwin. Soon after, and perhaps based on Leydin's findings, the responsibility of the "Electricity Supply Undertakings" was transferred to the Department of Works.

During the 1950s, electricity availability improved, airconditioning was an option for some, and plans were made for a larger power station. In 1954, electricity was available to 400 new houses in Nightcliff, and low tension reticulation ran from Bagot Road to Rapid Creek Road. High tension lines were constructed in Winnellie, Parap and Fannie Bay areas which allowed for an increase in power consumption and additional connections. By 1955, all prewar power poles and installations had been replaced and substations had been reconstructed.

Although airconditioning was available in the 1950s, most government and private businesses did not begin to become airconditioned until the 1960s. One couple who took advantage of airconditioning in 1954, were Lucy and Steve Entner who owned the Knickerbocker Cafe in Smith Street. The Entners claimed this move increased business by 30% because it was the only
airconditioned cafe in Darwin at the time. The downside was that airconditioning often overloaded the power system which resulted in many blackouts to their cafe and surrounding businesses.\textsuperscript{22}

Working without electricity is rare these days, but during the 1950s, it was common. Jon Lawrie who was employed by Water Resources Division remembers his office, a Sidney Williams hut which had been part of a collection of ex-Second World War camps. Facilities were primitive - if you wanted a cup of coffee, "you lit the fire and boiled the billy".\textsuperscript{23} With the installation of electric fans later, working conditions improved slightly but the heat under the tin roofed huts remained. Twice a week the Division issued hand towels because the draftsmen sweated on top of their drawings. "Our office had a whopping big fan nearly 3 foot high. It was a real blaster. You had to anchor everything down to stop it flying off the desk". The comforts of airconditioning did not transpire until the department moved into the Vogliotti Building, Mitchell Street in 1968.\textsuperscript{24}

By 1955, Darwin's daily maximum demand was 2250 kilowatts but only 22.5% of Darwin residents were connected to reticulated electricity.\textsuperscript{25} Tariffs were 1/1d per kilowatt hour for light and power was 3d per kilowatt hour. In nine years, the cost of light had risen by 4d and power by 1d per kilowatt.\textsuperscript{26} For the first time ever, power loads had remained well below the capacity of the power plant.

Forecasts indicated that daily maximum demand would reach 4450 kilowatts by 1960, and that another generating set would be
required before then. However, during 1955 and 1956, daily maximum demand reached 3,300 kilowatts and it was predicted that this figure would double in six years time. At the end of 1956, Darwin's power plant comprised of one Blackstone 400 kilowatt set, one Crossley 470 kilowatt set, two Mirrlees 950 kilowatt sets, and three Mirrlees 850 kilowatt sets, totalling 5,320 kilowatts. Tenders had also been called to supply and install a 1,500 kilowatt generating set.

The idea of building a steam driven power station was suggested as far back as 1947 but was only given serious thought in 1956. R.M. Taylor, Director of Works, believed that "when the capacity of the present station reached 7,500 kW it will be more economical to generate by steam than to operate diesel engines". The new power station would be oil-fired and would have an initial capacity of two 7,500 kilowatt turbo-alternators.

Other alternatives to steam were investigated and subsequently rejected: such as installing gas turbines in the existing power station or the use of free-piston gasifiers, and even the possibilities of nuclear power and hydro-electric were examined. R.N. Eden, Director of Water Use, studied the potential sites of the Adelaide or the Katherine Rivers for a hydro-electric scheme. Both were rejected because of their great distance from Darwin which would make power transmission an uneconomical service.

Further sites were investigated at Nightcliff, East Point, Quarantine Island (Channel Island), Middle Arm and Fort Hill. Finally it was agreed that the new power station should be located on vacant
land owned by the North Australian Railways on the eastern side of Stokes Hill. The proposal for the power station was outlined in a Cabinet Submission by Paul Hasluck, Minister for Territories. The most important aspect in Hasluck's submission was that for the first time, plans were made and costs set aside for future power demand. Hasluck discussed four stages in which the power station would develop and the allocation of monies for each stage. It was estimated to cost nearly $4 million to construct Stokes Hill Power Station (S.H.P.S.).

Tenders were advertised on 1 November 1958 through the Sydney, Melbourne and Darwin media and in the Commonwealth Gazette.

Another milestone was that the construction of the new power station was initiated and managed by the Darwin Department of Works and the Department of Housing and Construction through public works programmes. This was a strong indication that the N.T. Administration was beginning to take a greater role and responsibility in local matters. The key issue here is that with a larger power supply, industry and construction in Darwin went on expanding rapidly and the population trebled during the years of S.H.P.S. operation. This is a powerful indication of how electricity can play a major role in a community's economy.

The reality of a better "deal" for Darwin residents was beginning to come to fruition. With a more developed power supply, the long desired luxury of airconditioned office buildings and homes became possible. Contrary to all expectations, it was not to be the final chapter on unreliable power supply, for this power station, like its predecessors, was to be just as perilous.
So it might be said that Darwin had completed its first phase of power history - a period of hurried expansion and of hapless electricity schemes. The second phase was the rapid growth of Darwin, and this growth was to continue past the lifespan of S.H.P.S. until the present.
Stokes Hill Power Station was completed six months ahead of schedule, and after successful tests and acceptance trials, responsibility was transferred from the contractor, Riley Dodds Australia Limited on 1 July 1962 to the Electricity Supply Undertaking (E.S.U.). A plaque was unveiled by Paul Hasluck at the official opening ceremony on 14 June 1962, and power distribution commenced in June 1962. Armidale Street Power Station (No.2) remained in operation for emergency purposes until its closure in 1968, and then became part of the Ben Hammond Complex.

During the early years, the new power station suffered "teething" problems and Armidale Street Power Station was re-started on many occasions for emergency power and during equipment overhauls. It was not a smooth transition. From the beginning, S.H.P.S. was fraught with breakdowns and Darwin was plunged into darkness frequently - at least once or twice a week.

Darwin's electricity demand continued to rise, and in 1964 a larger turbo alternator set of 16 megawatt capacity was installed alongside the existing two 7.5 megawatt turbo-alternators.
Figure 5 - Stokes Hill Power Station 1987. Photograph courtesy of the Power and Water Authority Library.
Two additional 16 megawatt sets were commissioned in 1967 with Stage 2 in March and Stage 3 in November. With the completion of Stage 3, the power station's generating capacity had increased to 47 megawatts (47,000 kilowatts), a far cry from 5,320 kilowatts ten years before.

To meet the ever increasing population of Darwin and to cater for the growing areas of Alawa, Jingili, Moil and Wagaman, and the new suburbs of Anula and Wulagi, the Casuarina sub-station was constructed in 1971. Later, in November, the Stage 4 extension incorporated a 23.5 megawatt turbo alternator. Within nine years of operation, the power station had come to the end of its original planning stages. Expansion of government services, growth in pastoral, mining and agricultural industries, and the demand for airconditioning in private, government and business premises necessitated additional power.

Between 1970 and 1972, Darwin's population increased from 32,943 to 41,500. Electricity consumers had almost doubled from 5,287 in 1966-67 to 9,788 in 1971-72. Consequently, it became necessary to plan and allocate funds for a further stage. But when Stage 5 was about to begin Darwin was destroyed by Cyclone Tracy.

Inspecting the damage on Christmas morning in 1974, George Redmond, Director of Works, was awed by the devastation. "Galvanised iron, building materials, furniture, trees, power poles and powerlines blocked the majority of all roads. 50% of all
residences had been...completely destroyed and of the balance 45% suffered various degrees of damage. There was no water supply, no power and 90% of power distribution lines were destroyed. I was concerned at the magnitude of the task of opening up roads and restoring engineering services such as water, sewerage and power".  

 Cyclone Tracy had completely annihilated Darwin's electricity supply.

On Christmas Eve, most suburbs had lost power by 9pm and S.H.P.S was closed down at 3.30am on Christmas morning. Although the power station sustained no significant plant damage, massive damage to roofing and walls had allowed water to flood the station and destroy electrical equipment. Because of its location on the shore, the station was subjected to extremely high winds and the turbine hall, main control room and relay room were drenched by salt water which penetrated motors, relays, coils and electronic equipment.

John Sawyer, an E.S.U. engineer at the time, recalled that "a lot of electric motors had to be virtually completely rebuilt, and small ones replaced because of corrosion. Switch yards were damaged, the insulators...were broken, they had to be replaced. And in many cases sort of robbing Peter to pay Paul - you'd take half the switchyard out of service and just strip it of insulators and busbar[s], and [use] whatever you needed to patch up the other half".

All substation switchyards were substantially intact, but all had been damaged by airborne debris. Casuarina substation which
served the northern suburbs had collapsed completely, resulting in the switchgear and control panels being buried under debris, and Darwin's overhead distribution system was totally destroyed.14

First priority was the hospital which needed power and water connection. Inundated with casualties from the cyclone, the hospital was operating under adverse conditions. Two diesel generating sets were installed on the morning of Christmas day and water supplies were delivered by the afternoon. The roof on the main ward was repaired so that there was protection for the installation of an emergency generating set. Overhead distribution lines were hastily repaired using salvaged materials and by 29 December reticulated power had returned to the hospital.15

Others waiting for power reconnection were able to apply for a mobile generating set that was capable of operating a fan, fridge and a light.16 The majority of these sets were delivered by R.A.A.F. Hercules. As one person observed: "there'd be a Hercules arrive and when they opened the back door it would be full with nothing else but generators".17 By 30 December, 200 sets had been distributed but demand continued to exceed supply and a further 537 sets were allocated by 13 January.18 Understandably, there was a long wait for this service as one woman discovered; she was number 756 on the list.19

The first power output from the power station was from a 350 kilowatt diesel unit on 26 December, and on 29 December, a larger 1380 kilowatt diesel was brought back into service and supplied the hospital.20 Generating capacity reached 7 megawatts by early
January 1975. Although most residents had left Darwin by this time, 10% of those residents remaining were able to receive reticulated electricity. The power station was producing 41 megawatts by 6 January and the Snell Street Substation which supplied the Winnellie area began functioning on 2 January. A milestone was achieved on 25 January when supply became available to most residents between Darwin and Nightcliff. Twelve hundred and four houses and 200 commercial users had now been reconnected and this total reached 3000 on 24 February.

Telegrams seeking aid from interstate electrical authorities were transmitted on Boxing Day. Telegrams read: "distribution powerlines 100% conductor and fittings fully down or damaged. 70% poles down or damaged. Assistance should be initially confined to line gangs. Assistance with supply, conductors, insulators, line hardware of any type appreciated...No accommodation available suggest come with camping and cooking equipment".

The response was outstanding. Thirty one interstate authorities participated in the reconnection of power. Queensland electricity crews were the first to arrive on the scene with a team of 14 men from the Townsville Regional Electricity Board (T.R.E.B.) on 27 December, and a team of six from the Blue Mountains City Council followed the day after. Navy boilermakers, fitters, crane and transport drivers, riggers, electricians, staff personnel, and even Fannie Bay Gaol prisoners were freed to assist in the operation.
Figure 6 - Restoring power after Cyclone Tracy 1975. Photograph courtesy of the Power and Water Authority Library.

Figure 7 - A bent power pole in Cavenagh Street, Boxing Day 1974. Photograph courtesy of the Power and Water Authority Library.
Contradicting the efforts of Redmond to import labour was General Stretton who was intent on evacuating potential manpower and reducing the population to 10,000. This was to be one of the many acts by the Commonwealth Government that would both puzzle and disappoint Redmond.\textsuperscript{28}

A truck convoy loaded with building material from the Department of Housing and Construction, Canberra reached Darwin under police escort. Matching this, were the arrival of Sydney County Council semi-trailers carrying drums of electrical cable, switching equipment and generators.\textsuperscript{29} The Electricity Trust of South Australia's (E.T.S.A.) contribution was 10 heavy vehicles containing electrical equipment, camping supplies and rations borrowed from the Army.\textsuperscript{30}

It was no easy task to organise such a contingent. Men, supplies, equipment and stores were difficult to acquire during the Christmas period. Doug Byrne, a T.R.E.B. team member, relates their first task on arrival: "by midday Saturday [day after arrival] we were well set up and ready to start our first job. We were to restore a feeder to a light industrial area which included among others a milk factory, ice works, Readymix concrete, a baker and a crowd who manufactured louvres. It was a short feeder out of a substation with a gas turbine and didn't present any great problems",\textsuperscript{31}

Gary Inch from the Brisbane City Council carried out his work from the boot of a Holden Premier. Gary would travel behind the
linesmen and connect the power supply from the line to the house. "I carried [the service wire] in the boot, [and ran it] from the pole to what was left of the house - very often that was a matter of connecting it to the floor of the house".\textsuperscript{32} Our crew "was cabling fifteen to sixteen kilometres of overhead mains, [connecting] 150 services and two to three pole substations per week".\textsuperscript{33}

The hours were long, and crews would work from "sun-up to sun-down" as George Madsen from T.R.E.B. described it, with perhaps one day off a week.\textsuperscript{34} Very often the interstate crews would work well into the darkness and George recalls such times: "if there was a couple of houses left that didn't have power in a street where we were, we'd carry on a little bit later on into the night just so they weren't the only two homes that were left in the dark".\textsuperscript{35}

These men were just the beginning of a large consignment of interstate crew members that peaked at 260 by 4 January and numbered 200 a month later. Interstate electricity authorities rotated their teams every two to three weeks to ensure that the men were always fresh. By the time Darwin had been fully restored six months later, approximately 1000 men had been seconded to Darwin.\textsuperscript{36}

Peter Wundersitz, an E.S.U. engineer, spoke highly of the interstate crews who came to assist. "They saw what had to be done and got in and did it. Pulling old lines down, using whatever they could, putting the new lines up. They restored the power supplies to the city in miraculous time".\textsuperscript{37} Owen Peake who was responsible for the reconstruction of the transmission and distribution system
conceded that this feat would not have occurred if not for "the massive and enthusiastic assistance of individual members of the electricity supply industry to which the people of Darwin owe a great debt of gratitude".38

It is clear that without the dedication and team effort of E.S.U. staff and interstate crews, it would have taken much longer. Throughout the whole operation, the E.S.U. was left to organise and manage its own affairs without interference but this amicable situation changed with the rebuilding of Darwin.

The exclusion of local officials from contributing to the reconstruction of Darwin was made obvious from the beginning. The Darwin Reconstruction Commission Act was passed on 28 February 1975, and Darwin representatives were excluded from becoming members of the Committee. The same situation applied in regard to the Darwin Cities Committee.39

A valuable lesson learnt from the cyclone was that all powerlines would have to be placed underground. With only temporary overhead lines that were hastily erected after the cyclone, the E.S.U. considered underground cabling a priority, and approval and funding to achieve this was granted in March 1975. Due to the procrastination of the Darwin Reconstruction Committee (D.R.C.) only a few suburbs had underground power when the Committee disbanded in April 1978. The rest of Darwin was still being serviced by the temporary lines erected after Cyclone Tracy.40
The ultimate frustration was the minimal amount of work that the D.R.C. achieved. An exasperated Redmond said: "I can't understand why the D.R.C. was so negative in their attitude towards getting on with the job entrusted to them. In the case of the undergrounding of the power, and the...contract for housing, all they had to do was to provide us with an order and the work would have been done. [There] wasn't a shortage of money...With so much money, and unemployment throughout Australia, and so little being done, I was disgusted and demoralised".41 Besides the issue of underground power, the Director of Works was also dismayed that no houses had been constructed by September 1975 and that the rebuilding of Darwin was caught up with Commonwealth bureaucratic red tape. "It would have been much simpler if these [projects] could have been left under our control".42 "The Construction Authority was a disappointment to myself and my officers, and as it turned out, a disaster for Darwin and its people".43

The restoration of electricity supply after the devastation of Cyclone Tracy cost $10 million and 300,000 labour hours,44 and according to Redmond, the D.R.C. had successfully "put [Darwin] back at least three years".45

At the end of a somewhat disastrous year, E.S.U. could be congratulated on its effort in the restoration of power and its rational attempt to install underground power alongside that of new housing. Unfortunate as it was, Darwin, which had endured cyclones and enemy bombs, again became the victim of distant officialdom. As happened immediately after the Second World War,
Darwin became the subject of endless plans and delays. Not a single new house was occupied until the end of 1975. Meanwhile residents were denied access again to the benefits of electricity because they were forced to live under floorboards or in patched up homes while bureaucrats deliberated on the future development of Darwin.

In stark contrast to this, was the commitment of E.S.U. when it initiated Stage 5 soon after the cyclone. The completion of Stage 5 in 1975, included another 23.5 set and its associated equipment which increased the station's capacity to 94 megawatts (94,000). Stage 6, the final stage, saw a further two 23.5 megawatt turbo alternator sets installed in 1977. The power station had grown from 15 megawatts (15,000 kilowatts) in 1962 to 141 megawatts (141,000 kilowatts) in 1977 and it was estimated that this would meet Darwin's power needs until 1980. Although Darwin finally had a power station that could cope with an increasing demand, outages continued to occur.

Power cuts occurred for various reasons: equipment faults, union action and unforeseen problems that could be attributed to lightning strikes, fallen trees, bad weather or flying foxes landing on the lines. Sometimes power was off for periods of eight to ten hours and one of the longest blackouts that occurred was 18 hours.

For two consecutive weeks during the 1963 wet season, lightning struck the electricity distribution system 115 times but in most cases, power was restored quickly. There was little change by
the 1965 wet season when the Northern Territory News reported that the 13 Mile was continually experiencing power outages and in one instance, it was 11 hours before power was restored.\textsuperscript{52} Power failures were not just a wet season phenomenon. In July 1964, the Humpty Doo area lost power 15 times, the longest being 63/4 hours on one day.\textsuperscript{53}

According to Wundersitz: "power outages were a fact of life...two or three hour outages...were quite normal....Everyone lit up their candles and went outside and talked to their neighbours. In...the wet season you could have two or three hour outages a week. ...It wasn't a hassle, it was accepted".\textsuperscript{54} The difficulties of delivering a reliable service continued well into the 1970s but it was to be the 1976-77 wet season that drew attention to the predicament of the suffering residents.

Consumers were notified on New Year's Eve 1976, and again in January 1977, that power shedding was to occur in specific areas of Darwin at allotted times.\textsuperscript{55} The Legislative Assembly was advised in December 1976 by the Executive Member of Municipal and Consumer Affairs, Marshall Perron, that Darwin residents would face electricity rationing during the next five years if a new power house was not built.\textsuperscript{56} The Darwin Star's headline screamed "Crisis Reached at Power house" and the Northern Territory News was asking: "Electricity - Why the Mess?...the people of Darwin are entitled to know".\textsuperscript{57} In January 1977, a Darwin firm of angry solicitors sent a telegram to the Prime Minister stating: "Our electricity services seem to be pegged to the Australian dollar...all we ask of you as the leader of this country is to TURN ON THE
DAMN LIGHTS".58 The fact that many businesses and some residents still continued to utilise generators prior to and during the years of S.H.P.S. is a sound indication that Darwin's power supply remained unreliable since its induction.59

Some 15 years after the operation of the station, Darwin's power scheme was eventually investigated by the Commonwealth Government and an inquiry was held by the Minister for Construction, J.E. McLeay, in February 1977. The result was the "McKay Report", which claimed that the Northern Territory did not have the technical expertise to plan, design, construct, operate or maintain the electricity supply. The E.S.U. relied on expertise and assistance from other Commonwealth departments, and such a conglomeration contributed to the "impossible situation under which the electricity supply operates". The report considered the structure to be "an unwieldy division of responsibility, which militates against the formulation of firm policies and which hinders greatly the smooth operation of public electricity".60

On the basis of the "McKay Report", the Northern Territory Legislative Assembly passed the Electricity Commission Ordinance in 1978 and after self government (1 July 1978), the Northern Territory Electricity Commission (N.T.E.C.) was formed, and became responsible for the supply of electricity.61 A high priority for the newly formed department was to find an alternative means to supply Darwin's power because it was costing $10 million per year to fuel the power station. The cost became more alarming when it was estimated that this amount would double by 1985.62 Plans to construct a more economical power station became imperative.
Four sites were investigated as possibilities: Channel Island, Glyde Point, Point Margaret and Quarantine Island. In 1981, the Northern Territory Cabinet decided upon Channel Island as the preferred site because of its close location to Darwin and the rural area, its soil foundation, and its access to a deep water channel.\textsuperscript{63} A budget of $18.6 million was allocated in 1983 by the Northern Territory Government for its construction. Seventy hectares were appropriated and construction began on one of the largest projects ever undertaken in the Northern Territory.\textsuperscript{64}

Initially, it was proposed to construct a 300 megawatt coal-fired power station. Coal would have had to be transported by sea from Queensland and an exceptionally long jetty would have had to be built at Channel Island. The expense of such a proposal prompted a reconsideration of hydro-power but this was again rejected.\textsuperscript{65} In 1980, Mines and Energy Minister, Ian Tuxworth, contended for nuclear power as a cheaper and cleaner alternative. Tuxworth was opposed by the Treasurer, Marshall Perron, who believed that the Northern Territory's gas reserves should be exploited or the government should remain committed to using coal.\textsuperscript{66}

It was decided to develop Channel Island Power Station (C.I.P.S.) as a coal-fired power station but during the construction stage, N.T. Gas Pty. Limited announced that it would be building a 1500 kilometre gas pipeline from Central Australia to Darwin in early 1984. Supplying gas as an alternative to coal became a reality when gas reserves were estimated to be large enough to operate the new power station. Planning now focused on a gas-fired power
station. Switching to gas would lower operation costs, provide a reliable fuel supply and create minimal pollution.67

The new power station was built to withstand adverse weather conditions such as cyclonic winds up to 230 kilometres per hour and its infrastructure included access roads, the Channel Island bridge, a 23 kilometre water main and a 22 high voltage powerline. More than $30 Million was spent on work associated with the project.68

On 1 July 1986, N.T.E.C. amalgamated with the N.T. Water Authority to form the Power and Water Authority (P.A.W.A.). Another momentous occasion was in December, when C.I.P.S. fired its first gas turbine. Stokes Hill Power Station continued to supply power along with the new power station until June 1987 when all three gas turbines became operational. On 6 September 1987, C.I.P.S. was officially opened by Power and Water Authority Minister, Barry Coulter.69

"Teething" problems were rare compared to S.H.P.S. and those problems that did occur were mainly due to inexperienced staff dealing with new technology.70 Expectations were high, the population "believed they had a nice, brand new power station and the lights would never go out again!"71 However, four months later, reminiscent of the 60s and 70s, Darwin plummeted into darkness. A full day without power resulted in businesses and schools closing, restrictions on telephone use and no traffic lights created road chaos.72 Despite this, initial problems remained few and S.H.P.S. continued to function in emergency situations.73
Figure 8 - Construction of Channel Island Power Station [1984?]
Photograph courtesy of the Power and Water Authority Library.
When S.H.P.S. finally closed in July 1987, it had not reached its full capacity and some generating units that had a 30 year life span, were only eight years old. Some engineers considered that the power station had finally rectified its problems and its ability was only just beginning to show. Unfortunately, S.H.P.S. was never to change its reputation as an unreliable power station.

The closure of S.H.P.S. also closed an era in early technology. Gone now were the diesel and oil fueled power stations of yesteryear. For many staff who worked at the power station, the closing ceremony was a sad occasion: "they lowered the flag for the last time... [and] there were a few tears".

Channel Island Power Station commenced as a 200 megawatt facility comprising three 33.3 megawatt open cycle gas turbines, two 33.3 megawatt turbines with heat recovery systems feeding one 34.0 megawatt steam turbine. Power generation is also supplemented from both the Katherine and Pine Creek Power Stations. During 1996, power demand peaked at 193 megawatts and it will become necessary in the near future to install another turbine.

To produce electricity these days, fuel not only comes in the form of gas, but for many years, P.A.W.A. has been researching the possibility of using renewable supplies such as solar and tidal power. On the face of it, the Northern Territory is an ideal region to develop alternative energy systems, with its vast empty spaces, high degree of sunshine and its immense tidal movements.
Tennant Creek was selected as the most suitable site to examine the economics of a solar-thermal power station. A 2 megawatt power station will soon be in operation at Tennant Creek and in the future, it is planned to construct a 20 megawatt solar power station elsewhere in the Territory. The Tennant Creek solar power station will cost $16 million and will be the first of its kind in the world. This type of technology will eventually be exported to other countries that share the same latitude as northern Australia.78

Another alternative to solar is tidal power, which is being considered for coastal communities. Such a project is being investigated at Apsley Strait, which separates Bathurst and Melville Islands.79 If the tidal power trials succeed, all coastal communities that normally rely on diesel generators will be able to benefit from this technology. Both solar and tidal power are economically viable and will offer a cheaper and cleaner alternative.80

In the 1990s, the wheel has turned full circle as Australia moves into a new era of electricity supply - privatisation and corporatisation. These moves were initiated by the Hawke Labor Government. The P.A.W.A. has to some extent, based itself upon national models. The method of production has diversified to the concept of a National Grid. Linking to other energy corporations has enabled the purchase of electricity at a cheaper rate, and increased reliability and flexibility. Private companies, Energy Developments Limited and N.T. Power Pty. Limited, sell electricity to mining companies and the P.A.W.A.81 Competiveness, commercialisation
and privatisation are new challenges to the government sector, and who would know which way the wheel may turn in the next 85 years.

The last five chapters have covered 85 years of Darwin's history of electricity supply including the disastrous effect Cyclone Tracy had on Darwin's power system. This chapter not only illustrated the amount of effort needed to restore the electricity system after "Tracy" but demonstrated that the N.T. Administration attempted to have some influence over the Territory's power industry.

Although S.H.P.S. could be viewed as a failure to a certain degree, of greater importance was that it was a Territory initiative and succeeded in improving the living standards of the Darwin population. During its operation a healthy economy could be seen in the rapidly expanding population and in building and construction. The population had increased from 15,426 in 1961 to 72,937 in 1986 and matching this, was Darwin's increasing urban sprawl from Nightcliff to Karama. The advent of Cyclone Tracy scarcely interrupted the demand for electricity or the growth of the city because by July 1975, three quarters of Darwin's pre "Tracy" population had returned to Darwin. The expansion of S.H.P.S. from a 15 to a 141 megawatt power station more than adequately demonstrates this.

The success of C.I.P.S. and the investigations into solar and tidal power technology have proven that Darwin officials are capable of making sound decisions regarding the Territory's role and contribution to Australia's energy industry. One of the most
obvious points that emerged in this chapter, was that Commonwealth intervention in local matters still continued and remained a contentious issue until self government.
CONCLUSION

The Northern Territory was directly administered by the Commonwealth Government between 1911 and 1978, and in that period, whether by indifference, accident or design, no purposeful commitment to development was achieved. This is supported by the findings of the "Payne Report" which scathingly remarked that: "when the Territory was controlled by South Australia more general progress was made than during the Commonwealth's regime".1

The general lack of development and funding commitment was reflected throughout Darwin's history of electricity supply. Commonwealth funding was concentrated on the development of the Northern Territory's pastoralism and mining industries and in doing so, ignored the potential of townships. This criticism is justifiable when remembering that Darwin and Alice Springs were the only centres to have reticulated electricity after the Second World War.2 If the Commonwealth had not been compelled to provide a power scheme for its thousands of defence personnel, it is doubtful whether Darwin would have progressed to the thriving city it is today.

Darwin was no exception to other parts of Australia when its first public electricity supply was initiated by a private entrepreneur. This trend continued until Darwin's power scheme, like other cities and towns increasingly came under government control. Nevertheless, power generation was a contentious issue whether it
was under private ownership, the Defence Department or the various government departments throughout its history.

In the early years, disruptions and a limited service prevailed and modern conveniences such as fans, lighting, electrical ovens and refrigeration remained elusive to most of the population until after the Second World War. Bear in mind, residents of other capital cities were enjoying these electrical luxuries many years beforehand. Once a larger and more economical electricity scheme was established, living standards for the population improved, as shown in the daily lives of Bill Wong, Jon Lawrie and the Entners. Basic electric appliances such as fans, refrigerators and airconditioning made an immediate impact on their living standards. Indeed, if the electricity scheme in the beginning had not been implemented or managed in an ad hoc way, people may have stayed permanently and industry may have progressed further than it has done today.

Information on how the power supply coped from 1942 to 1945 is scant, but it could be assumed by the Alice Springs example, that the remaining civilian population would have suffered the effects of power shortages well before defence personnel. While it appeared that Darwin had the bonus of two power stations and larger plant machinery after the War, this was short lived. Initially the plant could meet demand but began to fail due to increasing demand for electricity as residents returned. The commissioning of new power plant became urgent but the population had to wait a further four years before this occurred.
Throughout the 1950s, Darwin's population and its suburbs continued to grow which necessitated the commissioning of Stokes Hill Power Station in 1962. The new power station was initiated by Darwin engineers, rather than by the Commonwealth Government. This move could indicate that the N.T. Administration may have by this time, began to demand and expect a greater role in decision making on local matters.

Airconditioned government departments improved working conditions for public servants, and industry could expand with confidence when S.H.P.S. began operation. The benefits of a larger power supply were seen in Darwin's growth, both in its population and its urban expansion. Without the power supply to meet demand, Darwin would not be able to support its dramatic increase in population. The negative side of the power station was that it became famous for its many blackouts which forced many Darwin businesses and residents to continue relying on private generators.

Cyclone Tracy arrived in 1974, completely destroying Darwin's electricity system, but the dedication of local and Interstate crews had the system almost fully operable within six months. It is here, in the aftermath of "Tracy", that Commonwealth policies towards Darwin development really began to change, and the push for self government accelerated.

Power technology took a quantum leap with the opening of C.I.P.S. in 1987. Darwin finally had a power station that can meet demand and incur few failures. Contrary to the long power outages suffered
by S.H.P.S., it was expected that "the lights would never go out again!" ³

From the very beginning of electricity supply in Darwin, wrangles about the utility were ongoing between Administrators, local officials, Commonwealth and Defence bureaucrats. Efforts by Darwin personnel to have an increased role in local matters were highlighted in the "Payne Report": "chang[ing government policy] involves reference to Canberra, Melbourne & c., and experience has shown that such attempts in the past are very costly in time and money and have rarely been successful".⁴

The only prominent Administrator who pressured the Commonwealth for a reliable and sound electricity scheme was Abbott. Throughout his years as Administrator, Abbott argued bitterly to obtain what other Australian capital cities already had access to. Echoes of the past returned with the rebuilding of Darwin after Cyclone Tracy. Again, local officials were excluded from the decision making process and Darwin's fate was once again decided by absentee landlords.

One of the fundamental tasks of this thesis has been to demonstrate that Darwin was Australia's forgotten capital until there became a need to develop it during the Second World War and immediately after Cyclone Tracy. Until these two events, Darwin was more or less left to its own devices. Darwin residents not only had to "make do" with the power system available but compete for it against defence personnel, only to lose it again to Cyclone Tracy.
An active interest in Darwin's development only occurred when the Commonwealth was pressured to do so. Strong evidence of the Commonwealth's disinterest was the lack of a credible power scheme which would have been advantageous to both residents and industry and no doubt, improved Darwin's economy and growth as was the case in other capital cities.

These days, the community would scarcely realise their need for, and dependence on, the electricity supply until it fails. Nor would they be aware, unless distribution lines are visible, of how the supply is carried to their homes. Very few Darwin people would know how electricity is generated and transmitted to the businesses where they work, the homes where they live, and to the streets where the lights show the way. The miracle of electricity that amazed earlier generations, is now taken for granted by today's society.

Interestingly, the history of electricity supply begins with gas as the first method of lighting Darwin and ends with gas as the fuel which generates electricity. Ironically, it was primarily gas companies that produced initial electricity supplies for Australian townships and now it is state power utilities which have helped develop gas supplies.

In conclusion, reflections on Darwin's present energy industry are warranted. National and world-wide trends towards competition, efficiency and productivity in government power utilities have seen privatisation become fashionable once again. Today Darwin's
electricity system stands at the dawn of a new era. Its heritage is made up of the lives of those whose work has moulded it, whose initiatives have guided it and whose plans have developed it. From its inception in Holmes' cold storage and ice making plant to government monopoly, the quest over who will control electricity is still unfolding.

Darwin's technology in the power industry has certainly achieved a milestone in 85 years. Gas, charcoal, wood, coke and diesel were the primary fuels used until the 1960s and 70s, when S.H.P.S. operated on oil. Natural gas was introduced 1986 with the construction of C.I.P.S. The first solar powered station in the world will be located at Tennant Creek and many remote communities are now utilising solar, with tidal power under investigation for coastal communities. The Territory has come a long way in a short time, and now leads the world in renewable energy. Ponder on this when you next turn on a switch.
LEGEND

Holmes' power house - Location 1
Cavenagh Square Power Station (No.1) 2
Armidale Street Power Station (No.2) 3
Bishop Street Power Station (No.3) 4
Stokes Hill Power Station 5
Channel Island Power Station 6

Figure 9 - Map showing the locations of Darwin's past and present power stations.
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